Elements, Compounds & Mixtures Key Notes

Elements, Compounds & Mixtures

There are over 150 types of atom. A substance which contains just one type of atom is known as an element. An element is made up of one type of atom

An atom is the smallest part of an element you can get - elements consist of just one type of atom (but there are countless numbers of atoms, not just one)!

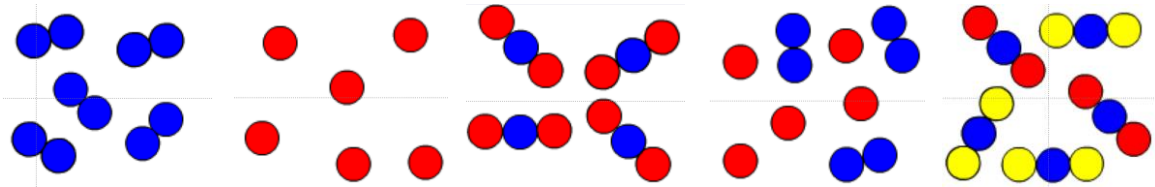
Each element has its own symbol

The atoms of different elements can join together in chemical reactions, forming compounds

The properties of compounds are usually very different from the properties of the elements they contain

A compound is two or more elements which are chemically bound together.

A mixture is made from different substances which are not chemically bound.



Element Element Compound Mixture Mixture

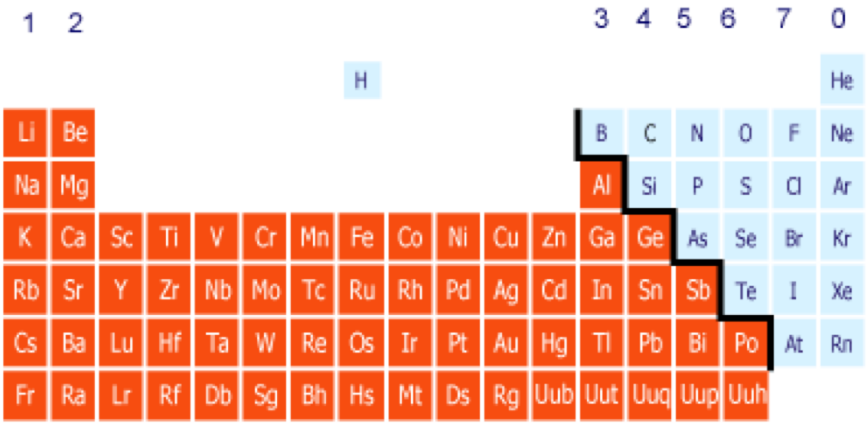
The Periodic Table

Every element has its own chemical symbol. It is usually one or two letters long (but can sometimes be three). Every symbol begins with a capital. The second and third letters are lower case

Sometimes the symbols are really obvious: O = oxygen; Li = lithium; Mg = magnesium

However sometimes it is not easy to tell what the symbol stands for (because the symbol come from a name that is not an English word) e.g. W stands for tungsten (from the word wolfram); Na for sodium (from natrium).

The chemical symbols are used all over the world, not matter what language people speak.



All the different elements are arranged in a chart - the periodic table

The elements are arranged so similar elements are found in the vertical columns, called groups. The horizontal rows are called periods

The metals are on the left, the non-metals on the right

Each element has its name and symbol, e.g. oxygen (O), but it also has a number - e.g. Oxygen = 8

This number is the atomic number - it tells you what element is what - e.g. oxygen always has an atomic number of 8, magnesium always has an atomic number of 12

You'll see in the table that this number gets bigger as you go along it

Elements Combining

To make your chemical name, you simply combine the names of the elements you reacted together to make your compounds

E.g.

carbon + oxygen → carbon oxide

sodium + chlorine → sodium chloride

iron + oxygen → iron oxide (rust)

copper + oxygen → copper oxide

The *ide* is added to the end to tell us the elements have joined together, forming a compound

When you add oxygen and 2 other elements, the name usually ends in *ate*

A chemical formula is made up of the symbols for the elements it contains

E.g. carbon monoxide is CO

This tells us it contains carbon and oxygen - for every one carbon atom there is one oxygen atom. Many chemical formulas also contain numbers - these tell you what the ratio of elements in the compound is

E.g. carbon dioxide is CO_2

This means that for every carbon atom there is, there are two oxygen atoms

Chemical Formula

Chemical equations show us our reactants and products

$$\text{reactants} \rightarrow \text{products}$$

They can be word or symbol equations, e.g.

$$\text{carbon} + \text{oxygen} \rightarrow \text{carbon monoxide}$$

$$2C + O_2 \rightarrow 2CO$$

Elements and compounds can be represented using chemical formula. We use numbers in the formula, which represents the number of atoms present (as a ratio)

C = 1 atom of carbon (C)

O_2 = 2 atoms of oxygen (O)

CO_2 = 1 atom of carbon (C); 2 atoms of oxygen (O)

NaCl = 1 atom of sodium (Na); 1 atom of chlorine (Cl)

H_2SO_4 = 2 atoms of hydrogen (H); 1 atom of sulphur (S); 4 atoms of oxygen (O)

Separating Mixtures

To separate mixtures we can use a variety of techniques - the method used depends upon the mixture: -

- Filtration
- Evaporation
- Distillation
- Chromatography

Filtration separates an insoluble solid (does not dissolve) from a liquid, e.g. sand and water can be separated using filtration

Evaporation separates a soluble solid (dissolved) from a liquid, e.g. water can be evaporated from salty water, leaving the salt behind

Distillation can separate a liquid from a solution. The liquid evaporates from the solution, is cooled and condenses (which you then collect). Different liquids boil at different temperatures, so it is possible to distill a solution containing many liquids, e.g. water can be separated from salty water

Chromatography can separate dissolved substances which have different colours. It works because some of the coloured substances dissolve in liquid better than others, so traveling further up the paper, e.g. an ink or dye can be split into the different colours which make it up

Melting & Boiling Points

Substances change states at given temperatures. This is very useful information to know, e.g. a mercury thermometer will not work below -39°C. Below this temperature the mercury will freeze (become solid), so cannot move up or down the thermometer!

Melting point - this is the temperature a substance turns from a solid to a liquid. Different substances have different melting points, e.g. water melts at 0°C; ethanol melts at -114°C

There is a fixed temperature where a substance turns from a solid to a liquid. Don't forget, this point is also the temperature where a substance turns from a liquid to solid (its freezing point), i.e - water melts at 0°C and above (solid to liquid); and it freezes at 0°C and below (liquid to solid)!

Boiling point - This is the temperature at which a substance evaporates as quickly as it can (liquid to gas). Different substances have different boiling points, e.g. water boils at 100°C; ethanol boils at 78°C

There is a fixed temperature where a substance boils from a liquid to a gas. Don't forget, this point is also the temperature where a substance turns from a gas to liquid (its condensing point), i.e - water boils at 100°C and above (liquid to gas); and it condenses at 100°C and below (gas to liquid)!

You can identify the state of a substance if you know its temperature, melting and boiling point:

- If the temp. is below the melting point, the substance will be a solid
- If the temp. is between the melting and boiling point, the substance will be a liquid
- If the temp. is above the boiling point, the substance will be a gas

If you add other substances then the temperature your original substance freezes, melts and boils can change, e.g. salt is added to water to lower the melting point (and freezing point). This is why salt is spread on roads during winter

Normally the water would freeze at 0°C. Adding the salt means the temperature must be even colder than 0°C for the ice to freeze - useful for cold nights!