AQA ELC Science Component 3 – Chemistry: Elements, mixtures and compounds

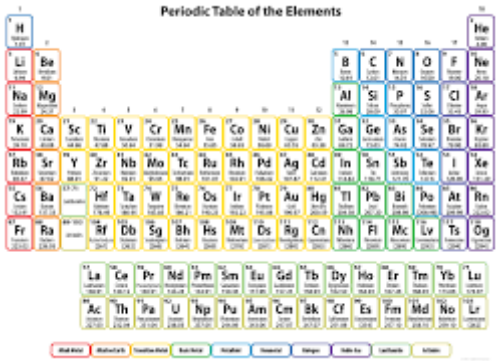
Atoms, Elements and Compounds

All substances are made of atoms. An atom is the smallest part of an element that can exist.

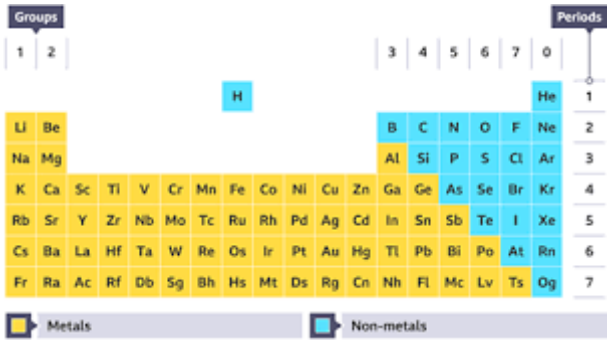
A substance that is made of only one sort of atom is called an element.

There are about 100 different elements.

Elements are shown in the periodic table.

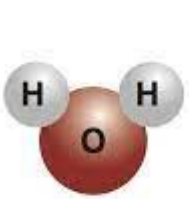


Metals are towards the left and the bottom of the periodic table and non-metals towards the right and the top of the periodic table.

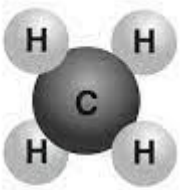


Elements in the same group of the periodic table have similar chemical properties.

When elements react, their atoms join with other atoms to form compounds.



Water
H_2O



Methane
CH_4

Some compounds are made from metals combined with non-metals, for example sodium chloride and magnesium oxide.

Sodium | Chlorine | Sodium Chloride

Some compounds are made from only non-metals, for example carbon dioxide.

Chemical reactions can be represented by word equations.

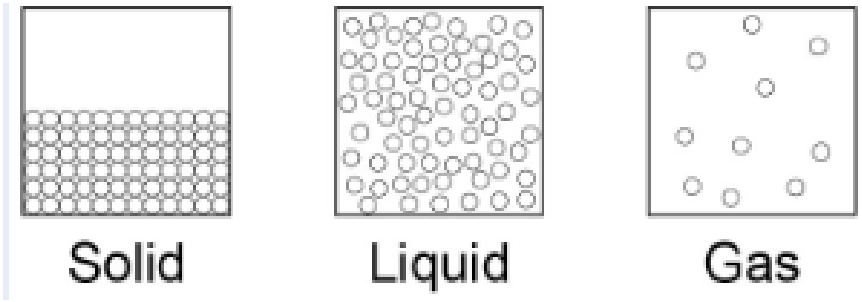
Sodium + chlorine → sodium chloride

Carbon + oxygen → carbon dioxide

How structure affects properties

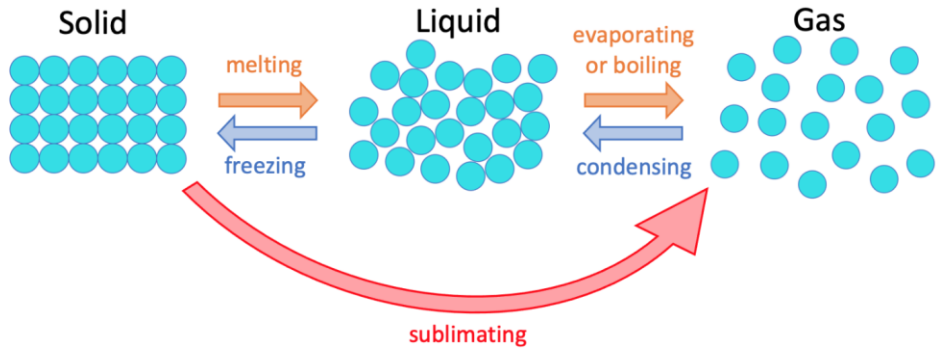
The three states of matter are solid, liquid and gas. Melting and freezing take place at the melting point, boiling and condensing take place at the boiling point.

The three states of matter can be represented by a simple model. In this model, particles are represented by small solid spheres.

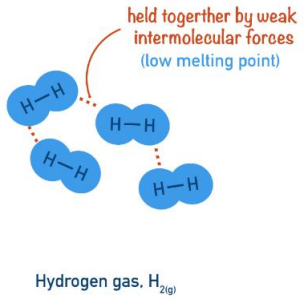


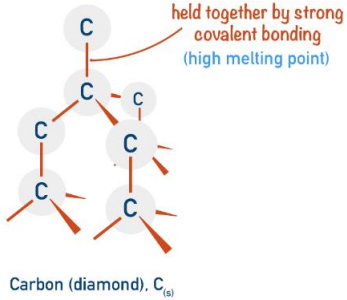
When a solid melts to become a liquid the particles are able to move about but stay close together.

When a liquid boils and becomes a gas the particles separate and move about rapidly.



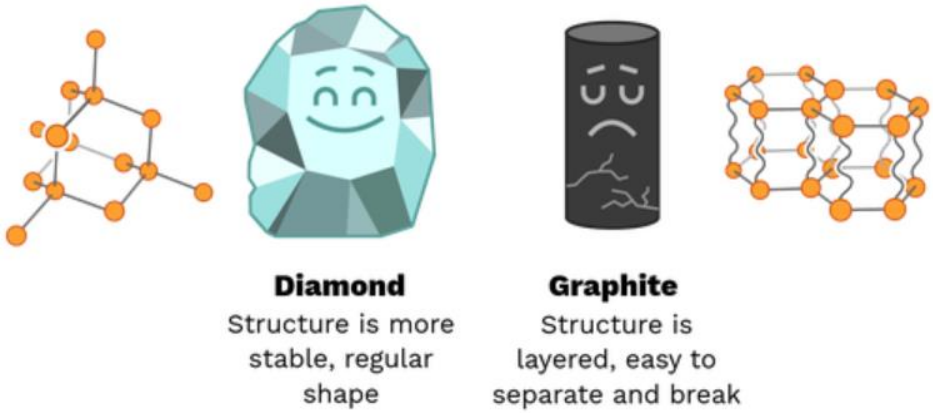
Substances with high melting points have strong forces that hold their particles together. Substances with low boiling points have weak forces between their particles.





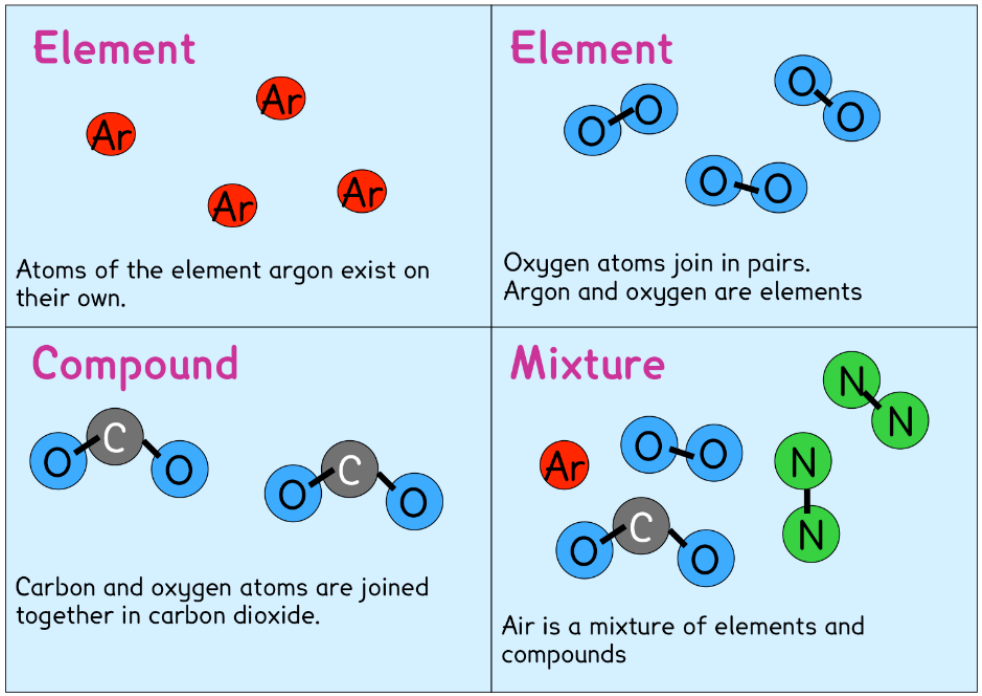
Diamond and graphite are forms of the element carbon with different properties because of their different structures. Diamond is hard because the carbon atoms are joined together in a giant three-dimensional structure.

Graphite is slippery because the carbon atoms are joined together in layers that can slide over each other.

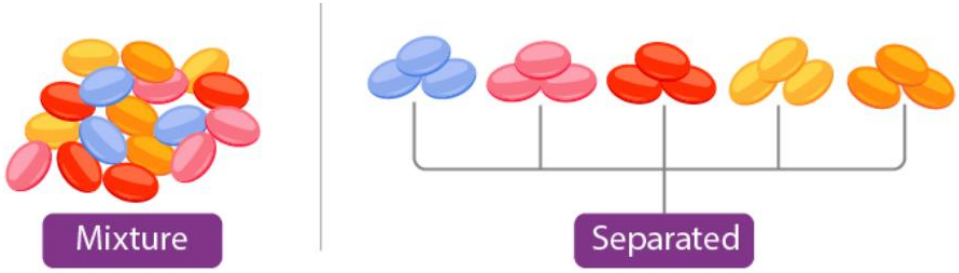


Separating mixtures

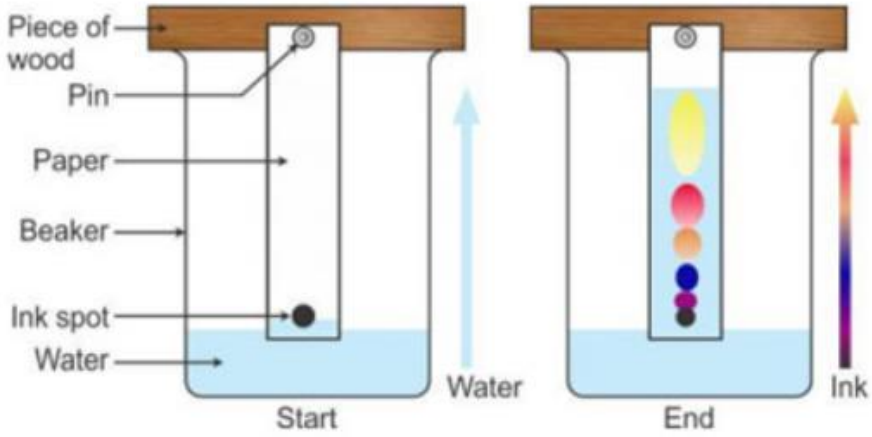
A mixture contains two or more substances not chemically combined together.



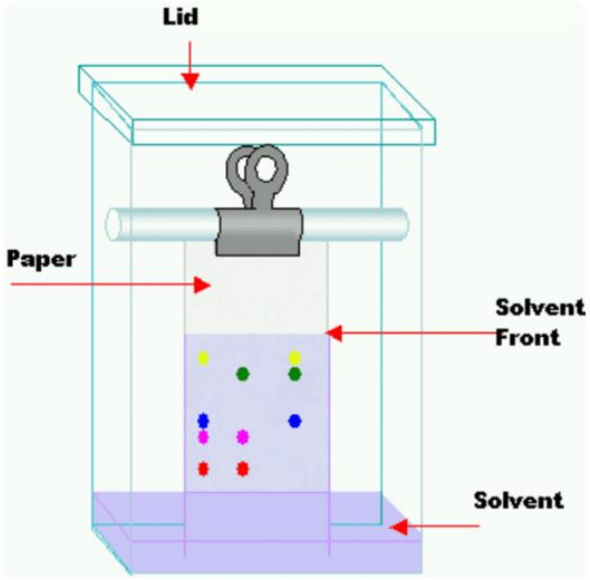
Mixtures can be separated by processes such as filtration, distillation, crystallisation and chromatography.



Paper chromatography can be used to separate mixtures and can give information to help identify substances.

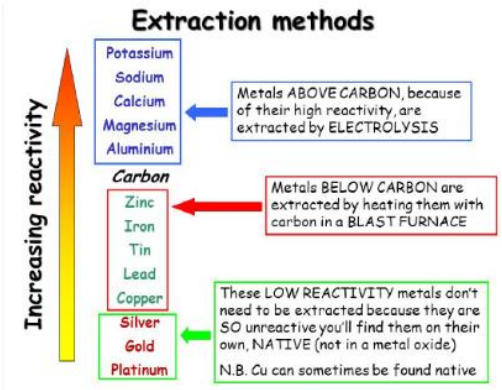


In paper chromatography a solvent moves through the paper carrying different compounds different distances.



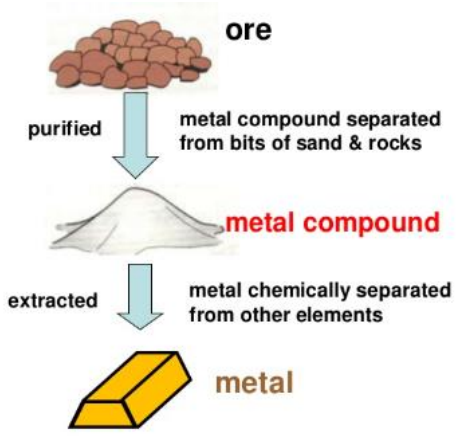
Metals and Alloys

Unreactive metals, such as gold, are found in the Earth as the metal itself, but most metals are found as compounds that require chemical reactions to extract the metal.



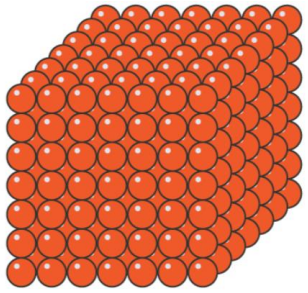
Metals less reactive than carbon can be produced by heating the metal compounds in the ore with carbon.

Ores contain enough metal to make it economic to extract the metal. Large amounts of rock need to be quarried or mined to get metal ores.



We should recycle metals to save resources and limit environmental impacts

Metals have giant structures of atoms with strong bonds between the atoms and so most metals have high melting points.



Copper has properties that make it useful for electrical wiring and plumbing.

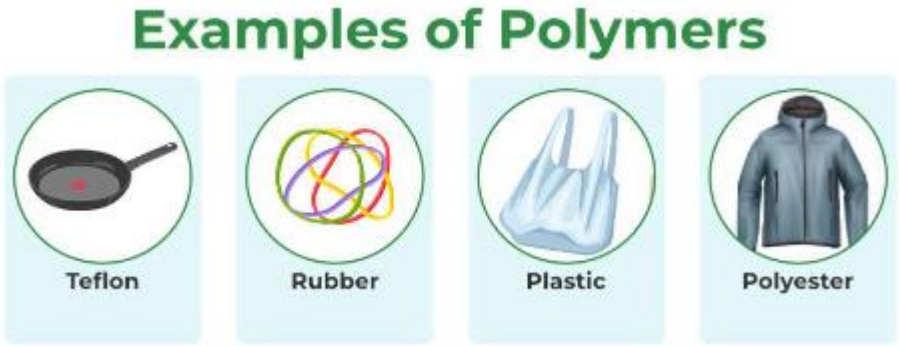
Aluminium is a useful metal because of its low density and resistance to corrosion.

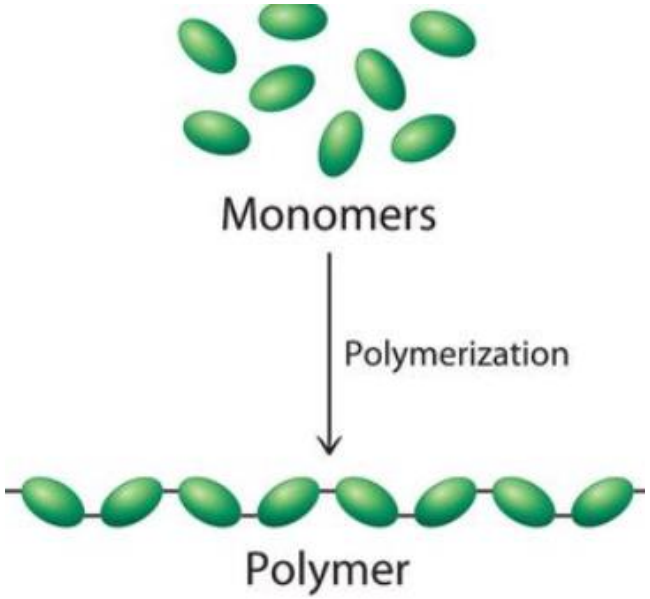
Most metals in everyday use are alloys. Pure iron, gold and aluminium are too soft for many uses and so are mixed with small amounts of other elements to make alloys, which are harder for everyday use.

Most iron is converted into steels. Steels are alloys since they are mixtures of iron with carbon and other metals.

Polymers

Polymers such as poly(ethene), poly(propene) polystyrene and PVC are made from small compounds called monomers that join together to form very long chains.





Polymers are waterproof, resistant to chemicals, and can be moulded, so they have many useful applications as packaging materials, pipes and containers.

Polyethylene is used to make plastic sandwich bags

Compact Discs are made from synthetic polymers such as polycarbonate

Polystyrene is used to make Styrofoam cups and cd cases

Milk jugs are made from the synthetic polymer polyethylene (HDPE)

Soda bottles are made from polyethylene terephthalate (PETE)

Synthetic polymers are used to make specialty athletic clothing using polymer such as Polyester, Nylon, Lycra or spandex

Many polymers are not biodegradable, so they are not broken down by microbes. This can lead to problems with waste disposal.