BGE Summary Notes

Matter and Substances

Matter

Matter is what everything is made from. There are 3 states of matter. These are SOLID, LIQUID and GAS.

Some examples of solids, liquids and gases are shown in the table.

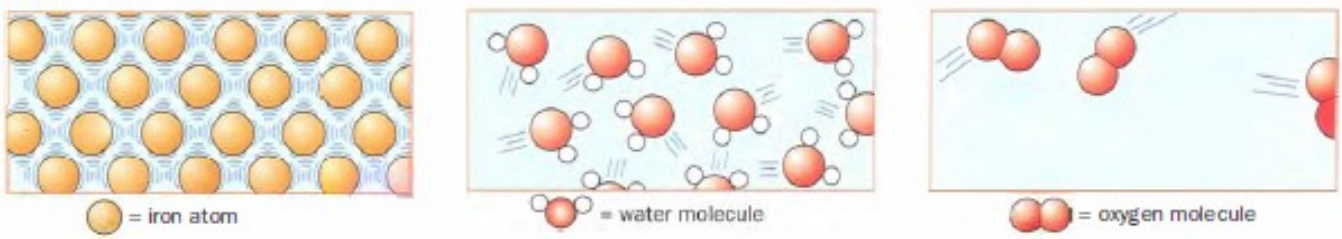
Solid	Liquid	Gas
ice	water	steam
iron	cola	oxygen
plastic	bleach	carbon dioxide
glass	oil	helium

Solids have a **FIXED SHAPE** and a **FIXED VOLUME**.

Liquids do **NOT** have a fixed shape, they will flow to take the shape of the container in which they are placed. They do have a **FIXED VOLUME**.

Gases do **NOT** have a fixed shape or a fixed volume.

The particles in solids, liquids and gases are arranged as shown in the diagram.



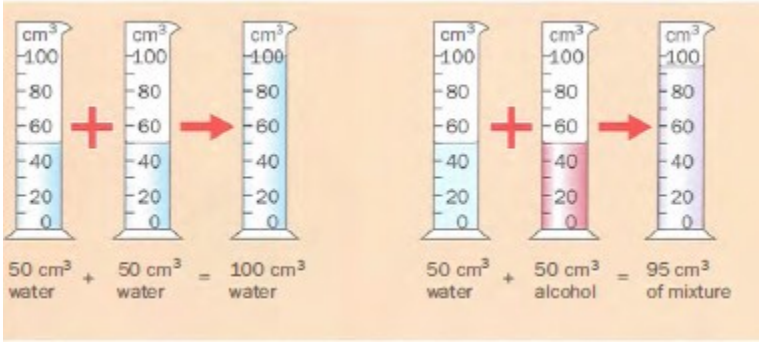
solid **liquid** **gas**

Compressing Matter

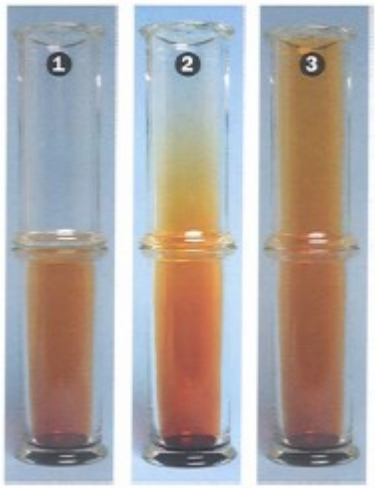
The word **COMPRESS** means to squeeze something into a smaller space. There is no space in either a solid or a liquid and so the particles cannot be squeezed any closer. In a gas, however, there is lots of empty space between the particles, allowing it to be compressed easily.

The mixing of one substance through another substance is called DIFFUSION.

eg When 50 ml of water is mixed with 50 ml of alcohol, the total volume is **NOT** 100 ml. This is because the water particles are smaller than the alcohol particles and can fall into the spaces between the alcohol particles. This is like grains of sand falling into the gaps between dried peas.



Diffusion can also happen in gases.

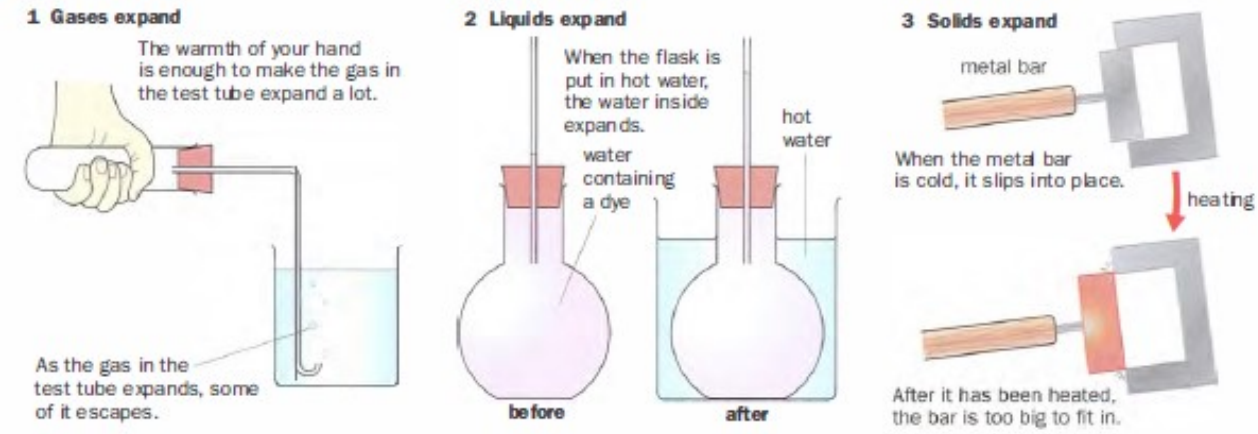


Changing the State

Heating and cooling can affect solids, liquids and gases. When a solid is heated, it **MELTS** and changes into a liquid. If a liquid is heated, it **EVAPORATES** and changes into a gas. A gas will change into a liquid when cooled. This is called **CONDENSATION**. If a liquid is cooled enough, it will change into a solid. This is called **FREEZING**.

Expansion

When a solid is heated, the heat causes the solid to **EXPAND** (become larger). When cooled, the solid will **CONTRACT** (become smaller). Liquids and gases also expand when heated and contract when cooled. Because of the spacing between the particles, gases are able to expand most followed by liquids and then solids.



The Periodic Table

Elements

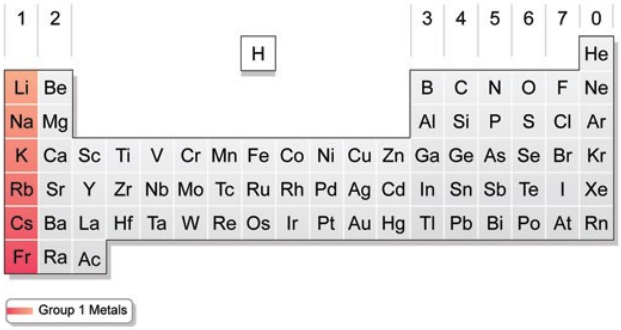
An element is a substance which is made up of only one type of atom and cannot be broken up into anything simpler. There are just over 100 different elements and these are listed on the PERIODIC TABLE. The arrangement of elements on the Periodic Table was first done by the Russian scientist **Dimitri Mendeleev**. The elements are mostly solids at room temperature, however, there are 2 which are liquids (bromine and mercury) and 11 which are gases (hydrogen, nitrogen, oxygen, fluorine, chlorine, helium, neon, argon, krypton, xenon and radon).

The Periodic Table can also be divided into METALS (on the left) and NON-METALS (on the right).

Elements are arranged together vertically in GROUPS according to the way in which they react.

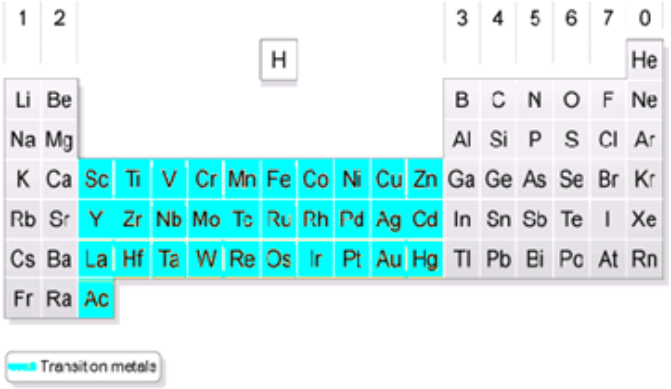
Alkali Metals

These are found in **group 1** of the Periodic Table. They all react violently with water.



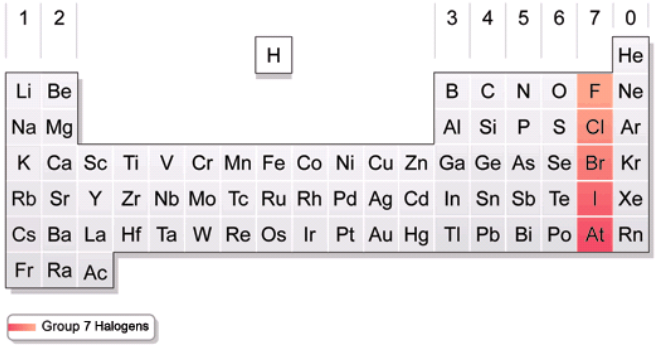
Transition Metals

These are found between groups 2 and 3 of the Periodic Table. They are all fairly unreactive.



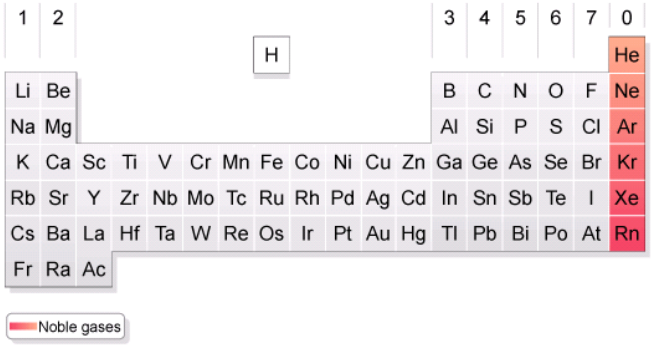
Halogens

These are found in group 7 of the Periodic Table. They are highly reactive non-metals.



Noble Gases

These are found in group 8 or 0 of the Periodic Table. They are **VERY** unreactive.



Compounds

An atom is the simplest type of particle. Very often atoms join together in groups to form MOLECULES. A COMPOUND is formed when atoms of different elements join together.

eg the elements magnesium and oxygen join together to form the compound magnesium oxide. This can be represented by a **WORD EQUATION**.

magnesium + oxygen ⟶ magnesium oxide

Naming Compounds

The name of a compound will indicate which elements are present in the compound.

1. Names ending in -**IDE**

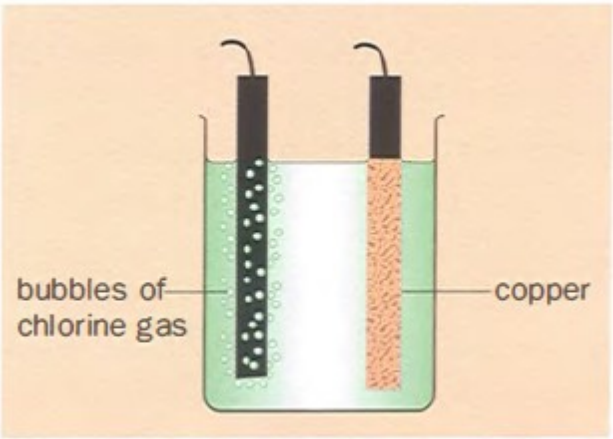
These contain the TWO elements which are suggested by the name eg aluminium sulfide contains the elements **aluminium** and **sulfur**.

2. Names ending in -**ITE** or -**ATE**

These contain THREE elements, one of which is always OXYGEN eg sodium carbonate contains the elements **sodium**, **carbon** and **oxygen**.

Breaking a Compound

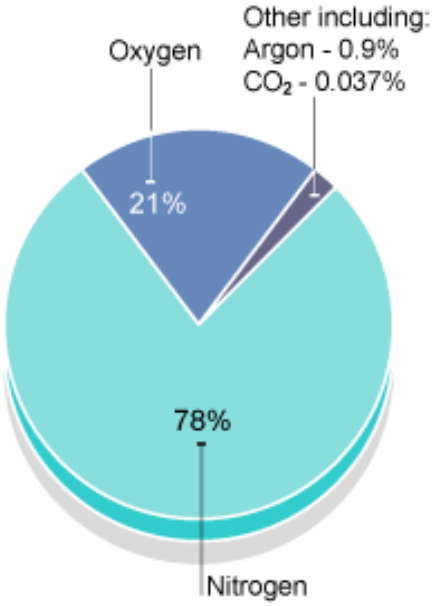
A compound can be broken up into the elements from which it was made. Energy is required for this process, usually in the form of heat or electricity eg the compound copper chloride can be broken down into the elements copper and chlorine using electricity.



Gases in the Air

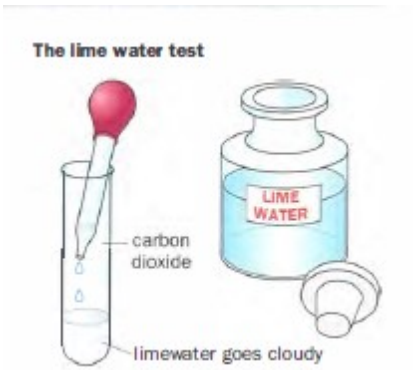
Air is a mixture of gases. It is made of 78% nitrogen, 21% oxygen and small quantities of other gases such as argon and carbon dioxide.

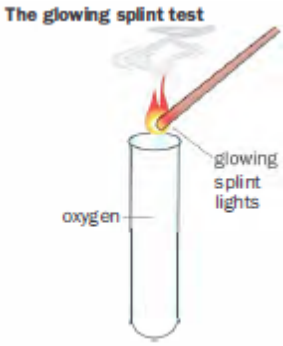
Air is an example of a MIXTURE. A mixture is made up of different substances which are not chemically joined together. In a COMPOUND, the substances have been chemically joined. A PURE substance is made up of one single chemical.

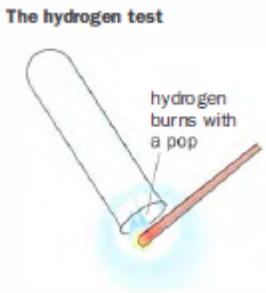


Gas Tests

We can carry out tests to show which gas is present in a sample. **CARBON DIOXIDE** gas will TURN LIME WATER MILKY; **OXYGEN** gas will RELIGHT A GLOWING SPLINT and **HYDROGEN** gas will BURN WITH A "POP".







Solutions

A solution is a mixture formed when a SOLUTE dissolves in a SOLVENT. The solute is the substance which is being dissolved; the solvent is the liquid which is doing the dissolving; the solute and solvent together make up a SOLUTION.

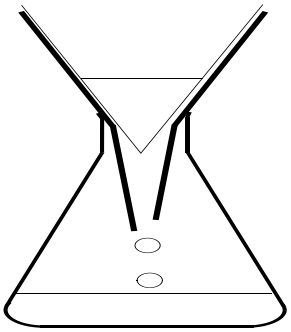
A substance which is able to be dissolved is said to be SOLUBLE, one which cannot dissolve is INSOLUBLE. A SATURATED solution is one in which no more solute can be dissolved.

Water is the most commonly used solvent. However, some substances which are insoluble in water may dissolve in other solvents eg nail polish is insoluble in water, but will dissolve in acetone.

These are called NON-AQUEOUS solvents.

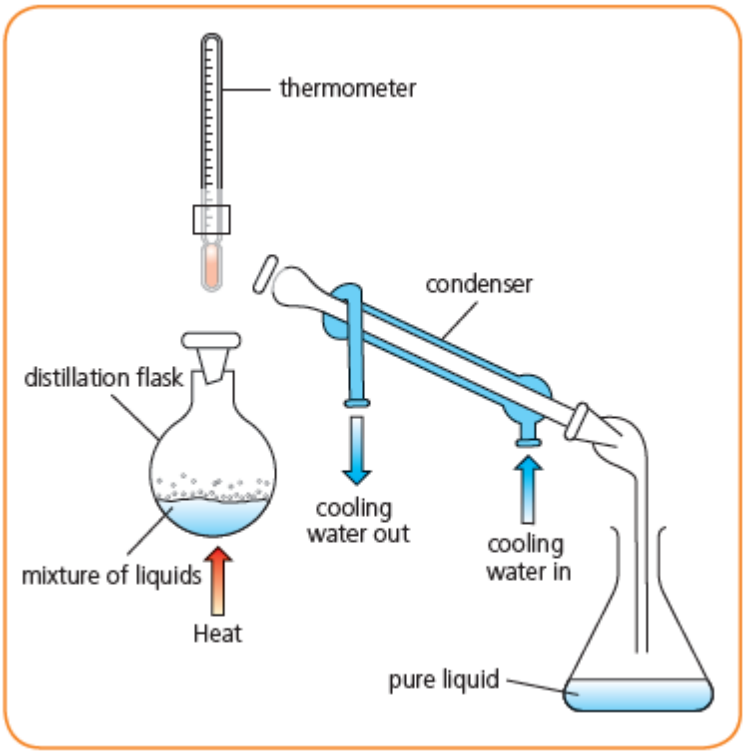
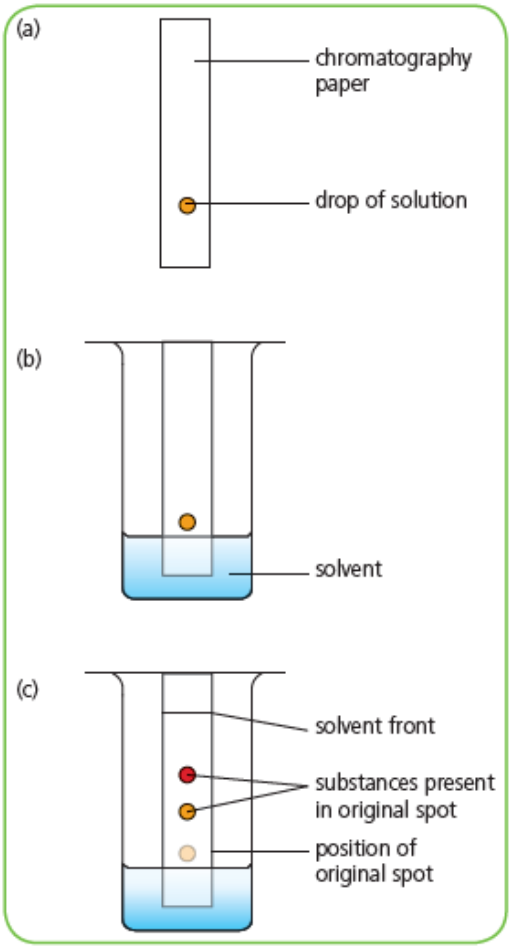
Separating Substances

An insoluble substance can be separated from water using a technique called **FILTRATION**.



A soluble substance can be separated from water using a technique called **EVAPORATION**.

Liquids can be separated using a technique called **DISTILLATION**.



Another separation technique is called CHROMATOGRAPHY. This is used to separate mixtures eg inks.