

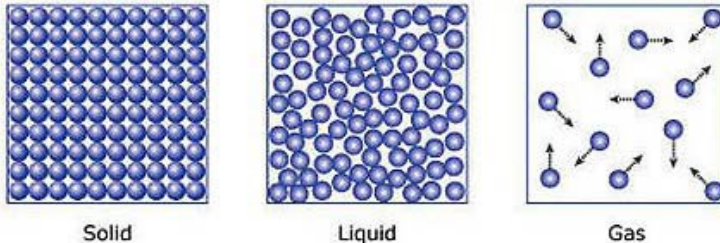


C1a Particles, elements, atoms and behaviour

Topic outcome: Describe the arrangement of particles in solids, liquids and gases.

Particle Theory

All matter is made up of particles. Particles are found in all 3 states of matter.



Particles in the 3 states behave differently. In **solids**, particles are arranged in a **regular pattern** and they can only **vibrate** in a fixed position. Particles in solids are not free to move and cannot be **compressed**.

In **liquids**, particles can **slide pass** each other and flow but cannot be **compressed**. They are **arranged randomly** and take the shape of a container.

In **gases**, particles carry a lot of energy and they **move in all directions** at high speed. Particles are **far apart** and are **arranged randomly**. They can be completely compressed.

Diffusion

Diffusion is the **movement of particles from a higher concentration to a lower**

concentration. Diffusion will stop when particles spread themselves evenly. Diffusion occurs in liquids and gases but not in solids, because particles in a solid are not free to move.

Term	Definition
State of matter	Matter is divided into three states: solid, liquid and gas.
Melting	Change of state from solid to liquid.
Freezing	Change of state from liquid to solid.
Boiling	Change of state from liquid to gas
Condensation	Change of state from gas to liquid
Diffusion	Particles spread from a region of higher concentration to a region of lower concentration
Concentration	The number of particles in a known volume.
Particles	All matter is made up of tiny particles



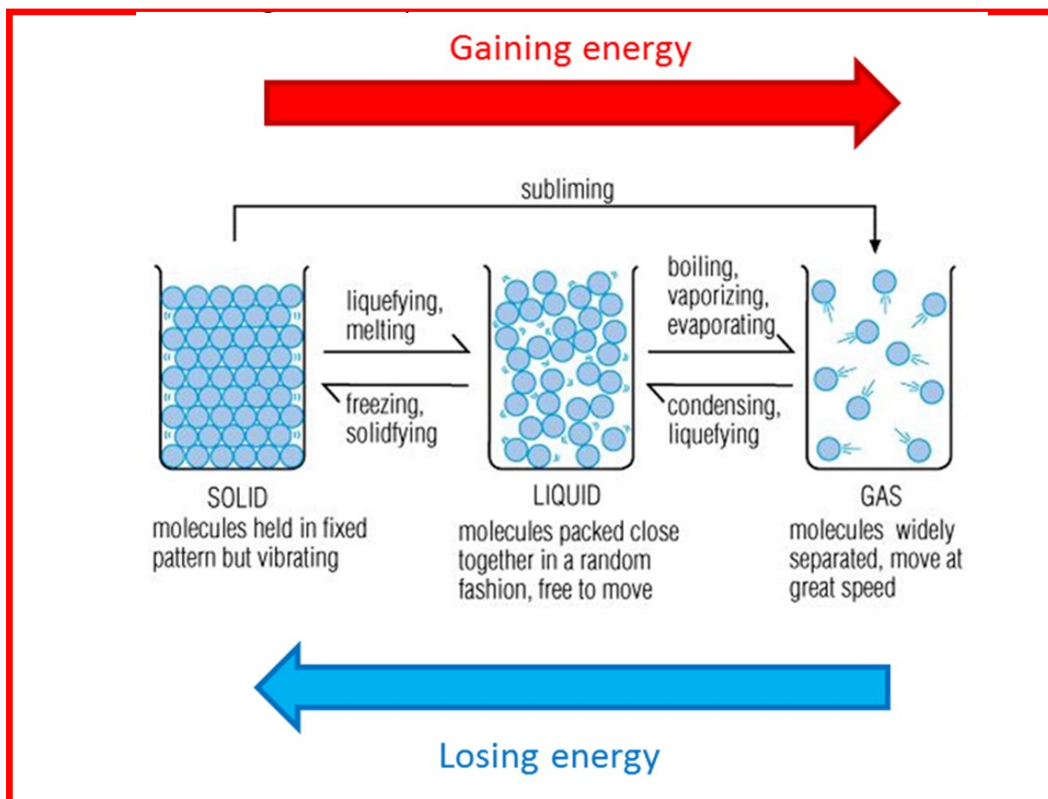
Diffusion

Temperature: When temperature increases, particles gain more energy. They can then move and spread out at a higher rate.



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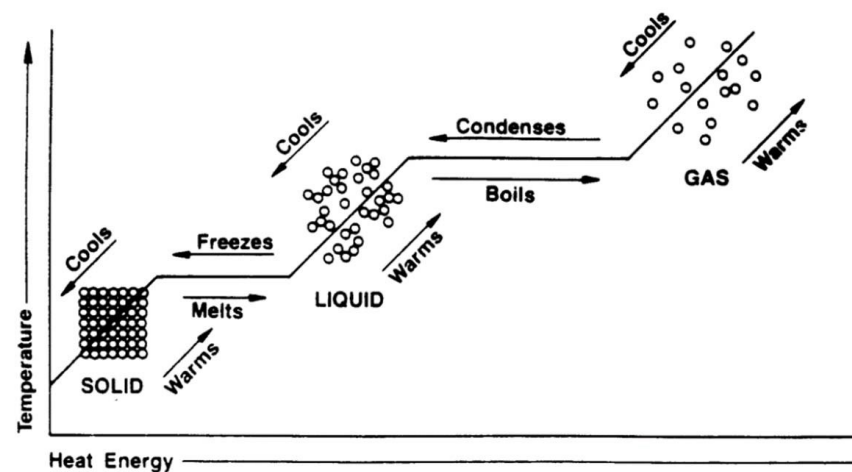
Topic outcome: Explain changes of state in terms of the particle model.



Change of State Changes of state take place when the particles gain or lose energy. When energy is applied, particles gain energy and move further apart. When energy is lost, particles become closer to each other and arrange themselves more regularly. As particles gain more energy they spread out more and their movement becomes more random. When substances change state all of the energy supplied to the substance goes towards breaking the bonds between the particles and not into increasing the temperature of the substance.

Interpreting the Energy-Temperature Graph

During the change of state, **the temperature will stay the same until the change of state has been completed**, i.e. all liquid has turned into gas, all liquid has frozen into solid, etc.

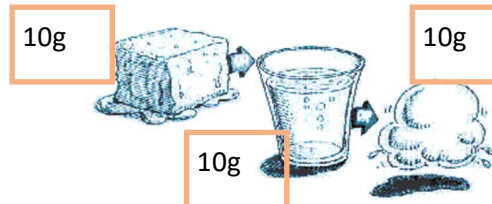


Conservation of Mass

Mass stays the same before and after a change of state.

For example, 10g of ice melts

into 10g of water, and 10g of water evaporates into 10g of water vapour. The same applies to other substances.





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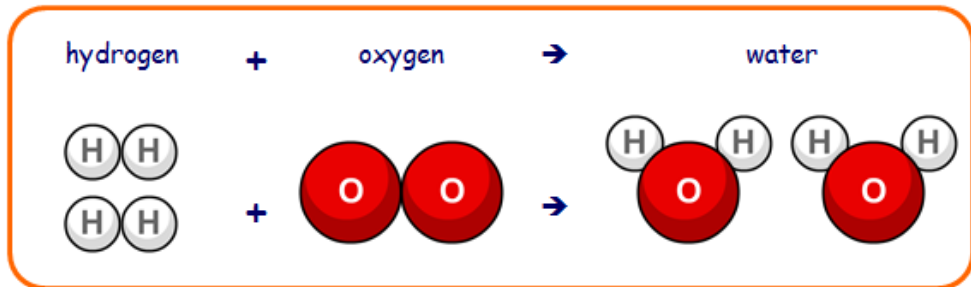
Topic outcome: Identify the differences between atoms, elements and compounds.

Atom All of the elements we know of are found on the periodic table.

Why isn't water an element?

Atom	The building block of matter (the smallest thing everything is made of).
Element	A substance made of only one type of atom.
Compound	A substance made of more than one type of atom which are chemically bonded.
Mixture	A substance made of more than one element or compound that are not bonded together.

When two or more elements react in a chemical reaction a new substance, called a compound is formed.



Each element is given its own chemical symbol, like **H** for hydrogen or **O** for oxygen. Chemical symbols are usually one or two letters long.

Every chemical symbol starts with a capital letter, with the second letter written in lower case. For example, **Mg** is the correct symbol for magnesium, but mg, mG and MG are wrong. **Take care to write chemical symbols correctly.**

Mg	mg	mG	MG
✓	✗	✗	✗

The same chemical symbols are used all over the world, no matter which language is spoken, which makes them very useful.

Properties

Each element or compound will have specific properties, this means what the element is like.

Physical properties are factors such as a substance's boiling point, density or melting point.

Chemical properties are factors such as a substance's reactivity. A compound has very different properties to the elements from which it is made.

