

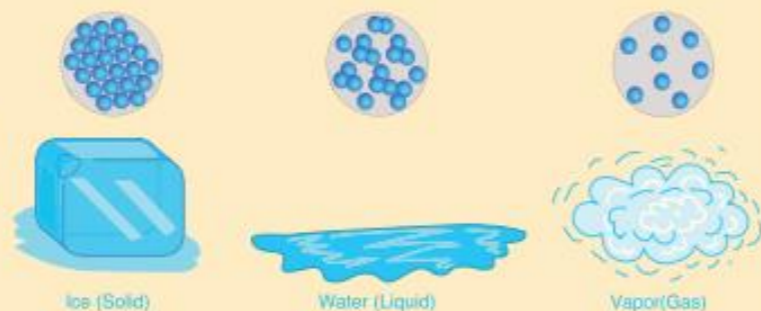
# Year 7 Chemical Engineer Topic Knowledge Organiser

## States of matter

Everything in the universe is made of particles. We can represent particles as spheres (balls).

There are 3 states of matter: solid, liquid and gas.

- Solids, the particles can vibrate in a fixed position.
- Liquids, the particles can flow but always touch other particles.
- Gases the particles have a lot of energy and are not in contact with one another.



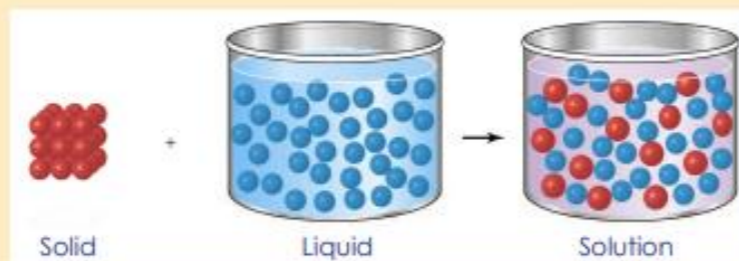
Ice (Solid)

Water (Liquid)

Vapor (Gas)

Solutions are formed when one substance (the solute) dissolves in another substance (the solvent).

Usually, solutions are formed when a solute is dissolved in a solvent.

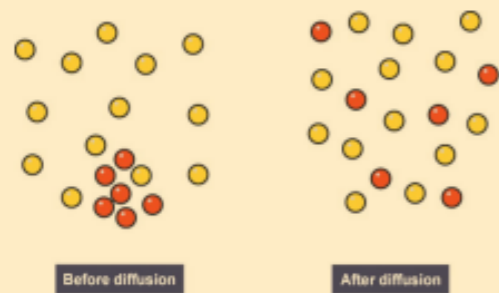


Solid

Liquid

Solution

## Diffusion

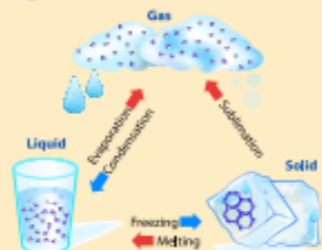


Before diffusion

After diffusion

Diffusion occurs when particles spread, they move from a region where they are in a high concentration, to a region where they are in low concentration.

## Changes of state

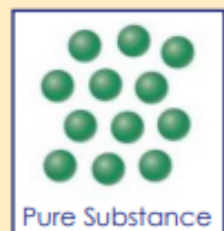


Particles have energy. The more energy they have, the faster they move. The faster they move, the more they can spread-out from one another. Solids have the least amount of energy, followed by liquids and finally by gases.

## Pure substances

A pure substance is made up of only 1 type of particle.

A mixture made up of more than one type of particle, but the particles can be easily separated back into pure substances.



Pure Substance



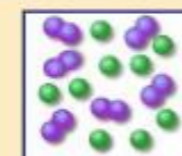
Pure Substance



Mixture



Elements



Mixtures



Compounds

Are made up of only one type of atom. The periodic table is a list of all the elements that we know. If a substance can be broken down into simpler parts, it cannot be an element.

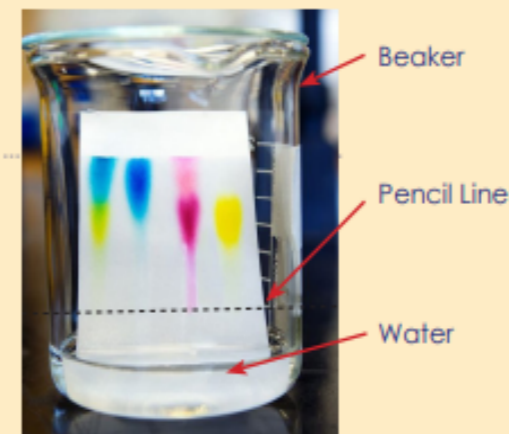
- Elements are made up of only 1 type of atom.
- The periodic table is a list of all the elements that we know.
- If a substance can be broken down into simpler parts, it cannot be an element.

Are made from more than one type of atom or molecule that are not chemically joined and therefore can easily be separated by processes such as filtration, distillation and crystallisation.

When two or more elements are chemically joined together, we call this a compound. The atoms in compounds are chemically joined; they cannot be easily separated.

## Chromatography

Chromatography can be used to separate liquids that have different solubilities. Chromatography is ideal for separating dyes in ink. The different dyes will travel up the paper at different rates.



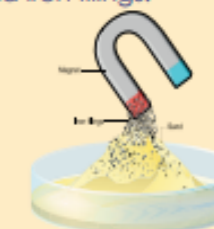
Beaker

Pencil Line

Water

## Magnetism

Magnets can be used to separate magnetic materials from non-magnetic materials. E.g. Sand (non-magnetic) and iron filings.



## Filtration

Filtration can be used to separate a insoluble solid from a liquid. This method requires filter paper and a funnel. E.g. Sand and water, the sand doesn't dissolve in the water and when the mixture is poured into the filter paper the grains cannot pass through the tiny holes in the filter paper and so the sand would collect in the filter paper.



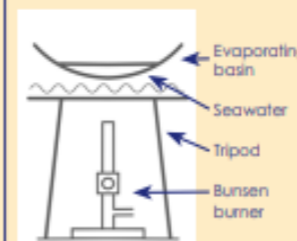
Filter paper

Funnel

Flask

## Evaporation

Evaporation can be used to separate a soluble solid from a liquid. E.g. Separating the salt and water in seawater. When the water is evaporated the salt will form crystals in the evaporating basin, this is called crystallisation.



Evaporating basin

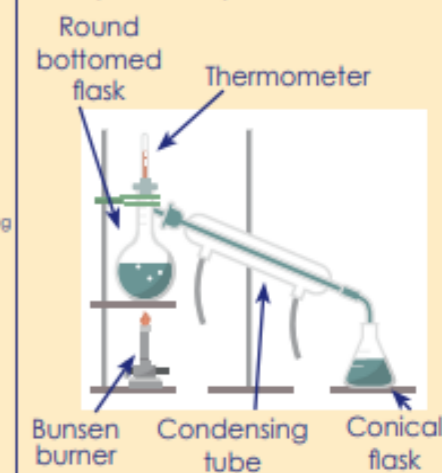
Seawater

Tripod

Bunsen burner

## Distillation

Distillation is used to separate liquids that have different boiling points. When heated the liquid with the lowest boiling point will boil first, it will then cool, condense and be collected in the conical flask (or beaker) at the end.



Round bottomed flask

Thermometer

Bunsen burner

Condensing tube

Conical flask

## Metals and Non-metals

### Physical properties

Metals	Non-Metals
Good conductors of electricity	Poor conductors of electricity
Good conductors of thermal energy	Poor conductors of thermal energy (insulator)
Malleable	Brittle
Ductile	Non-ductile
High melting point	Low melting point

### Chemical properties

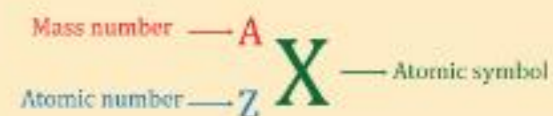
Metals and non-metals react to form compounds.

Metals react with oxygen to form oxides.

Metals react with acids to form a salt. The type of salt depends on the acid that the metal reacts with.

Some more reactive metals react with water to form hydroxides.

## The periodic table



- Groups – are the columns / Periods – are the rows.
- Elements in the same group have similar properties.
- The symbol for an element can be a single capital letter or a capital and a lower case letter.
- The symbols don't always match the name of the element – usually this is because the symbol is based on the name in Greek or Latin.
- On the periodic table each element has two numbers, this is the atomic (proton) number and the atomic mass.

### Group 1:

1. Known as alkali metals.
2. Silvery-coloured metals
3. Soft and can be easily cut
4. Reactivity decreases as you go down the group.

All Group 1 metals have a very high reactivity and the reactivity increases down the group.



### Group 0:

1. Known as Noble gases.
2. All Noble gases are inert (unreactive).
3. Reactivity does not change as you go down the group.

### Group 7:

1. Known as halogens.
2. Reactivity decreases as you go down the group.