Substances and particles

Solid	Liquid	Gas
Particles: - Are closely packed together - Are in fixed arrangement - Are constantly vibrating	Particles: - Are close together - Are in a changing, random arrangement - Can move around	Particles: - Are further apart - Are in a random arrangement - Move very quickly

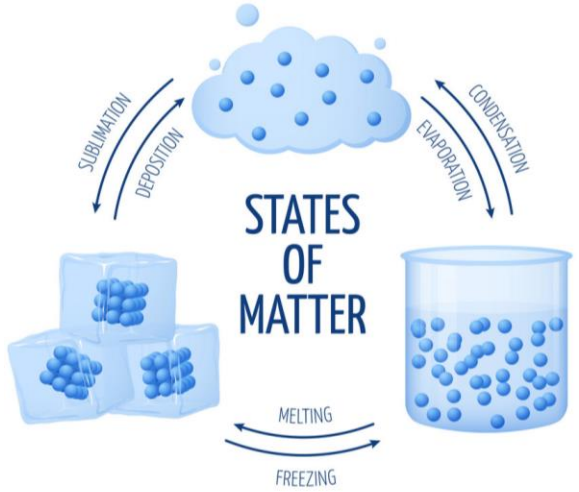
Melting

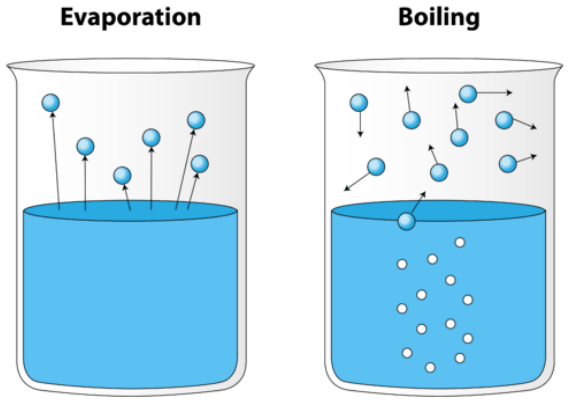
- When a solid turns to a liquid
- Energy is added
- Particles vibrate more and move away from each other
- Temperature at which melting occurs is known as its **melting point**.

Freezing

- When a substance moves from a liquid to a solid
- Particles move slower, as they transfer energy to surroundings
- Particles arrange into regular pattern and vibrate on the spot
- A substance will start to freeze at temperatures **below** its **melting point**.

The mass **does not** change during melting/freezing, as **no particles** are being added/removed.





Boiling

- When a liquid turns into a gas
- Energy is added
- As a liquid boils, steam bubbles rise to the surface and escape into the air.

The temperature a liquid boils at is known as its **boiling point**.

Boiling vs Evaporation

During boiling:	During evaporation:
- Bubbles of substance form in a gas form throughout liquid - Rise to the surface and escape - Happens only at the **boiling point**	- Particles escape from surface of liquid - Happens at **any temperature**

Diffusion

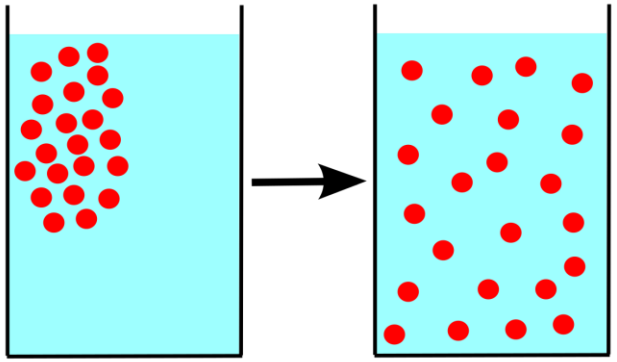
Movement of particles from an area of **high** concentration to an area of **low** concentration.

Diffusion can occur in liquids and gas. Particles diffuse because they are constantly moving.

Factors affecting diffusion:

Temperature – higher the temperature the faster the diffusion. Particle have more kinetic energy.

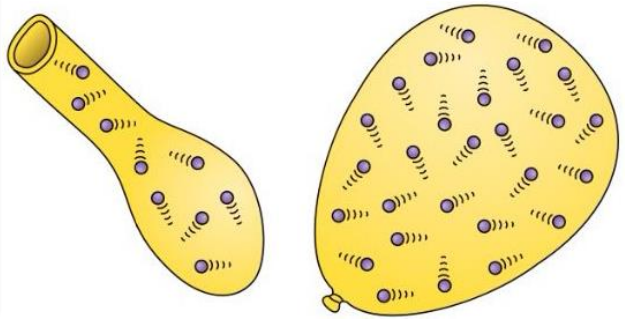
Particle size – the smaller the particle the faster the rate of diffusion, as the particles are lighter.



Gas Pressure

The force exerted by gas particles per unit area of a surface.

Gas particles always exert pressure on the walls of their container. A balloon with more air in it has a higher gas pressure than a deflated balloon as there are more particles colliding off each other and the walls.



Solution

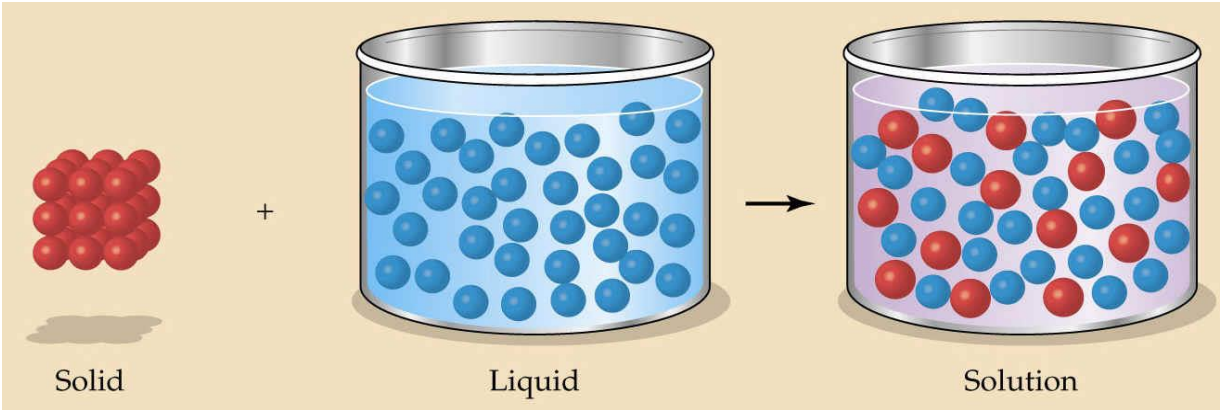
A mixture of a liquid with a solid or a gas.

Solute

The solid or gas that dissolves into a liquid.

Solubility

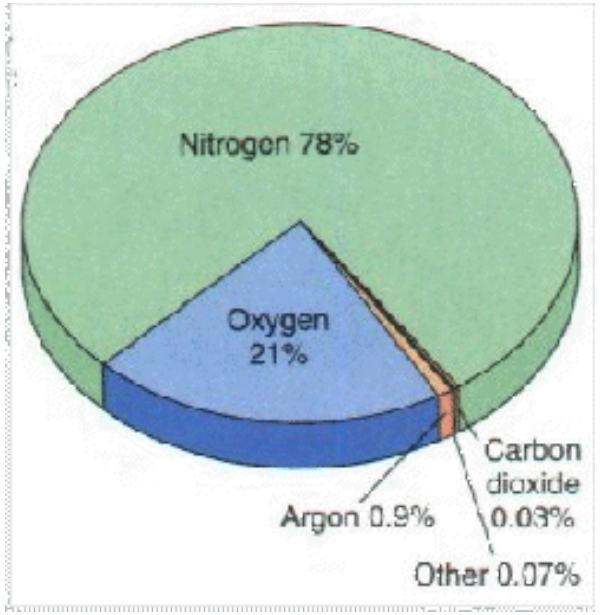
The mass of a substance that dissolves into 100g of water



Mixtures

When some elements or compounds are mixed together and intermingle, but do not react together. A mixture is an impure substance.

A gold bar is not a mixture as it only contains gold atoms. The air around us is an example of a mixture, as there are many different gas found in air. The purity of a substance can be determined by its **melting point**.

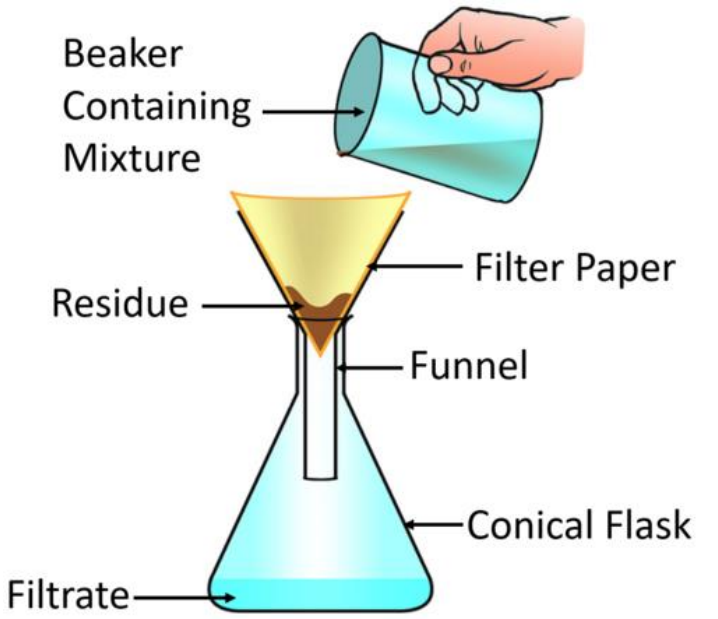


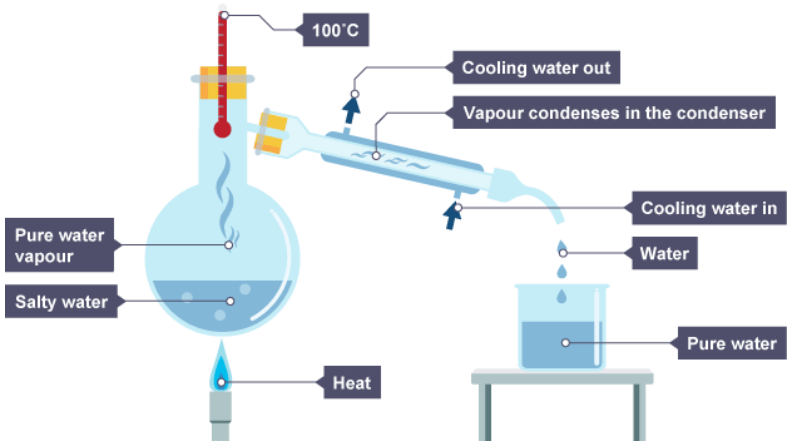
Filtration

Separates liquids from **insoluble** (cannot dissolve) solids.
Filter paper can be used to filtrate a mixture. The paper allows the liquid particles to flow through.
But the larger solid particles are too big to fit through. The solid left on the filter paper is known as **residue**.

How is filtration useful?

- Separates coffee solution from ground up coffee beans
- Oil filters in cars filter out dust/dirt, but allow liquid oil to pass through.





Evaporation and Distillation

Evaporation is the process of turning liquid into a gas.
When using some glues, the solvent evaporates leaving the sticky substance join the two surfaces.
Distillation is a technique that uses evaporation and condensation to obtain a solvent from a solution.
Distillation works by:

1. Heating a solution until it **boils**
2. Steam leaves the solution
3. Steam travels down a **condenser**, and cools down
4. The steam **condenses** into a liquid
5. The liquid drips into a **beaker**

Saudi Arabia use distillation to obtain drinking water from seawater.

Chromatography

A technique used to separate mixtures of liquid that are soluble in the same solution.

How does it work?

- The substance that needs to be separated is placed on a straight line (drawn in pencil) near the bottom of the chromatography paper.
- The paper is placed into a container, the solvent line (liquid) must below the solute (substance).
- The solvent travels up the paper, and takes the solute with it,
- Different solutes will travel different distances
- When complete a line is drawn for where the solvent had reached (in pencil)
- The retention factor (Rf) can be calculated by using this equation:

$$Rf = \frac{distance\ moved\ by\ solute\ (cm)}{distance\ moved\ by\ solvent\ (cm)}$$