Explaining the properties of solids

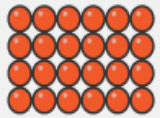
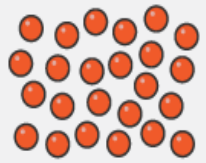
Property	Reason
Fixed shape & cannot flow	Particles cannot move from place to place
Cannot be compressed (squashed)	Particles are close together and have no space to move into

Explaining the properties of liquids

Property	Reason
They flow and take the shape of their container	The particles can move around each other
They cannot be compressed (squashed)	The particles are close together and have no space to move into

Explaining the properties of gases

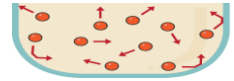
Property	Reason
They flow and completely fill their container	The particles can move quickly in all directions
They can be compressed (squashed)	The particles are far apart and have space to move into

State	Solid	Liquid	Gas
Diagram			
Arrangement of particles	Regular arrangement	Randomly arranged	Randomly arranged
Movement of particles	Vibrate about a fixed position	Move around each other	Move quickly in all directions
Closeness of particles	Very close	Close	Far apart

Science 7CP Particles

Gas Pressure

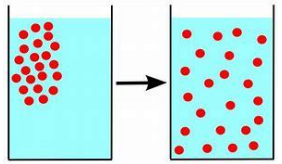
When gas particles hit the walls of their container, they cause pressure. The faster the particles move, the higher the gas pressure.



Diffusion

Diffusion is the movement of a substance from an **area of high concentration** to an **area of low concentration**.

Diffusion happens in **liquids** and **gases** because their particles move randomly from place to place.



Conservation of mass

The particles stay the same when a substance changes state - only their **closeness**, **arrangement** or **motion** change. This means that the **mass of the substance stays the same**.

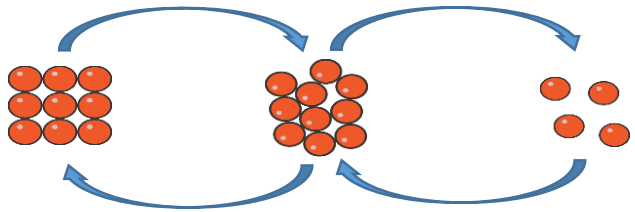
For example, 10 g of water boils to form 10 g of steam, or freezes to form 10 g of ice. This is called **conservation of mass**.

Losing energy

	Condensing	Freezing
Description	Gas to liquid	Liquid to solid
Closeness of particles	Become much closer together	Stay close together
Arrangement of particles	Stay random	Random to regular
Motion of particles	Stop moving quickly in all directions, and can only move around each other	Stop moving around each other, and only vibrate on the spot

Gaining energy

melting | Boiling (or evaporating)



Freezing | Condensing

Losing energy

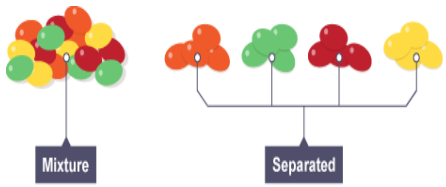
Gaining energy

	Melting	Evaporating or boiling
Description	Solid to liquid	Liquid to gas
Closeness of particles	Stay close together	Become much further apart
Arrangement of particles	Regular to random	Stay random
Motion of particles	Start to move around each other	Start to move quickly in all directions

Science7CP Particles

A pure substance contains only one type of particle.
For example:
- Pure iron contains only iron particles (called iron atoms);
- Pure water contains only water particles (called water molecules);
- Pure oxygen only contains oxygen particles (called oxygen molecules).

A mixture contains more than one type of particle that are <u>not</u> chemically joined together.
For example:
- Steel contains iron particles and small amounts of carbon particles (called carbon atoms);
- Tap water contains water particles and small amounts of other particles (called ions);
- Air contains 21% oxygen, 78% nitrogen and 1% of other gases (eg argon and carbon dioxide).



We can separate mixtures in different ways depending on their properties:

- Filtration
- Evaporation
- Chromatography
- Distillation

Dissolving is one way to make a mixture. For example, when salt is stirred into water, the salt **dissolves** in the water to make salt **solution**.

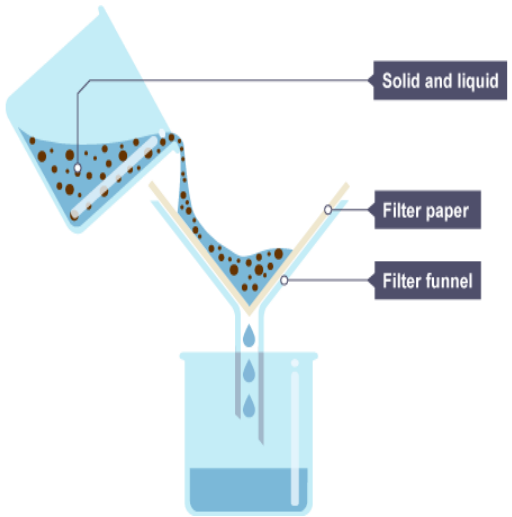
In a solution:
- the substance that dissolves is called the **solute**;
- the substance that the solute dissolves in is called the **solvent**.

E.G In salt solution, salt is the solute and water is the solvent.

When you can't dissolve any more solute in a solvent, we say the solution is **saturated.**

Filtration is a method for separating an **insoluble** solid from a liquid.

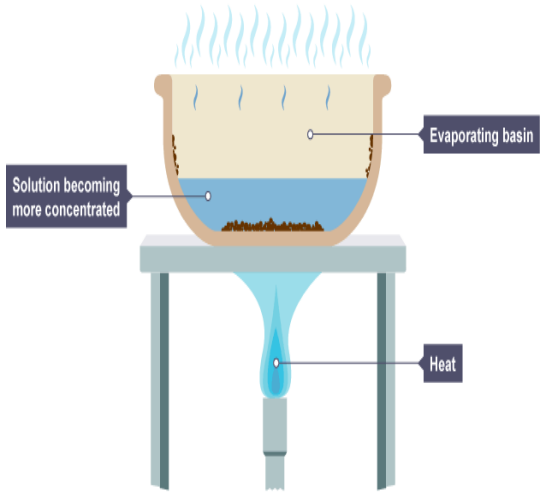
When a mixture of sand and water is filtered:
- the sand stays behind in the filter paper (it becomes the **residue**);
- the water passes through the filter paper (it becomes the **filtrate**).



Evaporation is used to separate a **soluble** solid from a liquid.

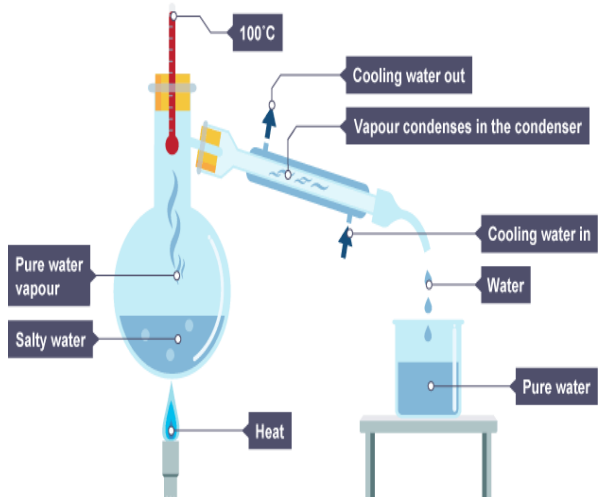
For example, copper sulphate is soluble in water – its crystals dissolve in water to form copper sulphate solution.

During evaporation, the water **evaporates** away leaving solid copper sulphate crystals behind.



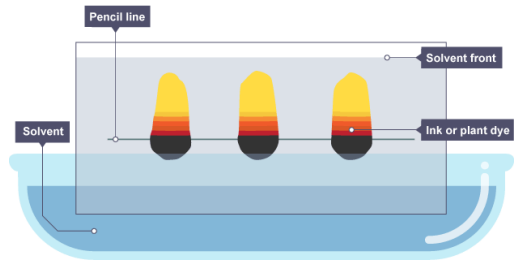
Distillation is a method for separating the solvent from a solution.

For example, water can be separated from salt solution because water has a much lower boiling point than salt. When the solution is heated, the water **evaporates**. It is then cooled and **condensed** into a separate container. The salt does not evaporate and so it stays behind.



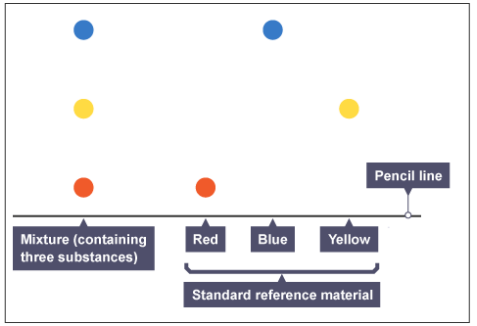
Chromatography is a method for separating dissolved substances from one another.

It works because some of the coloured substances dissolve better than others, so they travel further up the paper.



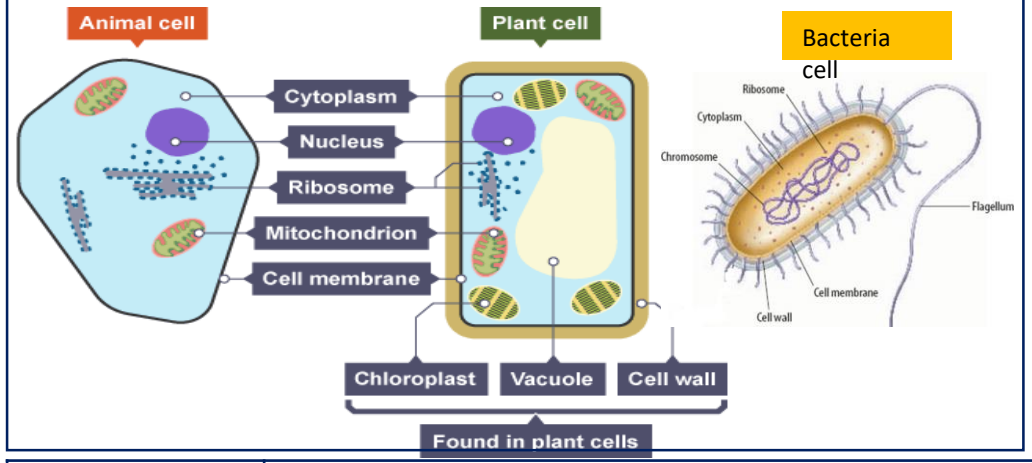
A pencil line is drawn, and spots of ink or dye are placed on it. There is a container of solvent (eg water or ethanol).

As the solvent continues to travel up the paper, the different coloured substances spread apart.



A **chromatogram**, the results of chromatography experiment.

Unicellular organisms are made of one cell (eg bacteria)
Multicellular organisms are made of many cells (eg plants and humans)



Organelle	Function
Nucleus	*Contains genetic material which controls the cell's activities*
Cell Membrane	*Controls the movement of substances in and out of the cell*
Cytoplasm	*Where chemical reactions happen*
Mitochondria	*Where energy is released in respiration*
Ribosome	*Where protein synthesis happens*
Cell Wall	*Provides strength and support*
Chloroplast	*Absorb light energy for photosynthesis (contains **chlorophyll**)*
Vacuole	*Filled with cell sap.*

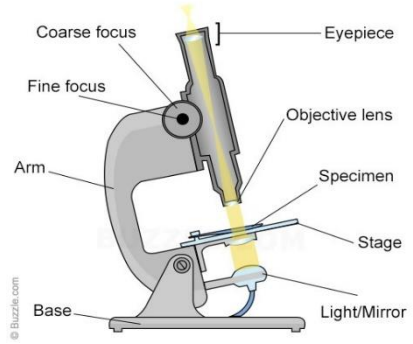
These are some examples of **specialised cells**; cells that are **adapted** to do a specific job.

Sperm cell
Streamlined – swim fast
Lots of mitochondria that release energy for swimming

Palisade cell
lots of chloroplasts that absorb sunlight for photosynthesis

Root hair cell
large vacuole for storing cell sap
large surface area to absorb water and minerals more efficiently

Parts of the microscope



- Put the slide on the stage
- Always start on the lowest magnification as it gives you the widest field of vision
- Use the focus to see your object
- Then increase the magnification

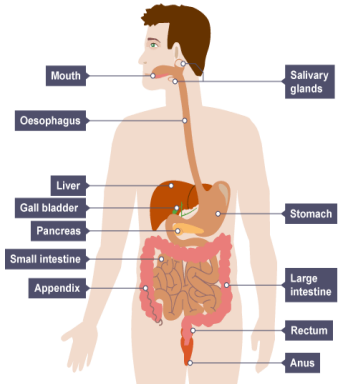
Science: 7BC Cells, tissues and organs

Cell → Tissue → Organ → Organ system

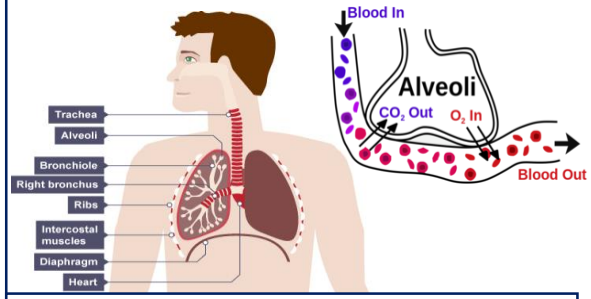
Cell	The smallest structural unit of all organisms
Tissue	Made from a group of cells with a similar structure and function, which all work together to do a particular job
Organ	Made from a group of different tissues, which all work together to do a particular job
Organ System	Made from a group of different organs, which all work together to do a particular job

Digestive system
Role: to break down large food molecules into smaller molecules that can be absorbed
Adaptations

- The intestine is a highly folded structure, which increases surface area which speeds up diffusion
- The intestine is covered in many villi which are further covered by microvilli = large surface area → faster rate of diffusion
- Thin membranes → shorter distance to diffuse → faster rate of diffusion
- Covered in blood vessels → keeps blood moving to maintain concentration differences → faster rate of diffusion



Respiratory system
Role: to take in oxygen for respiration and remove carbon dioxide



Inhaled air contains more oxygen than exhaled air. Exhaled air contains more carbon dioxide than inhaled air

Main adaptations

Trachea	Contains C ring cartilage which keeps the airway open leaving a clear passage for air to travel in and out of the lungs
Alveoli	• **Thin membranes** → reduced diffusion distance • **Good blood supply** → maintains concentration gradients • **Highly folded membrane** → increased surface area All of the above adaptation ensure that **gas exchange**, by d**iffusion**, happens efficiently.