

# Year 7 Science Knowledge Booklet

## Term 2

**Name:**

**Class:**

**Homework 1 Due: 8<sup>th</sup> November**

**Homework 3 Due: 6<sup>th</sup> December**

**Homework 2 Due: 22<sup>nd</sup> November**





# Science Homework 1

Read all of this knowledge organiser.

## Big questions

What are cells?

How does a microscope work?

How do we calculate magnification?

What do the organelles do?

How do different cells carry out different functions?

What is the difference between prokaryotes and eukaryotes?

How do we make new cells?

What are stem cells?

## Key vocabulary

<b>Cell</b>	The building block of living things.
<b>Nucleus</b>	Controls the activities of the cell. Contains chromosomes made of DNA.
<b>Cytoplasm</b>	Jelly-like contents of the cell where many chemical reactions take place.
<b>Cell membrane</b>	A thin layer around the cell that controls the movement of substances in and out of the cell.
<b>Cell wall</b>	Rigid layer outside the cell membrane of a plant (cellulose), fungi (chitin) or a bacterial (peptidoglycan) cell.
<b>Chloroplast</b>	Small disc in the cytoplasm of plants containing chlorophyll..
<b>Permanent vacuole</b>	Fluid-filled area in plant cell containing sap.
<b>Mitochondria</b>	The site of aerobic respiration in plant and animal cells.
<b>Specialised cell</b>	A cell that has a structure well suited to its function.
<b>Differentiation</b>	When a cell develops into a type that is specialised for a specific function.
<b>Diffusion</b>	When the net movement of particles from an area of high concentration to an area of low concentration.
<b>Prokaryote</b>	A small simple cell that contains no membrane bound organelles.
<b>Eukaryote</b>	A unicellular or multicellular organism that has a nucleus.
<b>Resolution</b>	The ability to distinguish between two parts of an object.
<b>Magnification</b>	The act or process of enlarging the physical appearance or image of something.
<b>Cell Division</b>	The process in which the parent cell divides to form new daughter cells – two types are mitosis and meiosis.
<b>Stem cell</b>	An undifferentiated cell that can become specialised into any type of cell.

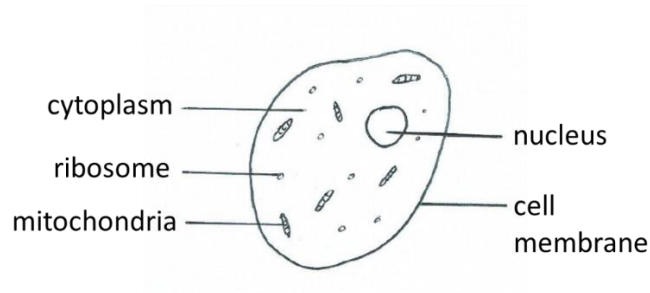
## What are cells?

**Cell** - The smallest unit that can live on its own and that makes up all living organisms

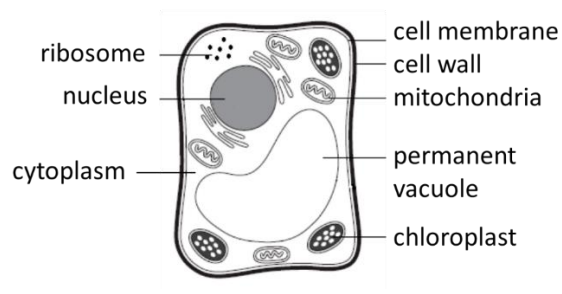
**Organism** - An individual form of life that is capable of growing and reproducing, and have one or more cells.

**Living** - Something that can grow, move, reproduce, respire, take in nutrition, excrete and respond.

**An animal cell**

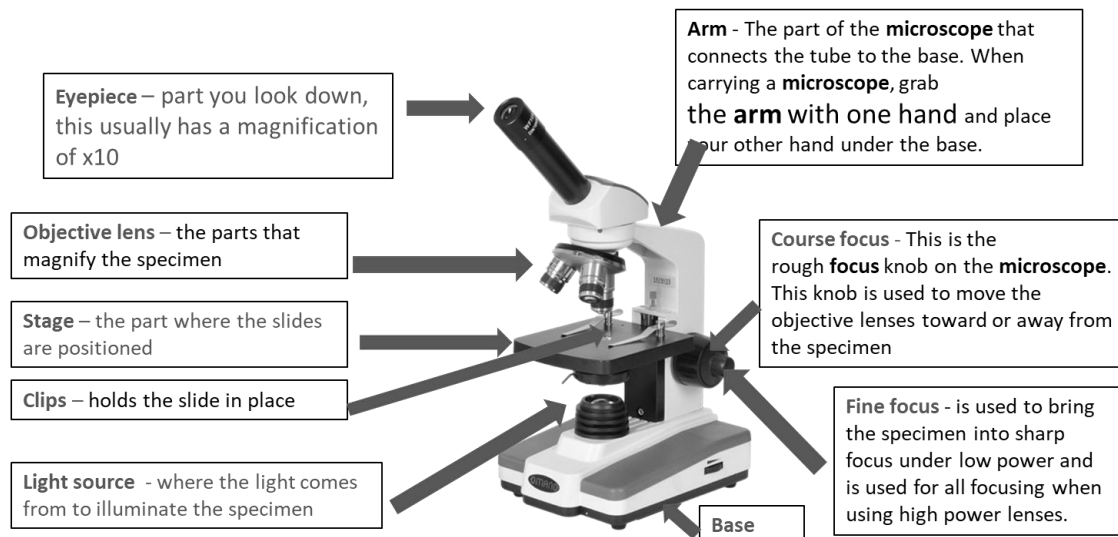


**A plant cell**



Organelle	Found in animal cells	Found in plant cells
Nucleus	✓	✓
Cytoplasm	✓	✓
Cell membrane	✓	✓
Mitochondria	✓	✓
Ribosomes	✓	✓
Cell wall		✓
Permanent vacuole		✓
Chloroplasts		✓

## How does a microscope work?



## Why do we use a microscope?

Microscopes have the ability to magnify an image/object to enable us to observe matter that we humans are unable to observe with the naked eye.

## How do we calculate magnification?

**Magnification** - The ability of a microscope to produce an image of an object at a scale larger than its actual size.

To calculate the magnification of a microscope will give you need to use the following equation:

$$\text{total magnification} = \text{magnification of eye piece lens} \times \text{magnification of objective lens}$$

Magnification can also be calculated using the formula

$$\text{magnification} = \text{image size} / \text{actual size}$$

$$M = I/A$$

$$I = \text{size of image} \quad A = \text{actual size} \quad M = \text{magnification}$$

## What unit of measurement should we be using?

Cells are measured in micrometers. The average cell is between 10-100 micrometers.

That means that one cell would fit into the 1mm gap on a ruler 1000 times.

## Converting between units

- To convert millimetres (mm) to micrometres ( $\mu\text{m}$ ) multiply by 1000.
- To convert micrometres ( $\mu\text{m}$ ) to millimetres (mm) multiply by 1000.



## Science Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the answer page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Questions in *italics* are from older work.

Key knowledge question	Your answer
What is the function of the cell membrane?	
What type of organisms have eukaryotic cells?	
What is the name given to the structures inside cells?	
What is the function of the mitochondria?	
How is DNA stored in a prokaryotic cell?	
What is the function of the chloroplast?	
What is the function of the nucleus?	
What stain would you use on an onion cell slide?	
Describe how a red blood cell is adapted to its function.	
If a small leaf is 10 millimetres in diameter what is its diameter in micrometres?	
What type of organisms have prokaryotic cells?	
<i>What are the 7 things signs that something is alive?</i>	
<i>Which group of animals has feathers?</i>	
<i>What do we call animals that feed their young with milk?</i>	

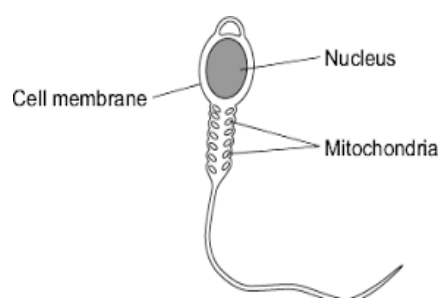
**What do the organelles do?**

Cell structure	Description	Function
Cell wall	The cell wall of plant cells is made from cellulose. This gives them a rigid structure.	Supports and strengthens cell
Cell membrane	Selectively permeable double layer.	Controls which substances can enter and leave the cell
Cytoplasm	Fluid enclosed by the cell membrane, containing organelles and ribosomes	Location of many chemical reactions
Mitochondria	Rod-shaped structures found in cytoplasm	Location where aerobic respiration occurs
Chloroplasts	Disc-shaped structures found in cytoplasm	Location where photosynthesis occurs
Vacuole	Compartment in cell containing solution of salts and sugars (cell sap)	Water storage and maintenance of turgor within the cell
Ribosomes	Small complexes found in cytoplasm	Location where proteins are produced
Nucleus	Compartment in cell where DNA is stored as chromosomes	Controls activities of cell

**Specialised cells have structures that are adapted for their function.**

Cells carry out a variety of jobs within organisms, some cells look very different from the ones we have seen so far.

Although they look very different cells will still have the same organelles as other cells.

**A sperm cell is an example of a specialised cell**

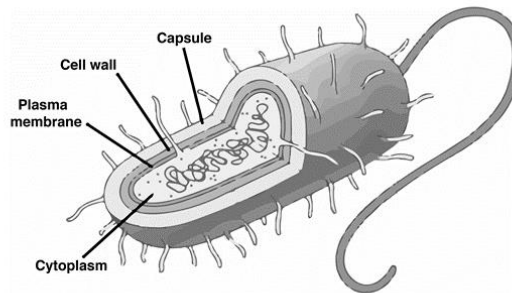
## What is the difference between prokaryotes and eukaryotes?

### Eukaryote

Eukaryote refers to any of the single-celled or multicellular organisms whose cell contains a distinct, membrane-bound nucleus, this contains their genetic material.

### Prokaryote

Prokaryotes are unicellular organisms that lack membrane-bound structures, the most obviously a nucleus.



Cell feature	Eukaryote	Prokaryote
cell wall	some	Often
cell membrane	Yes	Yes
nucleus	Yes	No
cytoplasm	Yes	Yes
genetic material	In the nucleus	in the cytoplasm as a loop and in plasmids

## How do different cells carry out different functions?

- New cells are made through a process called cell division.
- Mitosis is the type of cell division that makes one cell become two identical cells.
- We call these two cells daughter cells.
- This is how the cells needed for organisms to grow are formed.
- Even when organisms have stopped growing mitosis continues as new cells are needed to replace those that are damaged.

## What are stem cells?

- Stem cells are the body's raw materials — cells from which all other cells with specialized functions are generated.
- Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells.
- These daughter cells either become new stem cells (self-renewal) or become specialized cells (differentiation) with a more specific function, such as blood cells, brain cells, heart muscle cells or bone cells.
- No other cell in the body has the natural ability to generate new cell types.

Key knowledge question	Answer
What is the function of the cell membrane?	To control what enters or leaves the cell
What type of organisms have eukaryotic cells?	Plants, animals, fungi and protists
What is the name given to the structures inside cells?	Organelles
What is the function of the mitochondria?	Site of aerobic respiration
How is DNA stored in a prokaryotic cell?	In loops in the cytoplasm
What is the function of the chloroplast?	Site of photosynthesis
What is the function of the nucleus?	To control the cells activities, hold genetic information
What stain would you use on an onion cell slide?	Iodine
Describe how a red blood cell is adapted to its function.	Small, rounded, big surface area, full of haemoglobin
If a small leaf is 10 millimetres in diameter what is its diameter in micrometres?	10,000 micrometres
What type of organisms have prokaryotic cells?	Bacteria, cyanobacteria
<b>What are the 7 things signs that something is alive?</b>	<i>Move, respire, sensitive, grow, reproduce, excrete, nutrition. (Mrs Gren)</i>
<b>Which group of animals has feathers?</b>	<i>Birds</i>
<b>What do we call animals that feed their young with milk?</b>	<i>Mammals</i>



**Big questions: How can we separate mixtures?**

- What is the difference between a compound and a mixture?
- What is solubility?
- How can we separate soluble and insoluble solids?
- How can salt be extracted from sea water?
- How can pure water be extracted from sea water?
- How can we identify if a substance is pure?

**Key vocabulary**

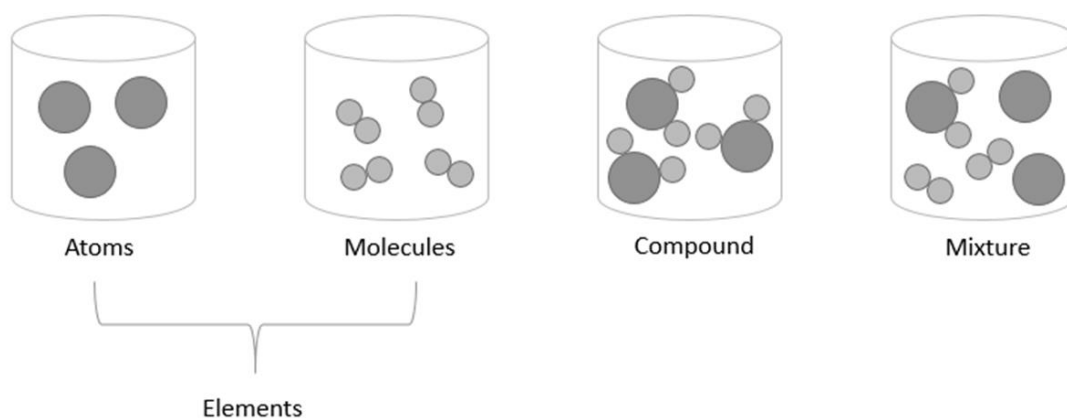
<b>Boiling point</b>	The temperature at which the liquid changes state into a gas.
<b>Chromatography</b>	A separation technique used to separate mixtures of liquids that are soluble in the same solvent.
<b>Diffusion</b>	The net movement of particles from a region of high concentration to low concentration until equilibrium is reached.
<b>Distillation</b>	A separation technique used to separate mixtures of liquids or remove the solvent from a solution based on the boiling point.
<b>Evaporation</b>	Where the solvent changes state into a gas before the boiling point.
<b>Filtration</b>	A separation technique used to separate insoluble solids from a solution or solvent.
<b>Gas</b>	The particles move randomly in all direction with lots of energy. They fill the container they are in as there are no / incredibly weak interactions to other particles.
<b>Liquid</b>	When the particles are randomly arranged, and takes the shape of the container. Particles have more energy than in solid and can slide past each other
<b>Melting point</b>	The temperature at which the solid changes state into a liquid.
<b>Rf value</b>	The distance travelled by a component in solution divided by distance moved by the solvent front, it is always less than 1.
<b>Solid</b>	When the particles are regularly arranged and retain its shape. Particles cannot move only vibrate.
<b>Solubility</b>	How well a substance dissolves in a solvent.
<b>Solute</b>	A solid, liquid or gas (a substance) that dissolves in a solvent to form a solution.
<b>Solution</b>	The resulting mixture when a solute dissolves in a solvent. It is evenly distributed (same concentration throughout).
<b>Solvent</b>	The liquid in which a solute dissolves (typically water) to form a solution.

**What is the difference between a compound and a mixture?****What is a Mixture?**

- A mixture is a substance which contains more than one type of atom/element/compound that are not chemically bonded together.

**What is a Compound?**

- Compounds are substances that are made up of more than one type of atom chemically bonded together. Examples are water ( $\text{H}_2\text{O}$ ) and Carbon Dioxide ( $\text{CO}_2$ )

**What is solubility?****What is a solute?**

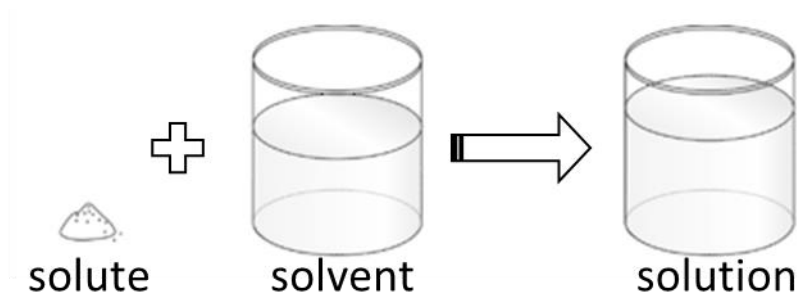
- The solute is the substance that dissolves in a solvent. It is typically a solid, but it can also be a liquid or a gas.

**What is a solvent?**

- A solvent is the liquid that a substance dissolves into.

**What is a solution?**

- A solution is the resulting mixture formed from a solute dissolving into a solvent.

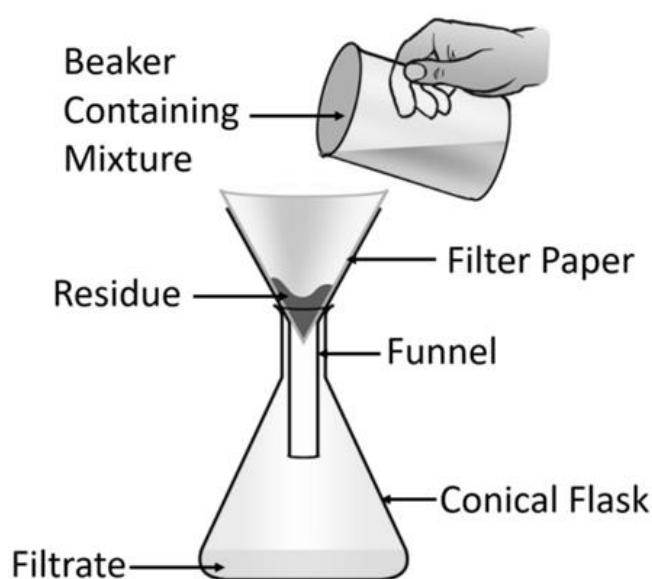


**How can we separate soluble and insoluble solids?**

- Filtration can be used to separate a liquid from an insoluble solid.
- It is also used to separate a solution from a solid that is mixed with it, but not dissolved.

**How does filtration work?**

1. Pour the solution with the insoluble solid into the funnel; which is holding the filter paper.
2. The filter paper stops the solid from passing through, only allowing the solution.
3. The insoluble solid that is caught is the residue.
4. The solution that passes through the filter paper is the filtrate.



**Separating salt from sand (rock salt), You need to be able to describe how to do this.**

**Method**

1. Grind up salt and sand so surface\_area is smaller.
2. Add water until the solid stops dissolving.
3. Pour solution through filter paper.
4. Solid residue (sand) stays in filter paper.
5. Filtrate (salt dissolved in water) passes through filter paper.
6. Evaporate water to leave pure water.



## Science Homework 3

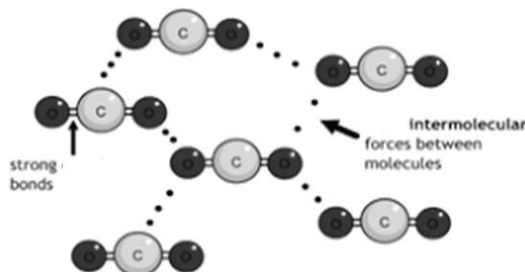
Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Questions in *italics* are from older work.

Key knowledge question	Your answer
Why is the melting point different for different substances?	
How does distillation separate substances?	
How would you separate an insoluble solid from a liquid?	
In chemistry what do we mean by pure?	
What do we call the separation technique used to separate mixtures that are soluble in the same solvent?	
What does solubility mean?	
What is a solute?	
What is a solution?	
What is the equation to calculate $R_f$ ?	
When a solvent changes state into a gas before the boiling point we call it?	
<i>Describe what is meant by "contact forces"</i>	
<i>Describe what is meant by the term "non-contact forces"</i>	
<i>In which direction does friction act?</i>	
<i>Name the apparatus used to measure force.</i>	

**How can salt be extracted from sea water?****What is evaporation?**

- Evaporation is the process where a liquid turns into a gas.
- The intermolecular forces in the liquid are overcome and broken; separating the particles.

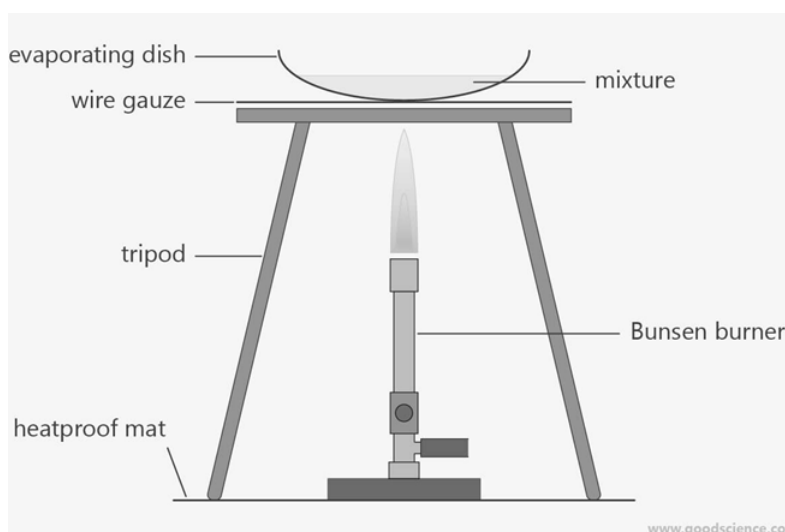
**What is the difference between boiling and evaporation?**

- Boiling occurs at the boiling point of a substance.
- It is typically accompanied by bubbling as the gas escapes the liquid.

**How could we separate the solute (salt) from the solution (sea water)?****Method**

1. Add 50ml of salt water to the evaporating dish.
2. Turn the Bunsen burner to a clear flame (air hole partly open, partly closed).
3. Evaporate the water; leaving the salt crystals behind.

**SAFETY: Stop before all the water evaporated or it will spit.**

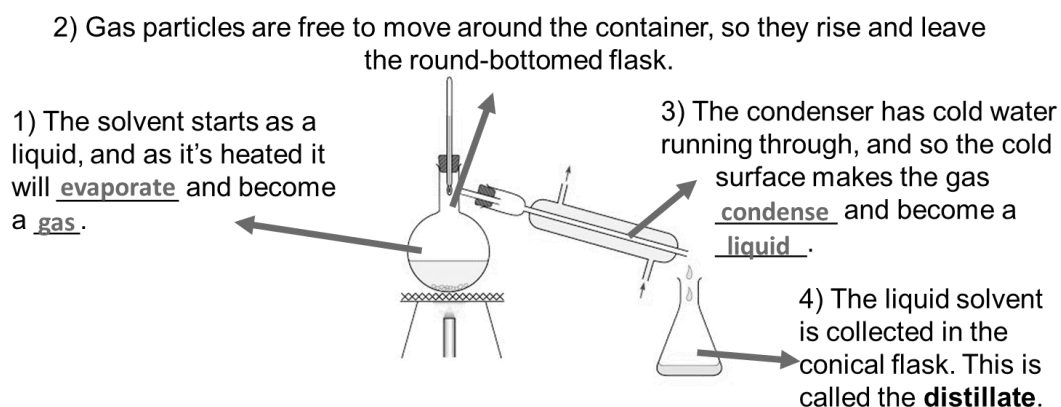


## How can pure water be extracted from sea water?

**Distillation** is a separation technique where a mixture of liquids or a solution can be separated and the solvent is collected; instead of being lost to the surroundings.

**Distillation can be used to separate different kinds of mixtures.**

- **Soluble solids and liquids** – the solvents will evaporate and leave the solid in the round-bottomed flask
- **Liquids of different boiling points** - the liquid with the lower boiling point will evaporate off; leaving the liquid with the higher boiling point in the round-bottomed flask.



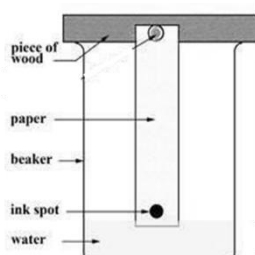
## How can we identify if a substance is pure?

**What is Chromatography used to separate?**

- Chromatography is used as a way of checking to see if a substance is a mixture or pure, and as a means of comparing one unknown against known substances.
- If different solutions are mixed together, they can also be separated by their solubility.

## How do we use a chromatogram to identify if a substance is pure or a mixture?

1. Draw a starting line in pencil
2. Mixtures are placed as a dot on chromatography paper
3. Chromatography paper is placed in a solvent, the solvent has to be below the pencil starting line
4. The solvent dissolves the substances in the mixture
5. Each substance travels up the chromatography paper with the solvent
6. The dissolved substances stop at different places
7. The separated substances are left on the paper



**How to get the most out of your knowledge organiser:**

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.
- There are several different things you can do
  - Look, cover, write, check, correct
  - Read through the organisers
  - Mind maps
  - Key spellings
  - Make a glossary
  - Missing out key words
  - Questions/answers answers/questions
  - Flash cards
  - Revision clock learning
  - Mnemonics

**Science Learning Tools and wider study:**

The Oak Academy – Online Science lessons

BBC Bitesize KS3 science

You tube channels:

Fuse school

Ted talks

Free science lessons

Primrose Kitten

Shows on Netflix

Our planet

Tiny creatures

A life on our planet

Key knowledge question	Answer
Why is the melting point different for different substances?	Different strengths of attraction between different particles
How does distillation separate substances?	By different boiling points
How would you separate an insoluble solid from a liquid?	Filtration
In chemistry what do we mean by pure?	Made up of only one thing (only one type of atom or only one type of molecule)
What do we call the separation technique used to separate mixtures that are soluble in the same solvent?	Chromatography
What does solubility mean?	How well a substance dissolves in a solvent
What is a solute?	Something that has been dissolved
What is a solution?	A solute dissolved in a solvent
What is the equation to calculate $R_f$ ?	$R_f = \frac{\text{distance from the base line to the spot}}{\text{distance from baseline to solvent front}}$
When a solvent changes state into a gas before the boiling point we call it?	Evaporation
<i>Describe what is meant by "contact forces"</i>	<i>A force produced by something that is touching something else</i>
<i>Describe what is meant by the term "non-contact forces"</i>	<i>A force produced by something that is not touching something else</i>
<i>In which direction does friction act?</i>	<i>In the opposite direction to movement</i>
<i>Name the apparatus used to measure force.</i>	<i>Newton meter</i>