

# Knowledge Organiser Booklet Year 11 Term 1 Core

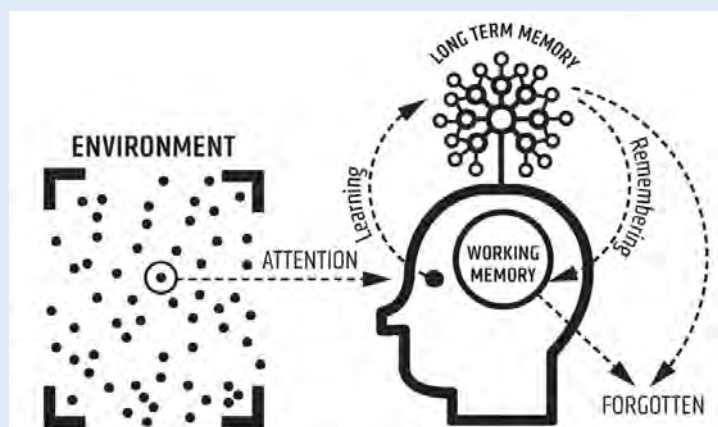


Our working memories can only store a limited amount of information, whereas our long term memories can store limitless information. To learn successfully, we need to store core knowledge into our long term memories, so we can retrieve it when we need it.

For instance, if you are at work or in the shops and need to work out a 25% discount, you can't memorise 25% of every number, so you need to be able to quickly recall the method for calculating a percentage. Committing core knowledge to our long-term memories is a life-hack. It makes thinking about difficult things easier.

Using a knowledge organiser with regular retrieval activities is a way for you to store core knowledge & subject specific words, into your long term memory so it is there when you need it.

Click here to be taken to the knowledge organiser part of the school website.



# Contents

Clicking on the subjects below will take you directly to the knowledge organisers for each subject. These are to support learning that has taken place this past term. Use these to help reinforce the key knowledge. Use some of the strategies explained in the introduction to help you retain this important information.

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# Blended Learning Expectations

Make sure you have access to a computer at home (If you don't please make pastoral staff aware or email [langley.homelearning@taw.org.uk](mailto:langley.homelearning@taw.org.uk))

**Download Microsoft Teams** on both your phone and computer. (If you don't know how to do this please ask a member of staff or do this in your next computing lesson)













**Spend at least 2 hours a week using teams EVERY WEEK.** (Engagement in teams can be tracked and monitored). You need to be accessing each of your class teams and recapping on the previous learning or completing additional tasks set by your class teacher.













If you have any issues with teams (e.g. login problems or missing classes etc then please email [langley.homelearning@taw.org.uk](mailto:langley.homelearning@taw.org.uk))

Teams is a tool to support ongoing learning and should **only be used for educational purposes.**



How to complete homework your teacher has set

	<b>LOOK, COVER, WRITE, CHECK</b>	<b>DEFINITIONS TO KEY WORDS</b>	<b>FLASHCARDS</b>	<b>DUAL CODING</b>
<b>STAGE 1</b>	<p>Look at &amp; study an area of your knowledge organiser</p> 	<p>Write down the key words &amp; definitions</p> 	<p>Write key words, dates/formulae, equations/quotes on one side &amp; answers on the other</p> 	<p>Draw pictures/diagrams/ cartoon strips</p> 
<b>STAGE 2</b>	<p>Cover up your knowledge organiser and write everything you remember</p> 	<p>Cover up the definitions. How many can you remember? Repeat.</p> 	<p>Include pictures or diagrams if it helps. Read through them.</p> 	<p>Label your pictures/diagrams/ cartoon strips</p> 
<b>STAGE 3</b>	<p>Check. Correct mistakes in green and add anything you missed. Repeat</p> 	<p>Check. Correct mistakes in green pen. Which ones do you find hard to remember?</p> 	<p>Test yourself and get someone to test you.</p> 	<p>Explain out loud to yourself or family/friend what your images show</p> 

	<b>SELF QUIZZING</b>	<b>MINDMAPS</b>	<b>PAIRED RETRIEVAL</b>	<b>SPEAK, COVER, WRITE, CHECK</b>
<b>STAGE 1</b>	<p>Use your knowledge organiser to create quiz questions.</p> 	<p>Create a mindmap of everything you can remember from your knowledge organiser</p> 	<p>Give a family member/friend the knowledge organiser to hold</p> 	<p>Read out loud the information from the knowledge organiser several times.</p> 
<b>STAGE 2</b>	<p>Write down the answers to your quiz</p> 	<p>Check your knowledge organiser &amp; use a green pen to make any corrections.</p> 	<p>Get them to test you using the knowledge organiser</p> 	<p>Cover up your knowledge organiser and write everything you remember</p> 
<b>STAGE 3</b>	<p>Keep self-quizzing until you get all the answers correct</p> 	<p>Add additional information to your mindmap or make connections to other knowledge</p> 	<p>Write down your answers to their questions</p> 	<p>Check. Correct mistakes in green and add anything you missed. Repeat.</p> 

# Retrieval Placemat

Look at your knowledge organiser. Now cover it up and write down  
Key vocabulary & definitions from memory:

First time: Look.  
Cover. State 3 facts

Second time: Look.  
Cover. State 3 facts

Third time: Look.  
Cover. State 3 facts

Check & green pen your answers

Look at the knowledge organiser again. Now cover it up and  
without looking, explain a concept or idea in your own words

Re-read your answer above. Look at the knowledge organiser  
again. Now cover it up and improve on your previous explanation in  
green pen.

# Retrieval Relay

Look at your knowledge organiser. Now cover it up.

First time: Write down everything you can remember

Second time: Look. Cover. Write down everything you can remember

Third time: Look. Cover. Write down everything you can remember

Write down everything here that you didn't remember:

# Vocabulary focus 1

Look at your knowledge organiser. Select a key word and write it here:

Write a definition of the key word in your own words - not the same as the one on the knowledge organiser:

Write a sentence with the key word in it:

Create a question where the key word is the answer:

What other words are connected to this key word?

Draw a picture or diagram to help you remember this key word:

# Vocabulary focus 2

Definition:

Characteristics:

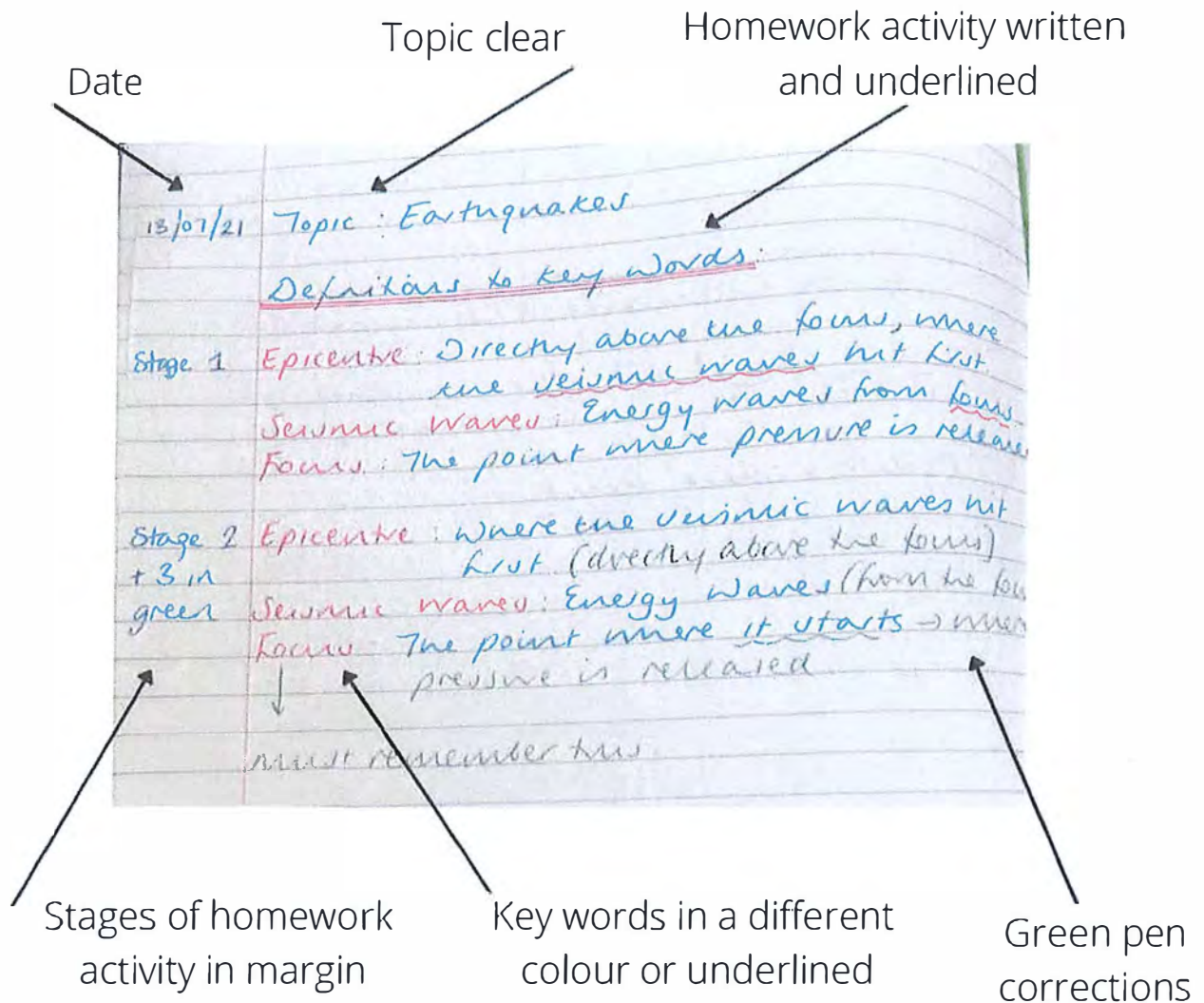
Key word:

Examples:

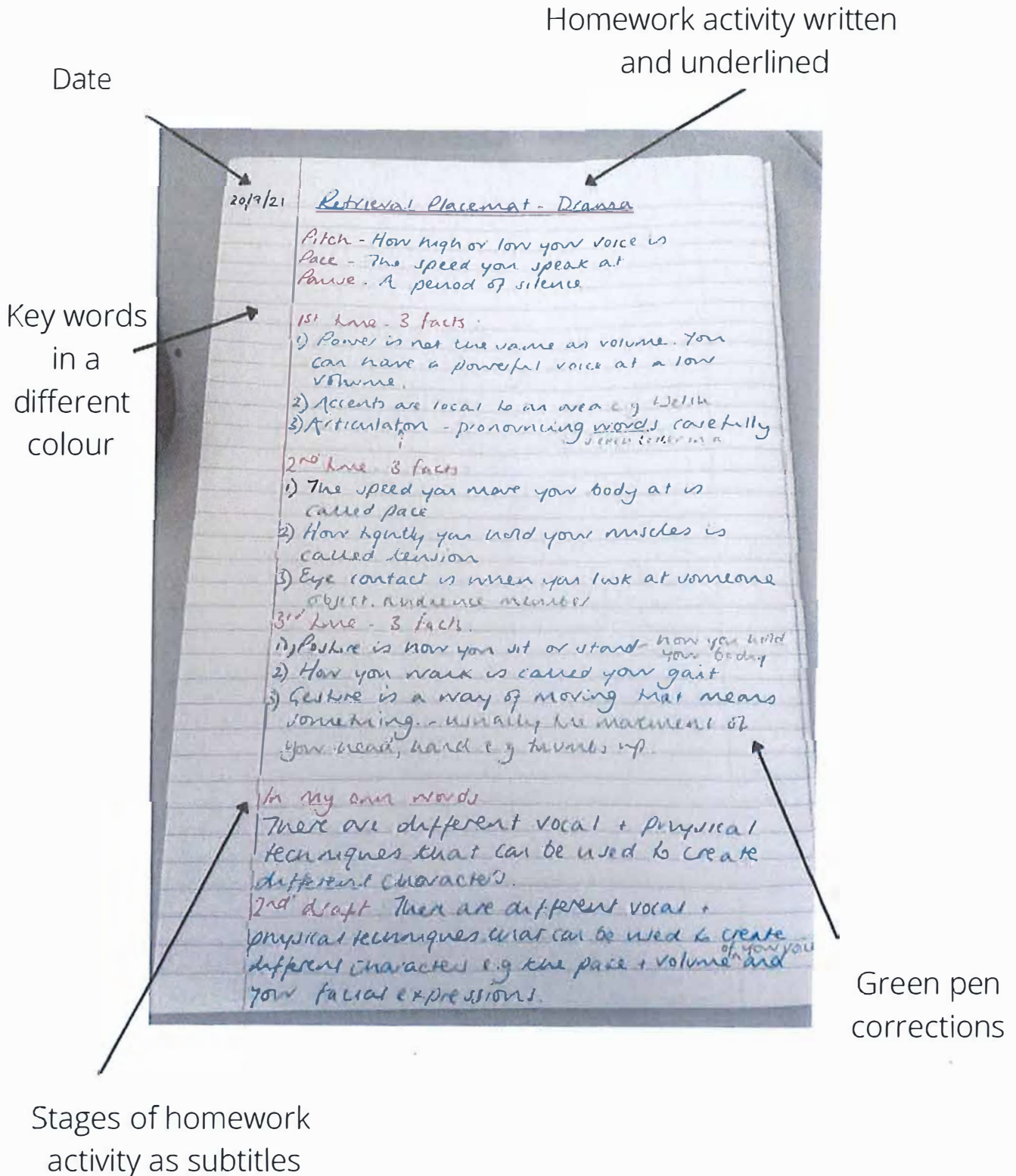
Non-examples:



# What should my knowledge organiser homework look like?



# What should my knowledge organiser homework look like?



**Biology**

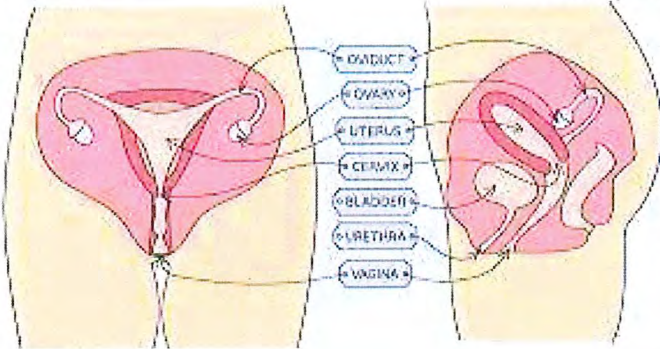
# Reproduction

## Threshold Concept

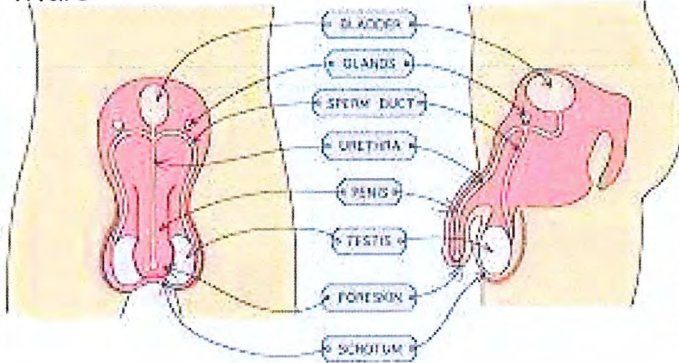
Reproduction can happen sexually and asexually

## Reproductive organs

Female



Male



## Keywords

- **Sperm:** male reproductive cell that contains genetic material
- **Egg:** female reproductive cell that contains genetic material
- **Reproduction:** the joining of sex cells (a sperm and egg) to produce offspring
- **Fertilisation:** the joining of a male and female sex cell/genetic material
- **Develop:** build upon given information

## Sperm cell

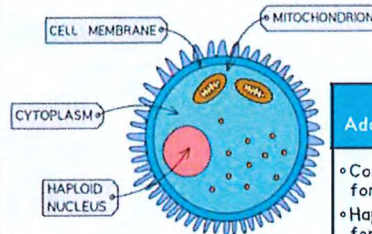
### Adaptations



- The head contains the genetic material for fertilisation in a haploid nucleus (containing half the normal number of chromosomes)
- The acrosome in the head contains digestive enzymes so that a sperm can penetrate an egg
- The mid-piece is packed with mitochondria to release energy needed to swim and fertilise the egg
- The tail enables the sperm to swim



## Egg cell

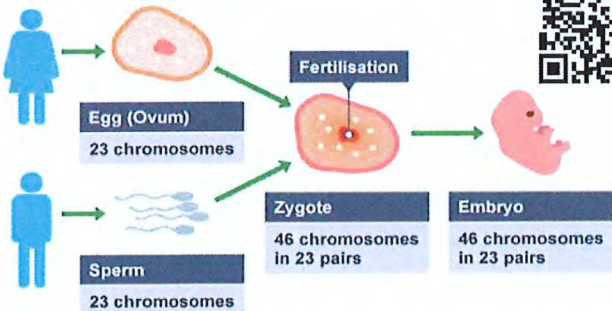


### Adaptations

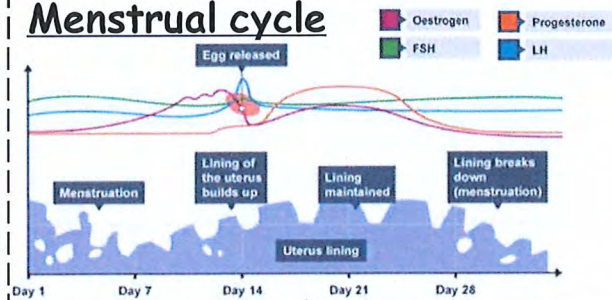
- Contains a lot of cytoplasm which has nutrients for the growth of the early embryo
- Haploid nucleus contains the genetic material for fertilisation
- Cell membrane changes after fertilisation by a single sperm so that no more sperm can enter

## Fertilisation

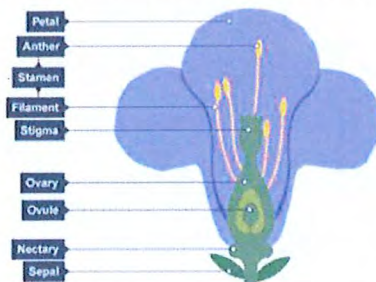
When the sperm and egg nuclei join, they form a ZYGOTE



## Menstrual cycle



## Plant structures



## IVF

In Vitro Fertilisation is used to help people with fertility issues conceive

### IVF PROCESS



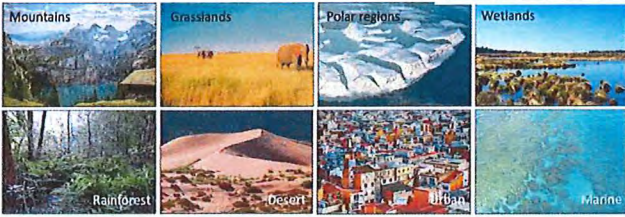
## Equations for this topic

# Ecology

## Threshold Concept

Understand that living things interact with the world around them

Different Habitat- An area where an organism is at home



## Keywords

- Living - Undertaking the seven processes of living things
- Changes - structural, physiological and behavioural changes that allow species to compete
- Animal - Living creature of one of seven domains
- Plant - Living tissue that is a producer
- Energy - The flow through all organisms and food chains

Food Chains/Webs - show the flow of energy

### FOOD WEB

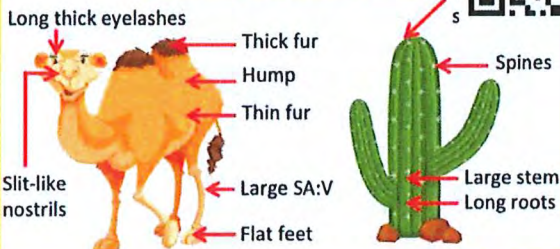


BYJU'S



## Adaptations

### Adaptations



## Abiotic and Biotic Factors

### Biotic factors

Living factors that affect another organism or shapes the environment.

- ✓ Predation
- ✓ Food availability
- ✓ Competition
- ✓ Disease

### Abiotic factors

Non-living factors that affect organisms.

- ✓ Temperature
- ✓ Light intensity
- ✓ Water
- ✓ Soil PH & mineral content
- ✓ Gases

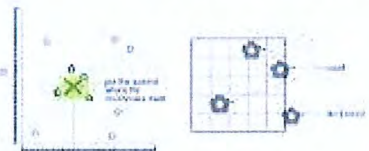


## Required practical



### Quadrats

1. Measure area and form a grid
2. Take 2 random numbers and use these as coordinates on your grid
3. Lay your quadrat down
4. Count the number of a species and record results



- Must be **random** assignment of grids
- The **bigger** the sample the better (**validity**)

## Producers and Consumers



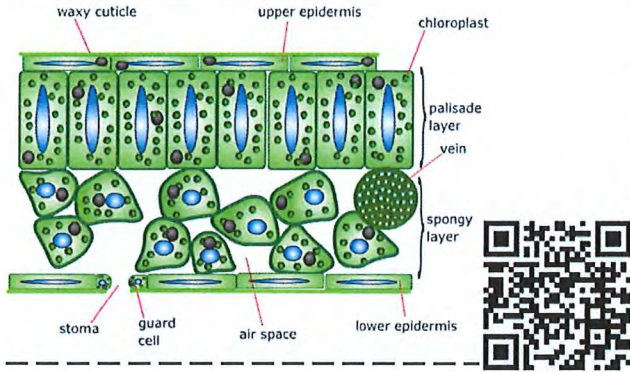
## Equations for this topic

# Bioenergetics

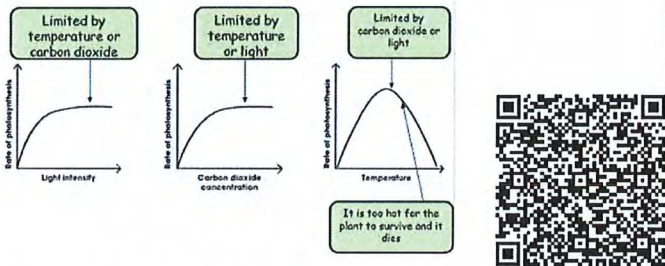
## Threshold Concept

Respiration and photosynthesis are chemical processes that provide plants and animals with energy.

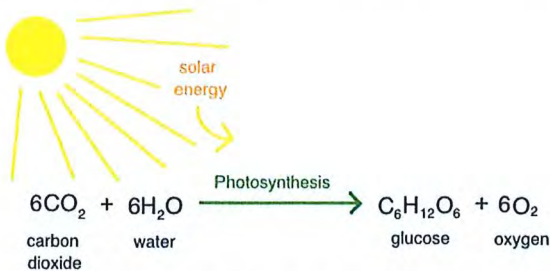
## Structure of the leaf



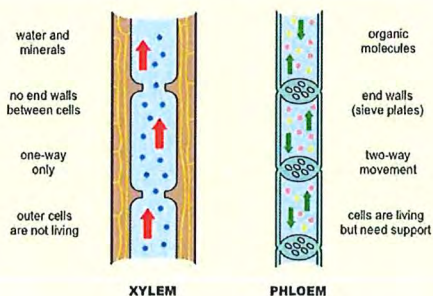
## Limiting factors of photosynthesis



## Photosynthesis



## Xylem and Phloem

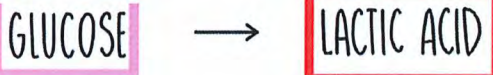
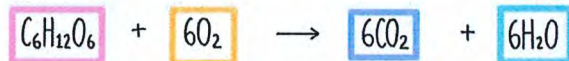


## Keywords

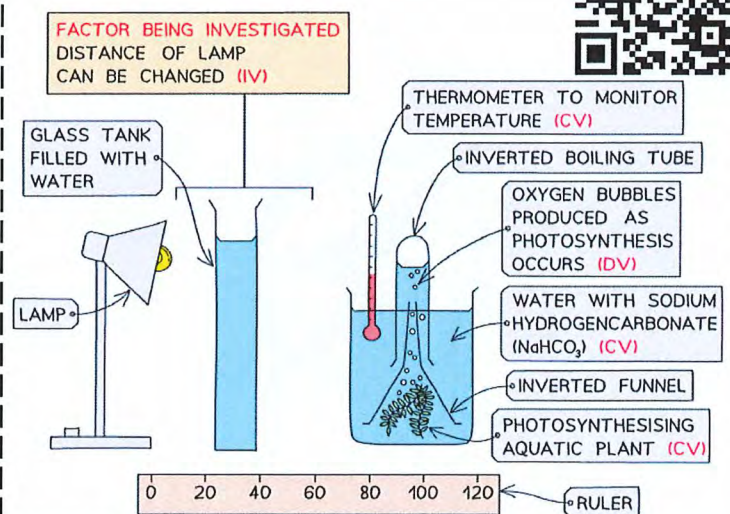
- **Respiration:** Respiration is the body's way of producing energy from the food we eat. It involves the breakdown of glucose in the presence of oxygen into carbon dioxide and water with the release of energy-generating molecules called ATP.
- **Photosynthesis:** is a chemical reaction that takes place in the chloroplasts of green plant cells, where light energy is used to convert carbon dioxide and water into glucose and oxygen.
- **Energy:** The ability to do work
- **Limiting factors:** Limiting factors affect the rate of a reaction. A limiting factor is a condition, that when in shortage, slows down the rate of a reaction.
- **Reaction:** A chemical reaction is when one or more substances change and produce one or more new chemical substances.



## Respiration



## Required practical



## Equations for this topic

$$\text{REACTION RATE} = \frac{\text{CHANGE IN MASS OF REACTANT OR PRODUCT}}{\text{TIME}}$$

# Infection and response

## Threshold Concept

Pathogens are microorganisms that cause disease

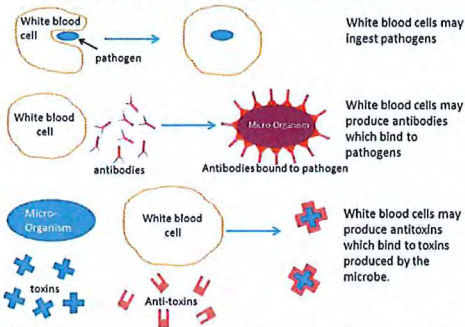
## Communicable and non-communicable disease:

- Communicable, which can be transferred from one person to another, or from one organism to another, eg in humans, these include measles, food poisoning and malaria
- Non-communicable, which are not transferred between people or other organisms



## Fighting against disease

How white blood cells protect us from disease



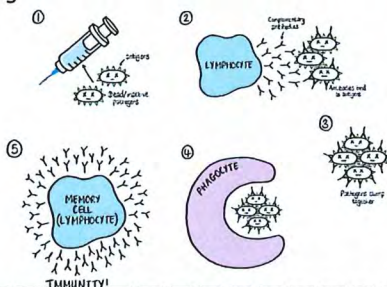
## Antibiotics vs painkillers

- Antibiotics are substances that slow down or stop the growth of bacteria.
- Painkillers are chemicals that relieve the symptoms but do not kill the pathogens.



## Vaccinations

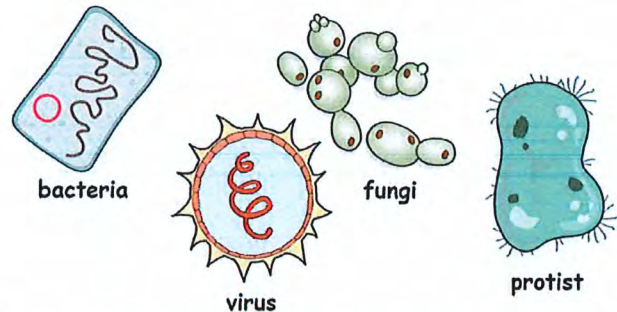
Vaccines allow a dead or altered form of the disease causing pathogen to be introduced into the body, which contain a specific antigen.



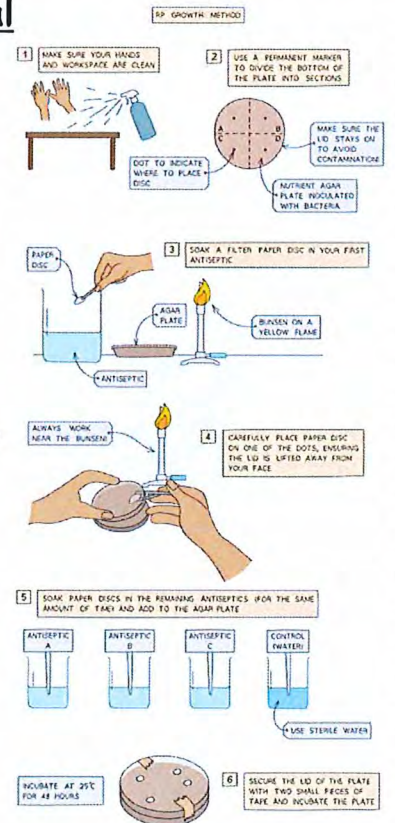
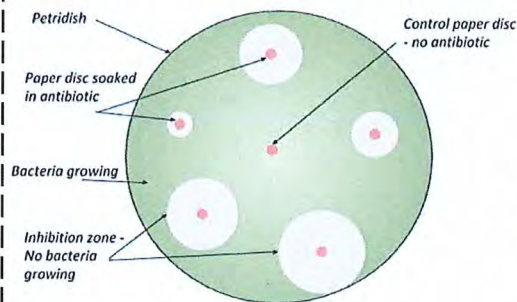
## Keywords

- **Pathogens:** A microorganism that causes disease e.g. bacteria, virus, protist, fungus.
- **Microorganism:** Are so small they can only be seen using a microscope.
- **Virus:** A disease causing agent about 1/100<sup>th</sup> of the size of a bacterial cell. Can only replicate within host body cell/
- **Bacteria:** A single celled microorganism without a true nucleus, some cause disease.
- **Fungi:** A microorganism that can cause disease, and that produces spores that can spread to other organisms.

## Pathogens



## Required practical



## Equations for this topic

# Chemistry



# Foundations of chemistry

## Threshold Concept

All matter is made of particles

### States of matter:

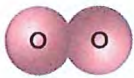


State	Solid	Liquid	Gas
Closeness of particles	Very close	Close	Far apart
Arrangement of particles	Regular pattern	Randomly arranged	Randomly arranged
Movement of particles	Vibrate around a fixed position	Move around each other	Move quickly in all directions
Energy of particles	Low energy	Greater energy	Highest energy
2D diagram			

### Atoms and compounds:

**Elements**  
contain just one type of atom.

Oxygen ( $O_2$ )



**Compounds**  
contain different types of atom bonded together.

Carbon dioxide ( $CO_2$ )



### Pure substances:

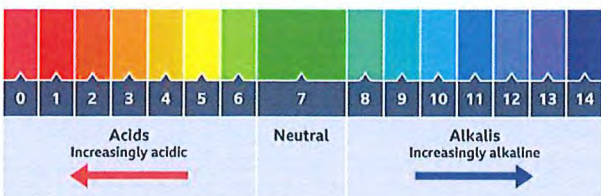
Pure substances are made from only one chemical element or one compound.

For example, salt is a pure substance made only of sodium chloride.



### The pH scale:

- 0-1 Hydrochloric acid (HCl)
- 1 Stomach acid
- 2 Lemon juice
- 3 Vinegar
- 4 Tomato
- 5 Banana
- 6 Milk
- 7 Pure water
- 8 Blood
- 8-10 Soaps
- 11 Ammonia solution
- 12 Bleach
- 13 Drain cleaner
- 13-14 Sodium hydroxide (NaOH)

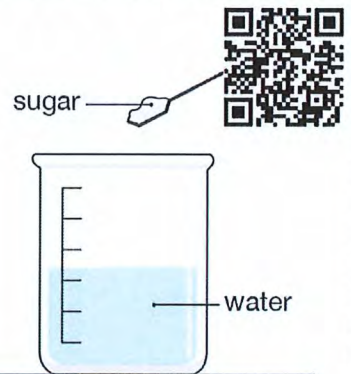


## Keywords

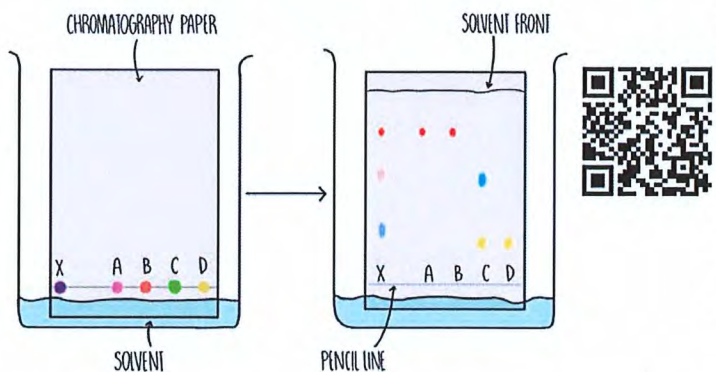
- **Particles:** The tiny things that all materials are made from. The smallest unit of matter.
- **Atom:** Atoms are the building blocks of all matter. Everything is made of atoms - even yourself. They are the smallest particle of an element, which are far too small to see.
- **Solid:** Have a fixed shape and cannot flow, because their particles cannot move from place to place, cannot be compressed (squashed), because their particles are close together and have no space to move into.
- **Liquid:** Flow and take the shape of their container, because their particles can move around each other, cannot be compressed, because their particles are close together and have no space to move into
- **Gas:** Flow and completely fill their container, because their particles can move quickly in all directions, can be compressed, because their particles are far apart and have space to move into

### Solubility:

- Some solids dissolve in water to make a solution.
- These solids are soluble.
- A solution is made from a solute (usually a solid) and a solvent (liquid).
- Some gases, such as oxygen and carbon dioxide, can also dissolve in water.



### Required practical: Chromatography



### Equations for this topic:

$$R_f \text{ value} = \frac{\text{distance travelled by substance (B)}}{\text{distance travelled by solvent (A)}}$$

# Periodic Table

## Threshold Concept

All elements fit within the Periodic Table



Link to information on most of the topic, consisting of slides, videos, and quizzes

## Keywords

**Elements** - a substance that cannot be broken down into any other substance.

**Periodic Table** - a table showing every element that is known to exist.

**Symbol** - a sign/letter/character that is used to represent something

## Periodic Table & Developing the Periodic Table

Mendeleev redesigned Newlands periodic table by organising the periodic table by atomic weights and the properties of the elements. Some gaps were left based on his predictions of other elements that hadn't been discovered yet. As more elements were found, the modern periodic table took from organised by atomic number.

Task 1 & 2

Group numbers												Group numbers						
1	2											3	4	5	6	7	0	
		H																Ho
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
Period numbers																		

## RAM & Isotopes

Task 10

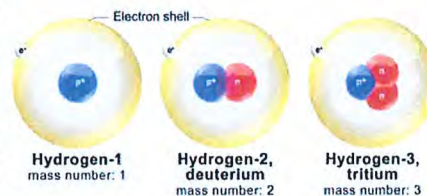
### RAM



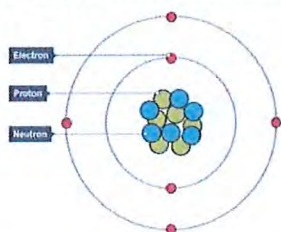
### Isotopes

Atoms of the same element must have the same number of protons, but they can have different numbers of neutrons. Atoms of the same element with different numbers of neutrons are called isotopes. Isotopes of an element have:

- the same atomic number
- different mass numbers



## Atomic Structure



Subatomic particle	Relative mass	Relative charge
Proton	1	+1
Neutron	1	0
Electron	Very small	-1



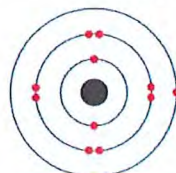
Task 8

## Electronic Configuration

Task 9

Example, using an atom of sodium

No. of electrons per shell  
 1<sup>st</sup> shell: up to 2  
 2<sup>nd</sup> shell: up to 8  
 3<sup>rd</sup> shell: up to 8  
 etc



## Group 1 - Alkali Metals

1

Task 4

All share similar properties:

- Are soft (can be cut)
- Have relatively low MP
- Have low densities

Li

Na

K

Rb

Cs

Fr

The further down the group you go, the more reactive the elements become.

- They will react with air and tarnish quite quickly.
- They will react with water to produce an alkaline solution (hence the name) and turn universal indicator blue/purple

## Group 7 - Halogens

7

Task 5

All have 7 electrons in outer shell.

All diatomic (made up of two atoms bonded together).

F

Cl

Br

I

At

Ts

The further down the group you go, the less reactive the elements become.

The further down the group you go, the higher its MP and BP, because:

- Molecules become larger
- Intermolecular forces become stronger
- More energy is needed to overcome these forces

## Group 0 - Noble Gases

0

Task 3

He

Ne

Ar

Kr

Xe

Rn

Og

All have full outer shells. All unreactive (inert).

All have low boiling points. Lower down the group, the higher it gets.

This is because, going down the group:

- Atoms become larger
- Intermolecular forces between atoms become stronger
- More energy is needed to overcome these forces

# Metals

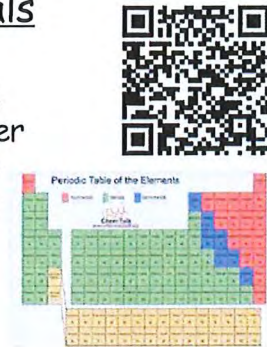
## Threshold Concept

Identify most metals have similar properties

## Metals and non metals

Most elements on the periodic table are metals. They are grouped together in the middle to the left-hand side of the periodic table.

Non metals are on the right-hand side.



## Keywords

**Metal**..... DEFINITION

**Non metal** ..... DEFINITION

**Property** ..... a characteristic of a particular substance

**Reaction** ..... a process that leads to the change of one set of chemical substances into another

**Alloy** ..... a mixture of two or more metals, or a metal and a non-metal

**Displacement** ..... A more reactive metal will displace a less reactive metal from its compound.

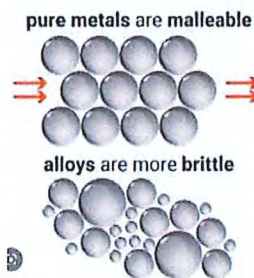
## Physical properties of metals

Properties	Metals	Non-metals
Appearance	Shiny	Dull
Hardness	Very hard or hard	Brittle
Malleability	Malleable	Non-malleable
Ductility	Ductile	Non-ductile
Heat conduction	Good conductor	Bad conductor
Conduction of electricity	Good conductor	Bad conductor
State	Solid	Solids, liquid, gases
Density	Higher	Lower



## Metals and alloys

Making alloys changes the metals properties by changing its structure. Alloying is done for many reasons, typically to increase strength, increase corrosion resistance, or reduce costs



## Chemical properties of metals

Burnt in air

Water

Acids

Metal salts

## Practical - Displacement reactions

**1**

Metal

**2**

Sulfate

**3**

What did you see?

	Magnesium	Zinc	Copper
Magnesium sulfate	X	○	○
Zinc sulfate	○	X	○
Copper sulfate	○	○	X



## The reactivity series

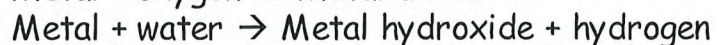
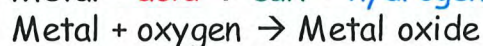
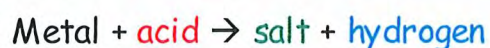
potassium most reactive  
sodium  
calcium  
magnesium  
aluminium  
carbon  
zinc  
iron  
tin  
lead  
hydrogen  
copper  
silver  
gold  
platinum least reactive



The Reactivity Series lists metals in order how easily they react with other substances



## Equations for this topic



# Rock Cycle

## Threshold Concept

Understand that rocks change within 3 types over time.

## Types of rocks

### Sedimentary rocks

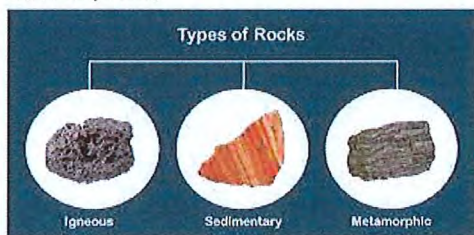
Sedimentary rocks are formed from sediments that have settled at the bottom of a lake, sea or ocean, and have been compressed over millions of years.

### Metamorphic rocks

Metamorphic rocks are formed from other rocks which change due to heat or pressure.

### Igneous rocks

Igneous rocks are formed from molten (liquid) rock that has cooled and solidified.

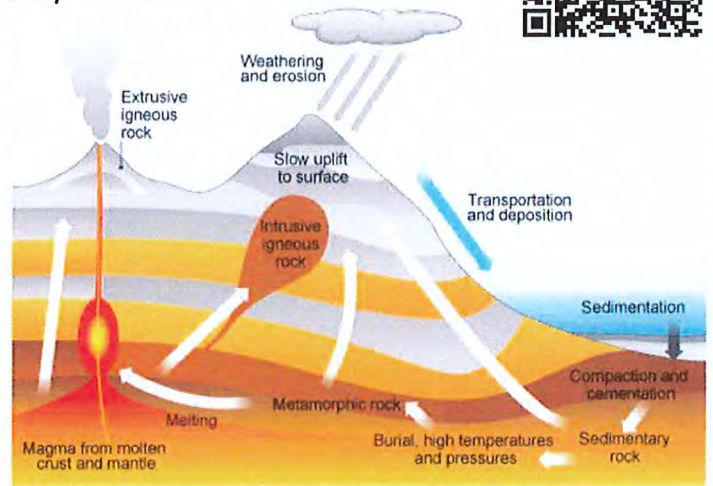


## Keywords

- **Rock:** The solid mineral material forming part of the surface of the earth and other similar planets, exposed on the surface or underlying the soil.
- **Earth:** The planet on which we live; the world.
- **Cycle:** Move in or follow a regularly repeated sequence of events.
- **Temperature:** The degree or intensity of heat present in a substance or object.
- **Pressure:** Continuous physical force exerted on or against an object by something in contact with it.

## The rock cycle

Rocks on earth do not always stay the same.



Rocks are continually changing due to processes such as, weathering, erosion and large earth movements. The rocks are gradually recycled over millions of years, changing between the different rock types.

## Types of weathering

### 1. Biological weathering

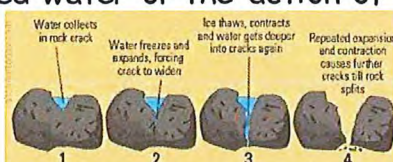
This describes rocks being broken up by the roots of plants, or animals burrowing into them.

### 2. Chemical weathering

This describes rocks being broken up because substances in rainwater, rivers and seawater or the air, react with the in the rocks.

### 3. Physical weathering

This describes rocks being broken up by changes in temperature, freezing and thawing of trapped water or the action of waves and rivers.



## Required practical

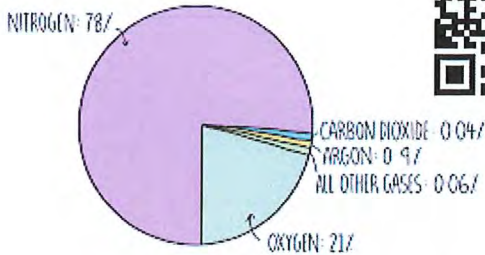
## Equations for this topic

# Chemistry of the atmosphere

## Threshold Concept

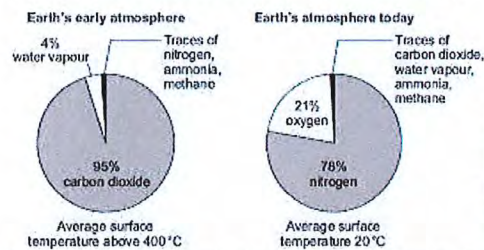
The Earth's atmosphere is made of different gases.

## The Proportion of gases in the earths atmosphere



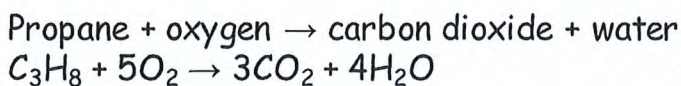
## History of the earths atmosphere

- The proportion of oxygen increased because of **photosynthesis** by plants and algae.
- The proportion of ammonia decreased as it reacted with the newly formed oxygen in the atmosphere to form nitrogen and water vapour.
- The proportion of methane decreased as it reacted with the newly formed oxygen to form carbon dioxide and water.

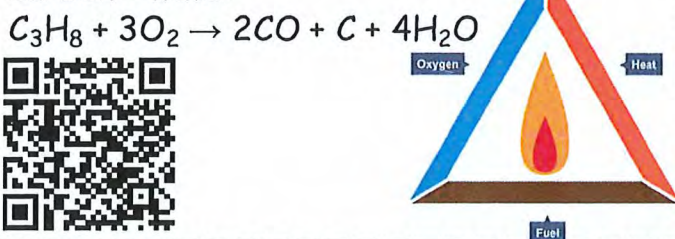
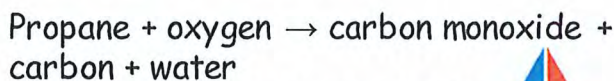


## Combustion

Complete combustion:



Incomplete combustion:



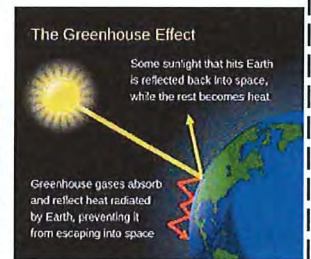
## Keywords

- **Atmosphere:** An atmosphere is the layers of gases surrounding a planet.
- **Pollutants:** A pollutant is a chemical or biological substance which harms water, air, or land quality.
- **Climate change:** Climate change refers to long-term shifts in temperatures and weather patterns.
- **Combustion:** Combustion is another name for burning. In a combustion reaction, fuel is burned and reacts with oxygen to release energy.
- **Global Warming:** Global warming is the long-term warming of the planet's overall temperature.

## Greenhouse gases

Greenhouse gases present in the atmosphere include:

- water vapour
- carbon dioxide
- methane



## Required practical

## Testing for gases

<p><b>Test for Carbon dioxide</b> <math>CO_2</math></p> <p>Carbon dioxide gas</p> <p>Limewater (clear/colourless)</p> <p>Limewater (cloudy/milky)</p>	<p><b>Test for Chlorine</b> <math>Cl_2</math></p> <p>Chlorine bleaches damp blue litmus paper</p> <p>Blue</p> <p>Red</p> <p>White</p> <p>Chlorine gas</p>	<p><b>Test for Hydrogen</b> <math>H_2</math></p> <p>Hydrogen makes a squeaky pop with a lighted splint</p> <p>POP!</p> <p><math>H_2</math></p>
<p><b>Test for Water</b> <math>H_2O</math></p> <p>Water turns cobalt chloride paper from blue to pink</p> <p>Cobalt chloride paper</p>	<p><b>Test for Oxygen</b> <math>O_2</math></p> <p>Oxygen relights a glowing splint</p> <p>Glowing splint</p> <p>oxygen</p>	<p><b>Cl Gas Tests</b></p> <p><math>Cl_2</math> <math>CO_2</math> <math>O_2</math></p> <p><math>H_2</math> <math>H_2O</math></p> <p>These gas tests appear regularly on the final exam. Try to learn them.</p>



## Equations for this topic

# Bonding Part 1

## Threshold Concept

How do 100 elements make up everything in the universe?

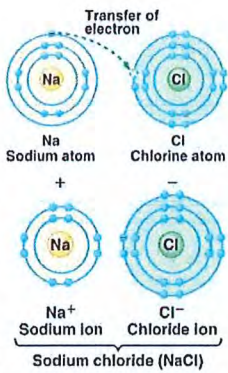
## Forming ions

An ion is a charged particle.

Atoms will lose or gain electrons to get a full outer shell.

The **metal** atom **loses electrons** to become a **positive** ion

The **non-metal** atom **gains electrons** to become a **negative** ion.



Use task 3-5

## Keywords

**Electron** - a subatomic particle with a negative charge

**Electrostatic attraction** - strong attraction between oppositely charged ions

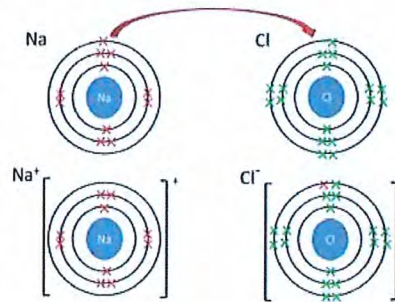
**Weak intermolecular forces** - force of attraction between atoms, elements and molecules

**Delocalised electron** - free moving electron that isn't a part of any atom

**Ion** - a charged particle

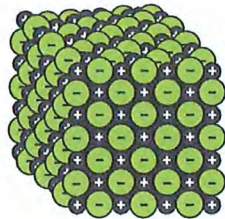
## Ionic bonds

Ionic bonds are formed between metals and non-metals. Metals **lose** electrons and **non-metals** gain electrons. The oppositely charged ions attract one another forming an ionic bond.



## Ionic compounds and properties

Positive and negative ions join together to form a giant ionic lattice



electrostatic attraction is strong

Ionic compounds have a high M.P

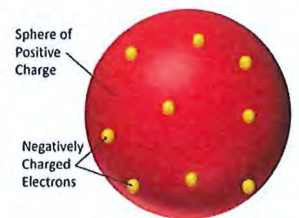
Lots of energy needed to overcome attraction

Ionic compounds don't conduct when solid because the ions are locked in position. When molten or dissolved the ions are free to move and can conduct

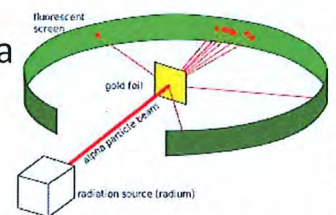


## History of the atom

JJ Thomson – Suggested the plum pudding model. Atoms were a ball of positive charge with negative particles scattered within.



Ernest Rutherford – Alpha scattering experiment. Found that atoms has a very small, positive nucleus and the majority of atoms are empty space.



# Bonding Part 2

## Threshold Concept

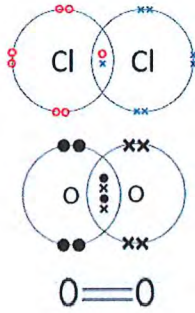
How do 100 elements make up everything in the universe?

## Covalent bonds

Two non-metals will form a covalent bond. The atoms share electrons to make themselves stable.



- 1 shared pair = a single bond
- 2 shared pairs = a double bond
- 3 shared pairs = a triple bond



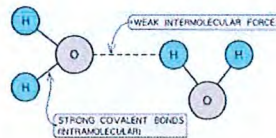
## Keywords

- Electron** - a subatomic particle with a negative charge
- Electrostatic attraction** - strong attraction between oppositely charged ions
- Weak intermolecular forces** - force of attraction between atoms, elements and molecules
- Delocalised electron** - free moving electron that isn't a part of any atom
- Ion** - a charged particle

## Simple Covalent compounds

Simple covalent compounds have strong covalent bonds between atoms and weak intermolecular forces between molecules.

Properties – low m.p and b.p  
- cannot conduct electricity

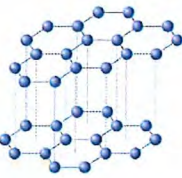


## Giant Covalent Structures

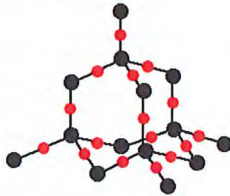
Diamond



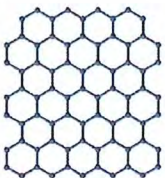
Graphite



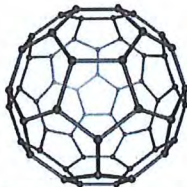
Silicon dioxide



Graphene



Fullerenes



## Metallic bonding

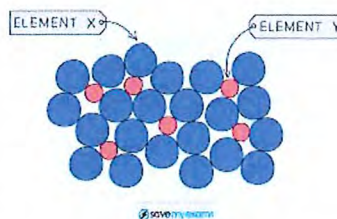
Metals consist of a giant metallic structure. They are positive metal ions surrounded by a sea of delocalised electrons



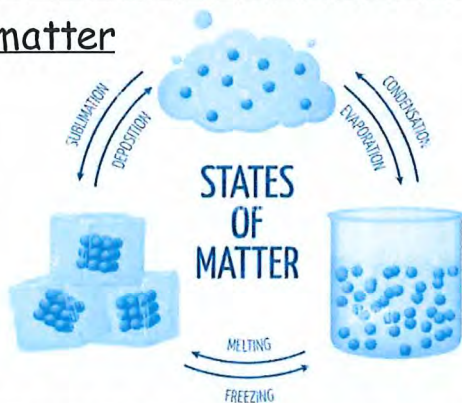
## Alloys

Alloys are a mixture of metals and another element.

Alloys are stronger than metals as the different sized atoms distort the layers



## States of matter



# Quantitative chemistry

## Threshold Concept

To understand that total mass of reactants equals total mass of products

## RFM

molybdenum	← element name
42	← atomic number number of protons (Z)
Mo	← atomic symbol
95.94	← atomic mass A (this is an average mass)

RAM is atomic mass of an element

RFM is the combination of all elements Ar in a compound or Molecule

### Work example

Helium (He) Ar = 4

Carbon dioxide = CO<sub>2</sub>

Carbon (C) = 12 Oxygen (O) = 16

Mr of CO<sub>2</sub> = 12 + (16 x 2) = 44

4 He 2 helium	12 C 6 carbon
16 O 8 oxygen	



## Keywords

Conservation - the mass of the reactants must equal the mass of the products in a chemical reaction

Formula mass - the combined mass numbers of an element or compound

Concentration - the amount of substance dissolved in a solution

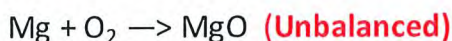
Equation - symbol representation of a chemical reaction

Loss - the process of losing something

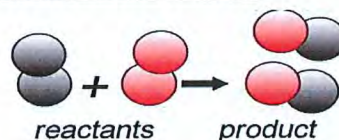
Gain - the process of gaining something

## Balancing Equations

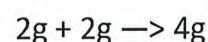
As the same number of elements are at the start and the end of reactions. The Equation needs to be balanced.



## Conservation of Mass



The reactants mass must always equal the mass of the products



We can not destroy atoms.



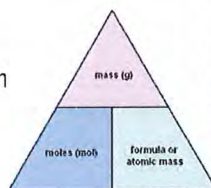
## Moles

Chemical amounts are measured in moles. One mole of a substance contains  $6.02 \times 10^{23}$  particles (Avagadro's number)



## Concentration

Concentration is the amount of substance in a certain volume of solution (g/dm<sup>3</sup>)



## Percentage by mass

The amount of an element in a compound is called its percentage composition. It can be calculated using the mass of the given element in the compound and the RFM of the Compound.

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100\%$$



## Limiting reactions

The reactant that gets used up first in a reaction is called the limiting reactant. This reactant is not in EXCESS



## Reacting masses

The mass of a product or reactant can be determined from having a balanced symbol equation. Once balanced, the equation tells you how many moles of each substance react with each other :  $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$  (Balanced)

This equation states that: 1 : Mg 2 : HCl to form 1 : MgCl<sub>2</sub> 1 : H<sub>2</sub>

Using the formula and moles you can use this information to work out how much product you will make





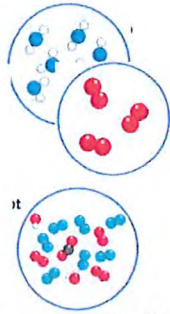
# Chemical analysis

## Threshold Concept

How do we identify a substance?

## Pure and impure

Pure substances are made up of just one type of element or compound. They will have one set melting or boiling point.



Impure substances are a mixture of elements or compounds and have a range of melting/boiling points.



## Keywords

**Pure** – a substance made from just one element or compound

**Impure** – a substance made from more than one element or compound

**Analyse** – to find the chemical composition of a substance

**Sample** – a portion of a substance taken from a larger amount

## Formulations

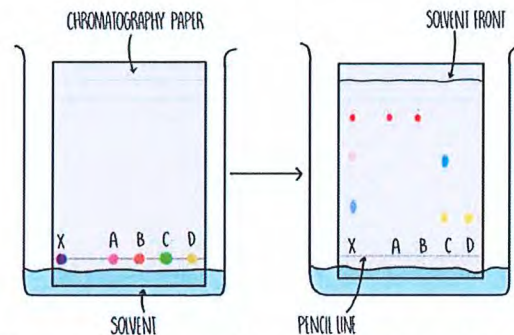
A formulation is a mixture which has been designed as a useful product.

- Fuels
- Cleaning products
- Paints



## Chromatography required practical

Chromatography is a method used to separate the substances in a mixtures.



**Stationary phase** – where the molecules can't move (chromatography paper)

**Mobile phase** – where the molecules can move (the solvent)

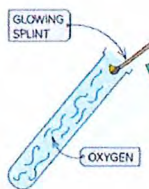


## Test for gases

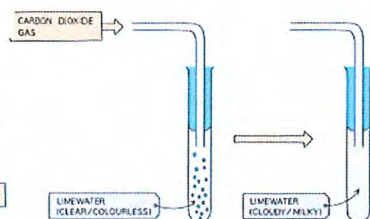
### Test for Hydrogen



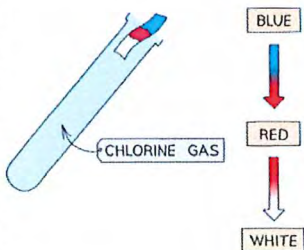
### Test for Oxygen



### Test for Carbon Dioxide

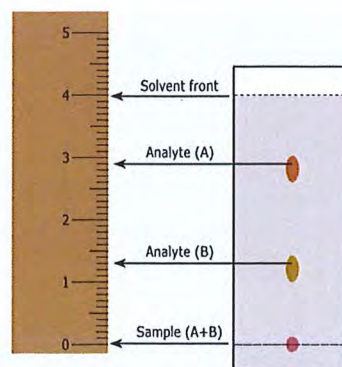


### Test for Chlorine



## R<sub>f</sub> Value

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$



# Chemical analysis Triple

## Threshold Concept

How do we identify a substance?

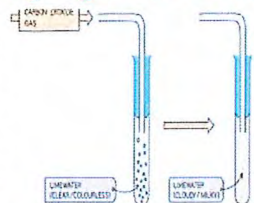
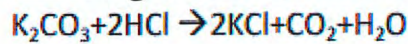
## Testing for metal ions

Metal ions will form coloured precipitates when they react with sodium hydroxide.

Metal Cation	Effect of adding NaOH
Aluminium ( $Al^{3+}$ )	White precipitate, dissolves in excess NaOH to form a colourless solution
Magnesium ( $Mg^{2+}$ )	White precipitate, insoluble so remains in excess NaOH
Calcium ( $Ca^{2+}$ )	White precipitate, insoluble so remains in excess NaOH
Copper (II) ( $Cu^{2+}$ )	Light blue precipitate, insoluble in excess
Iron (II) ( $Fe^{2+}$ )	Green precipitate, insoluble in excess
Iron (III) ( $Fe^{3+}$ )	Red-brown precipitate, insoluble in excess



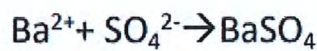
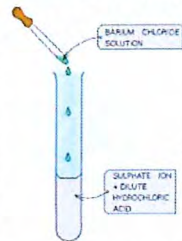
## Testing for carbonate ions $CO_3^{2-}$



- Metal carbonate and hydrochloric acid
- Forms Carbon dioxide
- Turns lime water cloudy



## Testing for Sulphate ions ( $SO_4^{2-}$ )



- Add barium chloride
- White precipitate formed



## Flame emission spectroscopy



An instrumental technique used to identify metal ions.



## Keywords

**Pure** - a substance made from just one element or compound

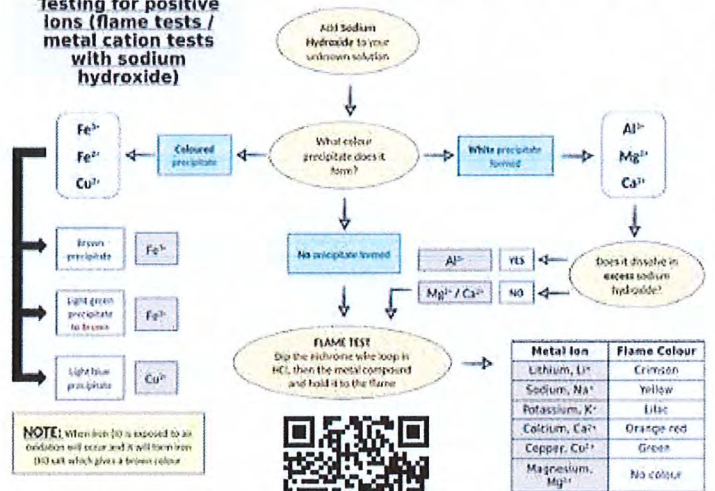
**Impure** - a substance made from more than one element or compound

**Analyse** - to find the chemical composition of a substance

**Sample** - a portion of a substance taken from a larger amount

## Identifying ions required practical

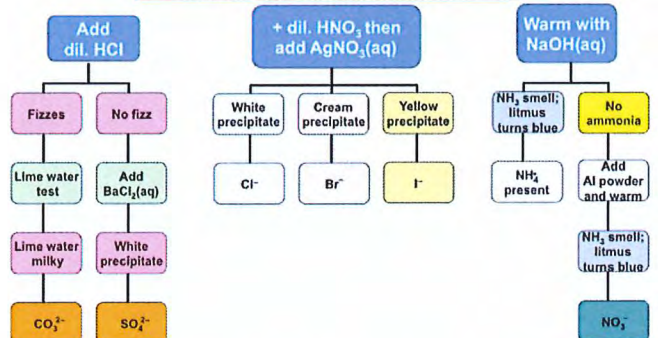
Testing for positive ions (flame tests / metal cation tests with sodium hydroxide)



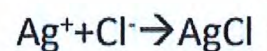
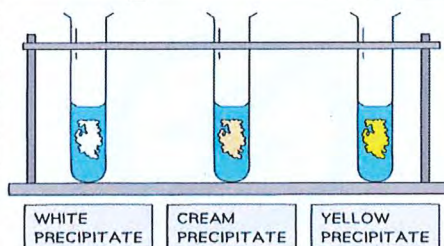
NOTE: When iron (II) is exposed to an oxidiser will occur and it will form iron (III) salt which gives a brown colour



## Testing for negative ions



## Testing for Halide ions ( $Cl^-$ , $Br^-$ , $I^-$ )



- Add nitric acid
- Add a few drops of silver nitrate
- Chloride forms a white precipitate
- Bromide forms a cream precipitate
- Iodide forms a yellow precipitate



English  
Language

## Threshold Concept- Year 10- Language- Reading:

TC1 -Understanding texts: identifying explicit and implicit information; selecting accurate and precise quotations.

TC2 – Demonstrate and appreciation of the writer's craft through analysis and critically evaluative comments.

TC4 – Evaluate writer's craft including comparison skills.



### Showing your understanding of texts- use PEEZL to structure your answers.

Component 1, Question 2 response- 5/5 marks.

**Point**- rephrase key words from question to start your answer.

**Evidence**- introduce quotation(s).

Mention techniques here!

**Explanation**- explain what quotations shows.

**Zoom**- pick a single word choice made by the writer and explain what it implies.

**Link to reader** - mention how reader may react and why.

You should use this info to get the base knowledge needed to confidently answer the different types of question on component 1 and 2.

Frequent, short quotations weaved into your answers and explained will make your work even more successful!

The writer creates the impression that there is a misunderstanding between the characters of Emma and Robbie. For example the writer describes how Robbie "was well known for his grumpiness", yet "Emma mistook it for shyness". The fact that Emma mistakes his grumpy attitude for being shy emphasises how the couple do not fully understand each other as they misinterpret each other's behaviour.

The writer also creates the impression that Emma and Robbie are both very different people. Whilst Robbie is "twenty years older than her" and quite grumpy, Emma is impressionable and slightly naive as she believes "he was more mature than he was" as a result of his sulking attitude. This impression is reiterated when the writer explains how after a week "Emma was feeling the need for some time apart from Robbie". This highlights the distant nature of their relationship and suggests it may not be as strong or loving as she believes.

### Expressing higher order ideas in explanations (for analysis/evaluation).

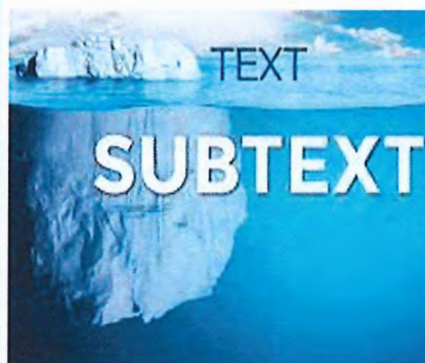
Use this to transform your responses from this...

**Text** = what is directly written in a piece of Literature.

(Don't include in your explanations- you'll just be repeating yourself/ retelling the story.)

**Subtext** = the meanings beneath the surface of what is written.

These are the things that show you are thinking deeply about the writer's choices.



What happens.

Connotations of words.

Implied emotions of characters.

Alternative interpretations.

Writer's intentions.

The quotation: "as strong as a bull" reflects that the man is like a strong cow. X

To this...

The quotation "as strong as a bull" shows that the man in question is a powerful physical specimen. It may also reflect the man is mentally tough, perhaps even stubborn. The noun "bull" might reflect the writer's intention to show that the man is aggressive, perhaps foreshadowing harm he does to others later in the story. ✓



### Identifying language and structural features.

0 2 Read lines 7-16.

What impressions does the writer create of Emma and Robbie in these lines? [5]

You must refer to the language used in the text to support your answer, using relevant subject terminology where appropriate.

Whenever you see the highlighted words, try to identify and mention the writer's technique choices in your essays.

Common language techniques	Common structural features
Simile Metaphor Personification Adjective Adverb	Lists Repetition of words Lexical (word) patterning Repetition of a technique Tone shift

Use this to transform your responses from this...

The quotation: "as strong as a bull" shows...

Make sure you can confidently identify these!

To this...

The quotation: "as strong as a bull" is a simile, which shows...



### Comparing successfully- using comparative connectives.

Words that signal a comparison

- As
- Also
- Like
- Alike
- Likewise
- Resembles
- Similar
- Just as
- Just like
- Equally
- Same both

Words that signal a contrast

- however
- Although
- Whereas
- In contrast
- Yet
- Differs from
- Instead
- Unlike
- On the contrary
- Different from
- On the other hand

Platinum answers may include: The words "more" "less" regularly AND comparative adjectives.

Words that end in 'er' that compare two things i.e. greater.

Use these frequently when comparing non-fiction texts.

Both the 'Penny Review' and the Chilean mining article finish with the miners being rescued. This creates a sense of drama as the rest of the texts build up tension and anticipation for their rescue. However, in the Chilean article the day of the rescue is also mentioned at the beginning: the "scenes of jubilation erupted" as the miners were rescued. This dramatic verb 'erupted' portrays the excitement and

Make sure you clearly mention which specific text you are discussing every time.



**Threshold Concept- Year 10- Writing:**

TC5 - Communicate clearly, effectively, and imaginatively, selecting and adapting tone, style and register for different forms, purposes and audiences.

TC6 - Organise information and ideas, using structural and grammatical features to support coherence and cohesion of texts

TC7 - Use a range of sentence structures for clarity, purpose and effect, with accurate punctuation and spelling.

**Vocabulary:**

Common word	Better word
Big	Vast
Small	Microscopic
Happy	Elated
Sad	Melancholy
Scary	Blood-curdling
Scared	Petrifying
Loud	Thunderous
Quiet	Soundless
Said	Declared
Red	Vermillion



**Ask yourself these questions:**

- Do I know, use and spell correctly plenty of better words for common words?
- Do I push myself to use more ambitious words in all my work- not just English?

To be a successful writer, you need to juggle all of these different skills.

**Techniques:**



**Ask yourself these questions:**

- Do I know what all these techniques are?
- Do I use a range of these (and maybe even some others!) in my own writing?

**Punctuation:**



**Ask yourself these questions:**

- Am I aware of the function and when to use each of these pieces of punctuation?
- Do I consistently use all these pieces of punctuation in my writing?

**Structure:**

For fiction texts- SCIT:

**40 min successful plot structure- SCIT.**

- Section 1:** Describe the **setting**.
- Section 2:** Describe the main **character**.
- Section 3:** Describe **ONE incident**.
- Section 4:** Describe how the setting/character has now **transformed**.



For non-fiction texts- PAF:

Purpose	WHY you are writing your non-fiction text.	Inform, persuade, advise, review, entertain.
Audience	WHO you are writing to/for.	Wide audience, council, parents, tourists, teenagers.
Form	WHAT you are writing and HOW it is uniquely laid out.	Letter, magazine article, newspaper article, advertisement, speech.



**Ask yourself these questions:**

- Does my writing achieve what I want it to?
- Do I adapt my writing (i.e. word/language choices) based on the task I am set?

# English Literature

**Threshold Concept- Year 10- A Christmas Carol:**

TC1 - Understanding texts

TC2 - Demonstrate an appreciation of the writer's craft through analysis and critically evaluative comments.

TC3 - Understanding the relationships between texts and the contexts in which they were written.

**A plot and character summary of 'A Christmas Carol:' Full text (if on MS Teams) = [A Christmas Carol Audiobook](#)**



**THE CHARACTERS**

**Scrooge**  
A mean, miserable, lonely old miser. Can he learn the truth about Christmas and about himself before it is too late?

**Bob Cratchit**  
Scrooge's poor office clerk and a loving father. Can he earn enough money to save his son's life?

**Tiny Tim**  
Bob's gentle, frail son. Will he live or will he die?

**Jacob Marley's ghost**  
Scrooge's dead business partner. Will his terrible warning come too late?

**Ghost of Christmas Past**  
Why does this ghost make Scrooge weep with both joy and sorrow?

**Ghost of Christmas Present**  
A cheerful spirit. Will Scrooge heed his warnings?

**Ghost of Christmas Yet to Come**  
A frightening, silent ghost. Can Scrooge change the dreadful future this spirit shows him?

Using this information can you:

- Recount what happens from start to finish in the novella?
- Explain who the primary characters are, and what makes them unique?

You should use this information to get the base knowledge needed for Charles Dickens' story.

E.g. The Ghost of Christmas Yet To Come shows Scrooge a horrible future where he dies- he is a silent, petrifying ghost.

**How to analyse the writer's craft- break the quotation up into smaller chunks. Example on Scrooge.**

**Golden-adjective = suggests value.**

**Noun:** Sunlight brings life, light and warmth. Scrooge brings life as he gives money to Bob to ensure Tiny Tim continues to live. He brings light as he is a much more jolly and friendly person. He brings warmth as he is a far warmer, more compassionate man.

**Adjective-** links to the idea of rebirth. Scrooge is starting afresh- he is reincarnated as a completely new Scrooge. The whole world is fresh to him and he is fresh to the world and the people around him, too.

Golden sunlight; Heavenly sky; sweet fresh air; merry bells.

Scrooge is a rare and valuable human being- a nice rich man. He is valued by the people around them, now!

Scrooge also now values the sunlight and the world around him = he is appreciative.

**Adjective-** Scrooge sees Heaven above him in the sky. London is now a place he is happy in- it is a heaven to him. It also suggests his new religious side where he follows God's teachings to treat others well.

In order to be successful, you must know a range of different moments from the whole story. For example, other moments where Scrooge is important include:

- Scrooge's introduction as a miserable boss. "Bah! Humbug!"
- Scrooge as a child. "Poor boy!"
- Scrooge's reaction to the ghosts. "I will honour Christmas in my heart."

**The relationships between A Christmas Carol and the historical context in which they are written.**



Prince Albert and Queen Victoria decorating a Christmas tree 1848. Where the tradition started.



Saint Nicholas- patron saint of children, known for his generosity and kindness.



The Ghost of Christmas Present, who resembles Saint Nicholas and is surrounded by new Victorian Christmas tradition.



Look out for other parts of the novella clearly inspired by the outside world, i.e. poverty, treatment of children, workhouses.

**Threshold Concept- Year 10- Poetry:**

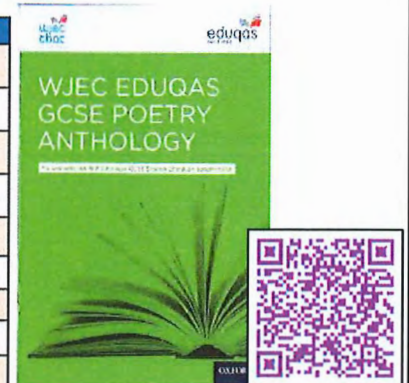
TC1 - Understanding texts

TC2 - Demonstrate an appreciation of the writer's craft through analysis and critically evaluative comments.

TC3 - Show understanding of the relationships between texts, and the contexts in which they were written.

1 sentence summaries of each poem: Full annotations (if on MS Teams) = [Annotated 15 poems.](#)

Poem	1 sentence summary
The Manhunt	The one where a wife writes about her scarred soldier-husband.
Sonnet 43	The one about listing ways you love someone.
London	The one about hating a city and what it represents.
The Soldier	The one about the glory of dying for England.
She Walks in Beauty	The one about the beauty of a mourning woman.
Living Space	The one about the cramped Indian slums.
As Imperceptibly as Grief.	The one about fear of time passing away and death.
Cozy Apolgia	The one about the specialness of a normal "boring" relationship.
Valentine	The one about how love is like an onion
A Wife in London	The one about the wife who finds out her husband has died in South Africa.
Death of a Naturalist	The one about where frogs teach a child about reproduction.
Hawk Roosting	The one about where a bird is compared to humanity.
To Autumn	The one where a season is compared to a woman/ goddess.
Afternoons	The one where about the restrictions of motherhood.
Dulce Et Decorum Est	The one about a WW1 gas attack.
Ozymandias	The one about the broken statue of someone who was powerful.
Mametz Wood	The one about soldiers' remains in farming fields.
The Prelude	The one about the magic of cold winter days.



**You should use this info to get the base knowledge needed for each poem.**

Using this information can you:

- Recount the main idea from each poem?
- Begin to recount quotations/words/the background in the poems?

E.g. London is a poem about how horrible the capital of England is to the poet.

How to analyse the poet's craft- use FLIRT to cover a range of different features in your responses.

<b>F</b> orm	Sonnet? Ballad? Free verse? Ode? Narrative poem?
<b>L</b> anguage	Word choices? Adjectives/adverbs? Verbs? Lexical fields? Connotations?
<b>I</b> magery	Similes? Metaphors? Personification? Hyperbole? Senses? Alliteration? Onomatopoeia?
<b>R</b> hyme/structure	Rhyme scheme? Enjambment? Caesura?
<b>T</b> one	Joyful? Depressed? Angry? Ironic? Nostalgic? Shifting?



**Ozymandias example.**

**Sonnet** = love poem = Ozymandias loved his power.

"desert" "boundless" "bare" **lexical field** of loneliness reflects how forgotten Ozymandias is now.

"sneer of cold command" strong sounding **alliteration** suggest violence of Ozymandias to his slaves

"Stand of the desert. Near them..." **Caesura** = isolation of the statue.

"Ozymandias- King of kings" **ironic** tone- Ozymandias' power has faded completely.

**Linking the content of the poem to the writer's life/ the history behind it!** This links to the context of the poem, because...



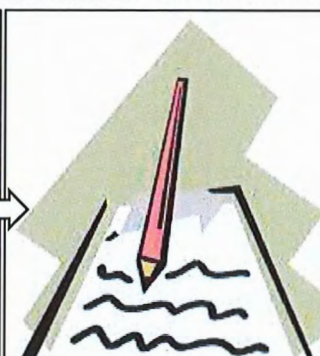
1914- Propaganda posters/ poetry persuades men to go to WW1.



1915- Wilfred Owen enlists in the army.



1915- 1918- Wilfred Owen experiences the horrors of war (including gas attacks).



1917- 1918- Wilfred Owen writes a response to the propaganda that persuaded men to go to war.



Each of the poems have stories behind them that inspired the writers- make sure you know them and mention them to showcase your knowledge!

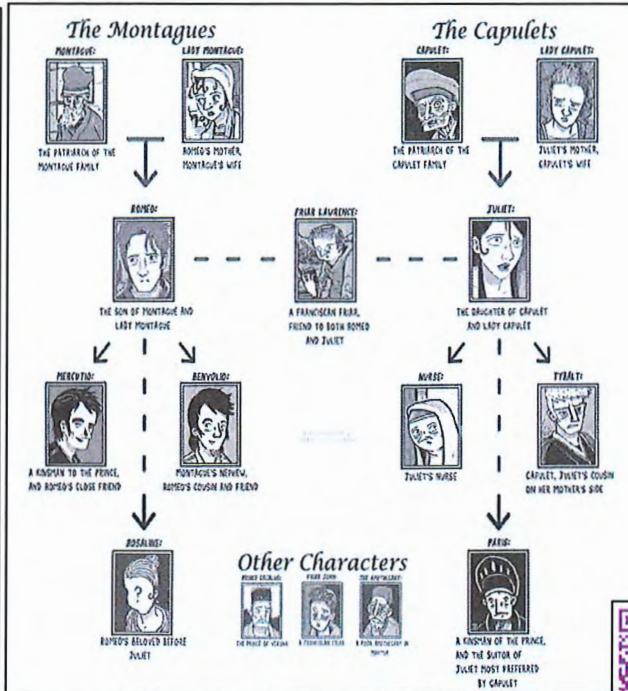
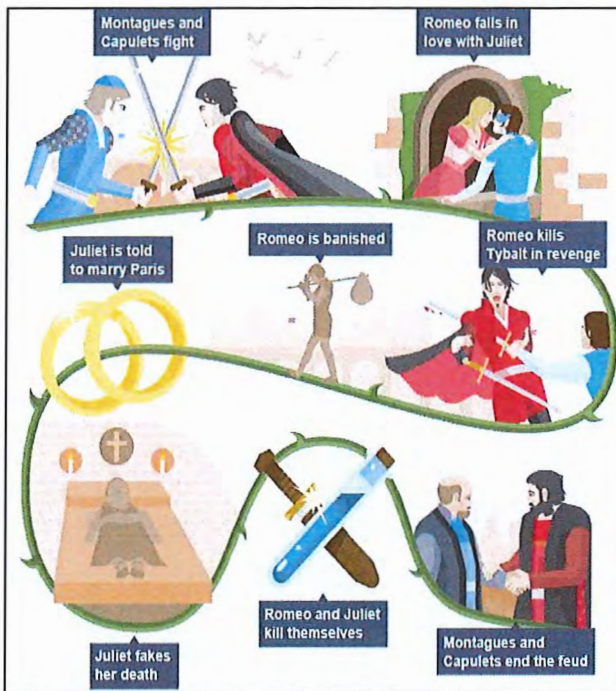


**Threshold Concept- Year 10- Romeo and Juliet:**

TC1 - Understanding texts

TC2 - Demonstrate an appreciation of the writer's craft through analysis and critically evaluative comments.

**A plot and character summary of 'Romeo and Juliet:' Full text (if on MS Teams) = [Romeo and Juliet Audiobook](#)**



Using this information can you:

- Recount what happens from start to finish in the play?
- Explain who the primary characters are, and what makes them unique?



You should use this information to get the base knowledge needed for Shakespeare's play.

E.g. Juliet is instructed to marry Paris by Capulet and Lady Capulet, but fakes her death to avoid this.

**How to analyse the writer's craft- mention the writer's name and all of the choices they make. Example on Tybalt (focus on trying to write explanations like you see in the green box below.)**

The character of Tybalt is presented purposely by Shakespeare to be aggressive and deadly: **"turn, Benvolio and look upon thy death"**. **Shakespeare has Tybalt use an imperative here to command the Montague characters to do what he says as he feels superior to them. His use of the metaphor "death" to describe his sword, shows that he often uses the object with the intention of killing his opponents. The original audience may celebrate Tybalt being like this, as it reflects his masculinity and strength in a world which promoted warrior culture, but a modern audience would more likely see his language as overly violent and completely unnecessary, as conflict is looked down upon more so now.**



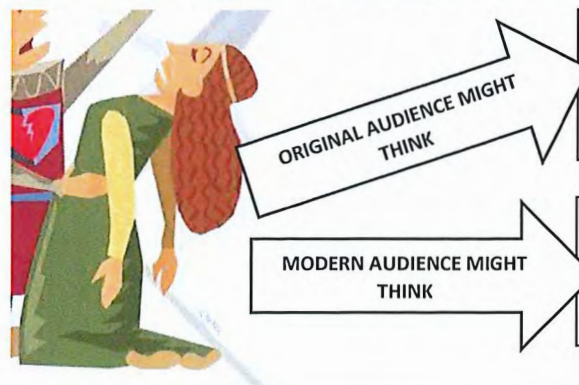
In order to be successful, **you must know a range of different moments** from the whole play. For example, other moments where violence is important include:

- Romeo and Juliet's suicide. "Stabs herself"
- Mercutio's death "a plague on both your houses."
- Romeo kills Tybalt. "They fight; TYBALT falls"



**Developing this further- discussing audience reaction.**

A really effective way to showcase your understanding of the text is by comparing how an original audience might react vs. how a modern audience might react (see the blue part of the WAGOLL above). This is how we do this:



Juliet is ungrateful for refusing to marry a suitable man they've selected for her. They may dislike her for trying to resist the male-dominated society that she (and they) are part of.

Juliet is right to do what she does. She should pursue the man she loves and should not bow down to the pressure of her parents. They may celebrate her power, in spite of her youth.



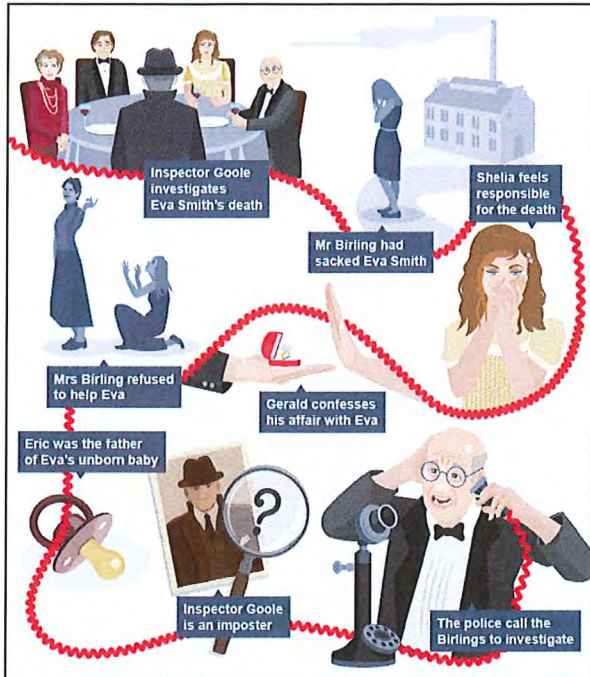
Try to consider, as you read the play, your own reactions to characters/ events. Then compare this to how an audience in the 1590s (with very different views to us) would react.

## Threshold Concept- Year 10- An Inspector Calls:

TC1 - Understanding texts

TC2 - Demonstrate an appreciation of the writer's craft through analysis and critically evaluative comments.

### A plot and character summary of 'An Inspector Calls:' Full text (if on MS Teams) = [An Inspector Calls audiobook](#)



**Arthur Birling**  
Head of Birling family, capitalist businessman

**Sybil Birling**  
Birling's snobby wife

**Inspector Goole**  
A police inspector sent to investigate Eva Smith's suicide

**Eva Smith / Daisy Renton**  
A young working-class woman with connections to the Birlings

**Gerald Croft**  
Sheila's fiancé, and son of Birling's business rival

**Sheila Birling**  
Birling's daughter and Gerald's fiancée

**Eric Birling**  
The youngest Birling

Using this information can you:

- Recount what happens from start to finish in the play?
- Explain who the primary characters are, and what makes them unique?

You should use this information to get the base knowledge needed for J.B. Priestley's play.

E.g. Mr Birling is an ignorant Capitalist who sacked Eva Smith for demanding equal pay.

How to analyse the writer's craft- mention the writer's name and all of the choices they make. Example on Sheila (focus on trying to write explanations like you see in green here.)

The character of Sheila Birling is used to reflect that the younger generation have a chance to be different to their elders. The quotation: **"these girls aren't cheap labour, they're people"** shows **Sheila's new understanding that women (regardless of class) should be treated more equally to men. J.B. Priestley has her criticise her male relatives who treat females as lower beings. The adjective "cheap" is used by the writer to show that she feels they are worth more than how society sees them. The original audience may dislike a woman challenging a man at this time as it is not the norm at all, though Sheila would be celebrated by a more modern audience as she is seen more so as a strong feminist figure, similar to the suffragettes.**

Key quote written down
Technique identified.
What it shows
Audience reaction(s).

In order to be successful, **you must know a range of different moments** from the whole play. For example, other moments where Sheila is important include:

- Sheila's introduction as Sheltered and childish "mummy" "daddy"
- Sheila's new-found power in her speech and interruptions "(cutting in)"
- Sheila's change and refusal to accept Gerald's engagement ring. "No...I must think"

### Developing this further- discussing audience reaction.

A really effective way to showcase your understanding of the text is by comparing how an original audience might react vs. how a modern audience might react (see the blue part of the WAGOLL above). This is how we do this:



ORIGINAL AUDIENCE MIGHT THINK

Edna is lucky to work for the Birlings. She has a stable job and an opportunity to live in a beautiful house. (Original theatre-goers more likely to have maids and be Capitalists.)

MODERN AUDIENCE MIGHT THINK

Edna is unlucky to work for the Birlings. She would earn very little indeed and has to wait on a whole family at all hours of the day. (Modern audiences more sympathetic to working-class)



Try to consider, as you read the play, your own reactions to characters/ events. Then compare this to how an audience in 1946 (with very different views to us) would react.

Maths

# Year 11 - Graphs...

## Gradients and Lines

### What do I need to be able to do?

- Equations of lines parallel to the axis
- Plot and interpret  $y = mx + c$
- Find the equation of a straight line from a graph, given one point and gradient, or from two points

### Keywords

**Gradient:** the steepness of a line

**Intercept:** where two lines cross. The y-intercept: where the line meets the y-axis

**Parallel:** two lines that never meet with the same gradient

**Co-ordinate:** a set of values that show an exact position on a graph given as  $(x, y)$

**Linear:** linear graphs (straight line) – linear difference by addition/subtraction

**Mid-point:** The middle of. The point halfway along.

### Lines parallel to the axis

R

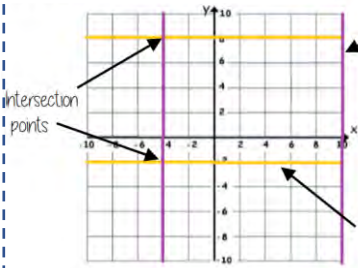
All the points on this line have a x coordinate of 10

'a' can be ANY positive or negative value including 0

Lines parallel to the y axis take the form  $x = a$  and are vertical

Lines parallel to the x axis take the form  $y = a$  and are horizontal

All the points on this line have a y coordinate of -2  
eg  $(3, -2)$   $(7, -2)$   $(-2, -2)$   
all lay on this line because the y coordinate is -2



### Plotting $y = mx + c$ graphs

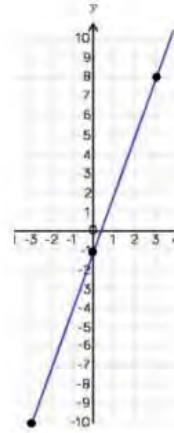
R

$y = 3x - 1$  → 3 x the x coordinate then - 1

x	-3	0	3
y	-10	-1	8

Draw a table to display this information

This represents a coordinate pair  $(-3, -10)$



You only need two points to form a straight line

Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

Remember to join the points to make a line

### Interpreting $y = mx + c$

The coefficient of x (the number in front of x) tells us the gradient of the line

$$y = mx + c$$

y and x are coordinates

The value of c is the point at which the line crosses the y-axis. Y intercept

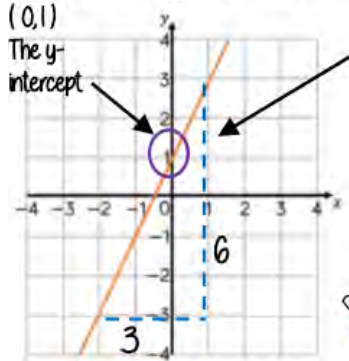
The equation of a line can be rearranged. Eg

$$y = c + mx$$

$$c = y - mx$$

Identify which coefficient you are identifying or comparing

### Find the equation from a graph



The Gradient  $\frac{6}{3} = 2$

$$y = 2x + 1$$

The direction of the line indicates a positive gradient

Positive gradients

Negative gradients

### Finding the equation of the line from two points

The y-intercept is at -5

To calculate the gradient (m) from two points on a graph:

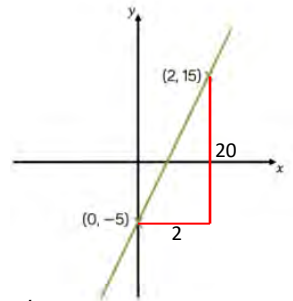
$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{20}{2}$$

$$m = 10$$

Therefore the equation of the graph is:

$$y = 10x - 5$$



### Equation of line – given point and gradient

A line has a gradient of -2 and passes through the point  $(1, -4)$

What is the equation of the line?

$$y = mx + c$$

We know the gradient is -2 so...

$$y = -2x + c$$

We now know that the point  $(1, -4)$  is on the line so we can substitute these values in as  $x = 1$  and  $y = -4$  and then solve to get c:

$$-4 = -2(1) + c$$

$$-4 = -2 + c$$

$$-4 + 2 = c$$

$$c = -2$$

Therefore the equation of the line is:

$$y = -2x - 2$$

### Finding the gradient from two points

Gradient of line between  $(2, 5)$  and  $(3, 14)$

$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{14 - 5}{3 - 2}$$

$$m = \frac{9}{1}$$

Therefore the gradient between the two points is 9

# Year 11 - Graphs...

## Non-linear graphs

### What do I need to be able to do?

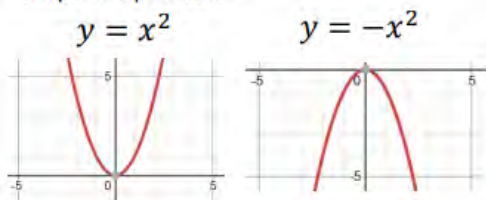
- Plot and read quadratic graphs
- Plot and read cubic graphs
- Plot and read from reciprocal graphs
- Recognise graph shapes
- Identify and interpret roots and intercepts of quadratics

### Keywords

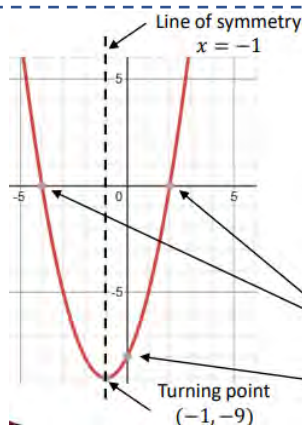
- Root:** Solutions to graph. Where the graph crosses x axis
- Intercept:** where two lines cross. The y-intercept: where the line meets the y-axis
- Parallel:** two lines that never meet with the same gradient
- Co-ordinate:** a set of values that show an exact position on a graph
- Quadratic:**  $x^2$  the highest exponent of the variable (usually x) is a square
- Cubic:**  $x^3$  the highest exponent of the variable is three
- Reciprocal:** a pair of numbers that multiply together to give 1

### Quadratic graphs

A quadratic graph will always be in the shape of a parabola.



The roots of a quadratic graph are where the graph crosses the x axis. The roots are the solutions to the equation.



### Examples

$$y = x^2 + 2x - 8$$

A quadratic equation can be solved from its graph.

The roots of the graph tell us the possible solutions for the equation. There can be 1 root, 2 roots or no roots for a quadratic equation. This is dependant on how many times the graph crosses the x axis.

Roots  $x = -4$   
 $x = 2$

y intercept = -8

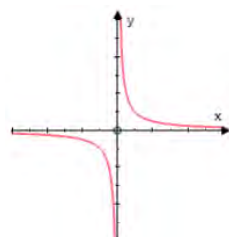
### Cubic graphs

- The highest power of x is 3.
- The graph to the right shows  $y = x^3$
- Other examples of cubic graphs could be  $y = x^3 - 5$ ,  $y = 2x^3$  or  $y = x^3 + x^2 + 1$



### Reciprocal graphs

- The graph shows  $y = \frac{1}{x}$
- In this example, there are asymptotes at the x and y axes – this means that the graph gets closer and closer to the axes without ever touching them.



### Completing table of values

Complete the table for  $y = x^2 + 2x - 4$

x	-4	-3	-2	-1	0	1	2
y	4					-1	

If you have to draw your own table of values use x values from -2 to 2

When  $x = -4$   $y = -4^2 + (2 \times -4) - 4$   
 $y = 16 + -8 - 4$   
 $y = 4$

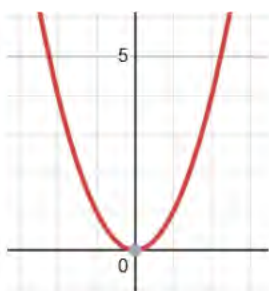
When  $x = 1$   $y = 1^2 + (2 \times 1) - 4$   
 $y = 1 + 2 - 4$   
 $y = -1$

Substitute x values into the equation you are given to find the values of y

This is a coordinate of (1, -1) which can be plotted to create a graph

### Types of graphs

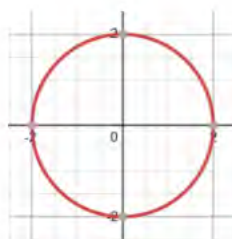
You need to be able to recognise different types of graphs



Quadratic graphs  
 $y = x^2$



Reciprocal graphs  
 $y = \frac{1}{x}$



Circle graphs  
 $x^2 + y^2 = 4$



Cubic graphs  
 $y = x^3$

# Year 11 - Graphs... using graphs

## What do I need to be able to do?

- Construct and interpret conversion graphs and other real-life straight line graphs
- Construct and interpret distance/time and speed/time graphs
- Recognise and interpret proportion graphs

## Keywords

- Convert:** Change a value or expression from one form to another
- Gradient:** How steep a line is
- Intercept:** Where two graphs cross
- Distance-time graph:** A graph that shows a journey and the relationship between the distance reached in a given time
- Speed-time graph:** A graph that shows the relationship between the speed and time taken
- Real-life graph:** This is a graph that represents a situation that we would see in real life
- Direct Proportion:** A relationship between two quantities such that as one increases, the other increases (or as one decreases, the other decreases) at the same rate.
- Inverse proportion:** A relationship between two quantities such that as one increase, the other decrease

## Conversion graphs



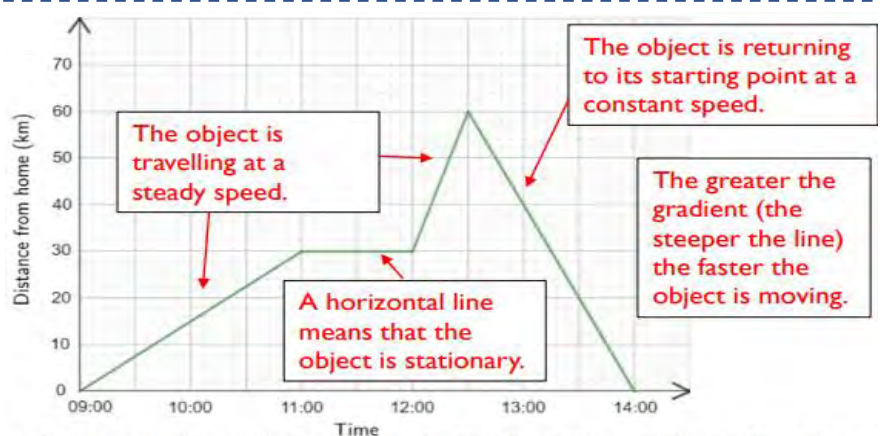
### Change £80 into Turkish lira

- 1) Start at 80 on the horizontal axes as this for pounds and go up vertically until you reach the line
- 2) From the line, read horizontally until you get to the axis showing lira

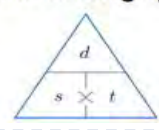
### Change 600 Turkish lira to pounds

- As this value is not shown by the graph, we have to use a value that is to help.
- 1) Start at 200 on the vertical axes and go across horizontally until you reach the line. From the line, read vertically until you get to the axes.
  - 2)  $200 \text{ lira} = \text{£}50$   
 $600 \text{ lira} = \text{£}150$

## Distance-time graph

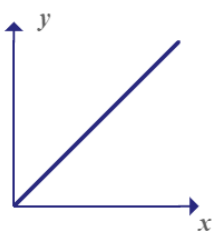


The speed of an object can be calculated from the gradient of the graph.  
E.g. calculate the speed at which the object travelled between 9am and 11am.  
 $\text{Speed} = 30 \div 2 = 15 \text{ km/hr}$

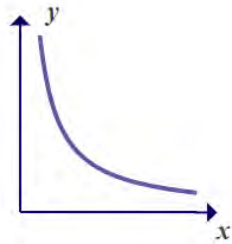


## Proportion graphs

### Direct proportion graph



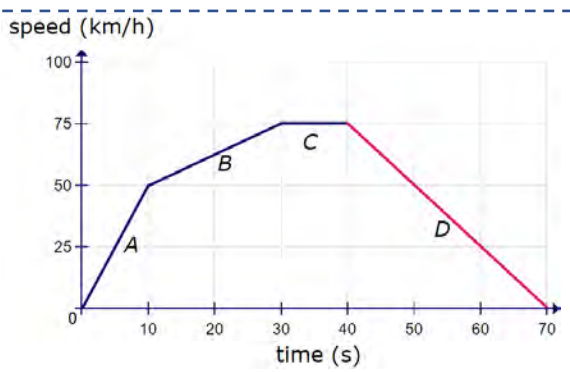
### Inverse proportion graph



## Speed-time graph

Here is a speed time graph showing the speed a motorbike is travelling at as time goes on.

- A - the motorbike is **accelerating** quite hard
- B - the bike is still **accelerating**, but less hard
- C - The bike is now travelling at a **constant speed** of 75km/hr
- D - The bike is **slowing down** at a constant rate



# Year 11 - Algebra...

## Expanding and factorising

### What do I need to be able to do?

- Expand and simplify brackets
- Factorise with single brackets
- Factorise quadratic expressions
- Solve equations equal to 0
- Solve quadratic equations by factorisation

### Keywords

- Expand:** multiply each term in the bracket by expression outside the bracket  
**Simplify:** collect like terms  
**Factorise:** reverse of expanding. Taking out a common factor  
**Quadratic:** The highest power of the variable is squared e.g.  $x^2$   
**Expression:** numbers, symbols and operators grouped together to show the value of something, no equals sign  
**Equation:** shows that two expressions are equal, it will have an equals sign =  
**Solve:** find a numerical value that satisfies an equation

### Expand and simplify with a single bracket

Expand means 'multiply out'  $5(3x + 4)$   
 $= 5 \times 3x + 5 \times 4$   
 $= 15x + 20$

Expand each of the brackets first and then simplify

$$3(2x - 1) - 4(3x - 2)$$

$$= 6x - 3 - 12x + 8$$

$$= -4x + 5$$

You could also use a grid to expand the brackets

x	3x	+4	
5	15x	+20	= 15x + 20

### Factorise into a single bracket

Factorise  $12x^2yz - 27xz$   
 $3xz \times 4xy - 3xz \times 9$   
 $3xz(4xy - 9)$

Factorise means put back into brackets by taking out a common factor

### Factorise quadratic expressions

Factorise  $x^2 + x - 42$

Sum of (+) 1  
 $-6 + 7 = 1$

product of -42  
 $-6 \times 7 = -42$

$$x^2 + x - 42 = (x - 6)(x + 7)$$

### Expand binomials

Use the grid method to expand brackets

x	5x	-3
2x	10x <sup>2</sup>	-6x
+1	+5x	-3

$$= 10x^2 - 6x + 5x - 3$$

$$= 10x^2 - x - 3$$

Remember to simplify the  $-6x$  and  $+5x$

Another method

$$(3x + 2)(5x + 3)$$

$$= 15x^2 + 9x + 10x + 6$$

$$= 15x^2 + 19x + 6$$

Don't forget to simplify  $9x + 10x = 19x$

### Solve quadratic equations by factorisation

The highest common factor of  $9x^2$  and  $27x$  is  $9x$

Solve  $9x^2 - 27x = 0$

$$9x(x - 3) = 0$$

$$9x = 0 \quad x - 3 = 0$$

$$x = 0 \quad x = 3$$

Solve  $x^2 + x - 20 = 0$

$$(x + 5)(x - 4) = 0$$

$$x + 5 = 0 \quad x - 4 = 0$$

$$x = -5 \quad x = 4$$

We need 2 numbers with a sum of +1 and a product of -20  
 $+5$  and  $-4$

Before you can factorise and solve, the equation must be in the form  $x^2 + bx + c = 0$

Solve  $x^2 = 2x + 15$

Rearrange

$$x^2 - 2x - 15 = 0$$

$$(x - 5)(x + 2) = 0$$

$$x - 5 = 0 \quad x + 2 = 0$$

$$x = 5 \quad x = -2$$

### Solve equations equal to zero

One or both of terms would have to equal 0

$$3x + 4 = 0$$

$$-4 \quad -4$$

$$3x = -4$$

$$\div 3 \quad \div 3$$

$$x = \frac{-4}{3}$$

$$9x(x - 3) = 0$$

$$9x = 0 \quad x - 3 = 0$$

$$x = 0 \quad x = 3$$

$$(2x + 1)(1 - x) = 0$$

$$2x + 1 = 0 \quad 1 - x = 0$$

$$-1 \quad -1 \quad +x \quad +x$$

$$2x = -1 \quad x = 1$$

$$\div 2 \quad \div 2$$

$$x = \frac{-1}{2}$$

# Year 11 - Algebra...

## changing the subject

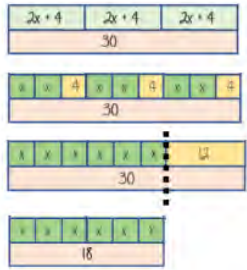
### What do I need to be able to do?

- Solve linear equations
- Solve inequalities
- Form and solve equations and inequalities in context of shape
- Change the subject formula (Simple/known/complex)

### Keywords

- Equation:** shows that two expressions are equal, it will have an equals sign =
- Solve:** find a numerical value that satisfies an equation
- Inequality:** an inequality compares two values showing if one is greater than, less than or equal to another
- Change:** Rearrange the equation
- Rearrange:** Change the order
- Inverse operation:** the operation that reverses the action

### Solve equations



$$3(2x + 4) = 30$$

$$3(2x + 4) - 30$$

Expand the brackets

$$6x + 12 = 30$$

$$-12 \quad -12$$

$$6x = 18$$

$$-6 \quad -6$$

$$x = 3$$

Substitute to check your answer  
This could be negative or a fraction or decimal



### Language of rearranging...

Make XXX the subject

Change the subject

Rearrange...

There are many ways in which a rearranging question can be asked so look out for these keywords

### Solve inequalities

Solving inequalities has the same method as equations

$$5(x + 4) < 3(x + 2)$$

$$5x + 20 < 3x + 6$$

$$2x + 20 < 6$$

$$2x < -14$$

$$x < -7$$

Check it!

$$5(-8 + 4) < 3(-8 + 2)$$

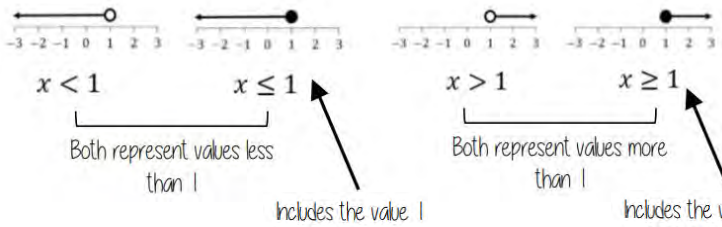
$$5(-4) < 3(-6)$$

$$-20 < -18$$

-20 IS smaller than -18



### Showing inequality solutions on a number line



Both represent values less than 1

Includes the value 1

Both represent values more than 1

Includes the value 1

### Change the subject of formula



$$x = y + z$$

Rearrange to make y the subject

$$y = x - z$$

$$y \rightarrow +z \rightarrow x$$

$$y \leftarrow -z \leftarrow x$$

Using inverse operations or fact families will guide you through rearranging formulae.

Rearranging can also be checked by substitution

In an equation (find x)

$$4x - 3 = 9$$

$$+3 \quad +3$$

$$4x = 12$$

$$\div 4 \quad \div 4$$

$$x = 3$$

In a formula (make x the subject)

$$xy - s = a$$

$$+s \quad +s$$

$$xy = a + s$$

$$\div y \quad \div y$$

$$x = \frac{a+s}{y}$$

The steps are the same for solving and rearranging

Rearranging is often needed when using  $y = mx + c$

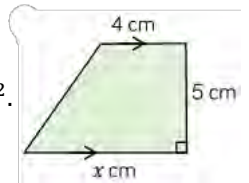
eg Find the gradient of the line  $2y - 4x = 9$

Make y the subject first  $y = \frac{4x + 9}{2}$

Gradient =  $\frac{4}{2} = 2$

### Form and solve equations and inequalities from shape

The area of the trapezium is  $25\text{cm}^2$ . Find x.



$$\frac{1}{2}(x + 4) \times 5 = 25\text{cm}^2$$

$$5(x + 4) = 50$$

$$5x + 20 = 50$$

$$5x = 30$$

$$x = 6\text{cm}$$

### Change the subject of complex formula

$$y = x^2 - a$$

$$x^2 = y + a$$

$$x = \pm\sqrt{y + a}$$

+a to both sides

Don't forget the  $\pm$  when you square root both sides

Factorise to isolate the 'x'  
 $ax - cx = x(a - c)$

$$ax - b = cx + b$$

$$ax - cx = 2b$$

$$x(a - c) = 2b$$

$$x = \frac{2b}{a - c}$$

Rearrange so that all the terms involving 'x' are on the same side

Divide by (a - c) to leave 'x' on it's own



# Year 11 - Algebra... Functions

HIGHER

## What do I need to be able to do?

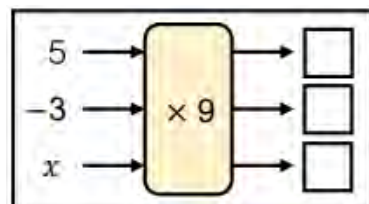
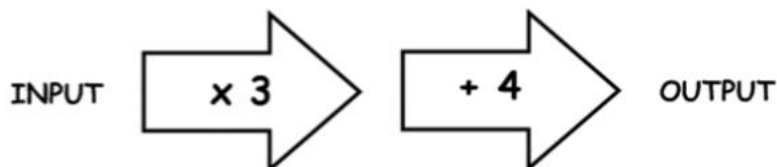
- Use function machines (R)
- Use function notation
- Work with composite functions (H)
- Work with inverse functions (H)

## Keywords

- Input:** a number/variable to put into an expression/function  
**Output:** the result of a function  
**Function:** a relationship between two sets of numbers – the input and output  
**Inverse:** the opposite function  
**Variable:** A symbol or letter for an unknown value  
**Composite:** A function made of other functions. The output of one is the input of another  
**Rearrange:** change the subject.

## Function machines

Takes an **input** value, performs some **operations** and produces an **output** value.



## Function notation

$$f(x) = 3x + 2$$

The function  $f$  is defined in terms of the variable  $x$

To work out the value of  $f$  substitute the  $x$  value into  $3x + 2$

$$\text{e.g. } f(2) = 3(2) + 2 = 8$$

The input value is 2 the output is 8

Functions don't always need to be  $f(x)$  they can be given by any letter...

$$g(x) = 3x^2 - x - 7$$

$$\begin{aligned} g(4) &= 3 \times 4^2 - 4 - 7 \\ &= 3 \times 16 - 4 - 7 \\ &= 48 - 4 - 7 \\ &= 37 \end{aligned}$$

## Composite functions

A combination of two or more functions to create a new function

$fg(x)$  is the composite function that substitutes the function  $g(x)$  into the function of  $f(x)$

$fg(x)$ ... means 'do  $g$  first, then  $f$   
 $gf(x)$ ... means 'do  $f$  first, then  $g$ '

$$f(x) = 5x - 3$$

$$g(x) = \frac{1}{2}x + 1$$

a) What is  $fg(4)$ ?

$$\begin{aligned} g(4) &= \frac{1}{2} \times 4 + 1 \\ &= 3 \end{aligned}$$

$$\begin{aligned} f(3) &= 5 \times 3 - 1 \\ &= 14 \end{aligned}$$

Therefore:

$$fg(4) = 14$$

b) What is  $fg(x)$ ?

$$\begin{aligned} fg(x) &= 5 \left( \frac{1}{2}x + 1 \right) - 3 \\ &= \frac{5}{2}x + 5 - 3 \\ fg(x) &= \frac{5}{2}x + 2 \end{aligned}$$

## Inverse functions

$f^{-1}(x)$  - A function that performs the **opposite process** of the original function  
 "Really similar to changing the subject of formula"

Find  $f^{-1}(x)$  given  $f(x) = 3x + 4$

$$\begin{aligned} y &= 3x + 4 \\ y - 4 &= 3x \\ \frac{y-4}{3} &= x \end{aligned}$$

$$f^{-1}(x) = \frac{x-4}{3}$$

## RULES FOR FINDING THE INVERSE $f^{-1}(x)$ :

Step 1: Write out the function as  $y = \dots$

Step 2: Swap the  $x$  and  $y$

Step 3: Make  $y$  the subject

Step 4: Instead of  $y =$  write  $f^{-1}(x) =$

PSHE

## Key Terms

Augmented Reality	A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view
Virtual Reality	The computer-generated simulation of a three-dimensional image or environment that can be interacted with
Botox	A bacteria substance which is injected into specific muscles (normally forehead, outer part of eyes and muscles of the mouth and jaw)
Fillers	Injections (often hyaluronic acid) to make areas of the face to look fuller, skin look plumper & younger
Digital Footprint	The trace you leave behind when using the internet
The Dark Web	the name given to specific websites which are not accessible through normal search engines. Special software or networks are needed in order for it to be accessed.

PSHE covers a variety of topics that focus on developing understanding in four key areas: personal, social, health and economic.

### Online Reputation

When you go online you leave a footprint. Everything you interact with leaves a trace. Often what people see about you online helps to form their first impressions of you. More and more, employers are looking up potential employees to see what they can find on them online. Therefore, it's important that what people can see online about you shows you in a good light.

### CVs

A CV (Curriculum Vitae) is a document that you can use to apply for jobs.

It should be no more than two sides of A4. It should include your contact information, qualifications, skills, references and work experience. It should have no spelling or grammar mistakes.

### Personal Statement

A personal statement is a written account of yourself. It is often used for job or college applications.

## Key Skills

- Active listening and communication
- Teamwork
- Negotiation and self advocacy
- Leadership
- Presentation and debate

## Job Interviews

If your CV or application is successful, the next step is that you may be asked to interview.

This is usually a face-to-face meeting with the potential employer.

They will ask you questions about yourself and your ability to do the job. They may also ask you to perform some tasks to test your skills.

# Physics

# Vehicle Safety

## Threshold Concept

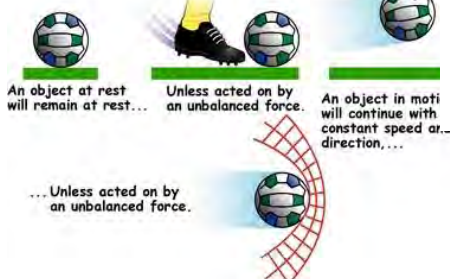
Cars have safety features to reduce impact forces

## Safety Features in Cars



## Newton's First Law

### Newton's First Law of Motion



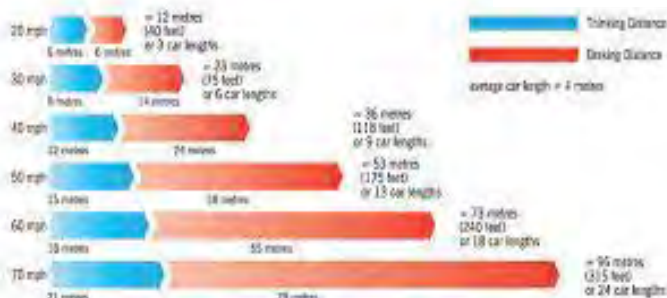
## Keywords

**Newtons Laws** - Three guiding principles stating the movement and reactions of all things due to physics

**Impact forces** - The forces occurring when two objects collide

**Momentum** - A measure of how difficult it is to stop a moving objects

## Stopping Distances



IT TAKES NEARLY TWICE AS FAR TO STOP at 70mph AS IT DOES TO STOP at 50mph

## Newton's Second Law

To get the wagon to accelerate, you have to apply a PULL (Force).



If the MASS of the wagon increases, a greater PULL is necessary to accelerate it.



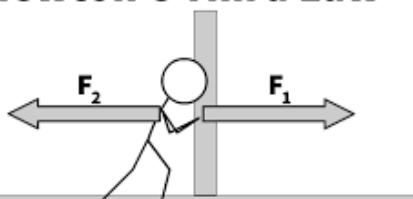
## Momentum



Fig 1. The Conservation of Momentum Applies to a Closed System Not an Open System.

## Newton's Third Law

### Newton's Third Law



Forces always Come in Pairs:  
You Push on a Wall  
the Wall Pushes Back

## Equations for this topic

Force = Mass x Acceleration

Momentum = Mass x Velocity

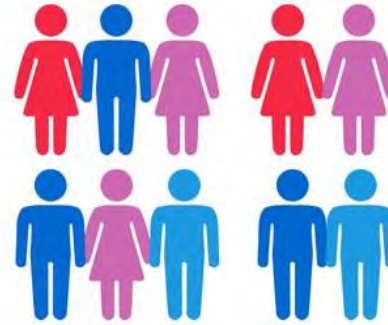
RSE

# Year 11 - RSE - Respectful Relationships/Sexual and Intimate Relationships

## Key Terms

Asexuality	Having little or no sexual feelings or desires for others
Monogamy	The most common form of relationship - a sexual relationship that has developed between two people only
LGBTQIA+	Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual +
Gender Expression	The way we show our gender to the world
Toxic Masculinity	An expression of manhood which depends on being tough, unemotional, strong physically or financially, and powerful
STIs	Sexual Transmitted Infections
Chlamydia	A common STI which can cause fertility problems in females

RSE covers a variety of topics and focuses on developing understanding of different aspects of relationships. This includes with yourself, friendships, romantic and sexual relationships



## Key Skills

- Active listening and communication
- Teamwork
- Presentation and debate

## Sexual Health

Sexual health is a state of physical, mental and social well-being in relation to sexuality.

This includes thinking about: contraception, consent and coercion

## Child-on-Child Abuse

Child-on-Child Abuse (previously referred to as Peer-on-Peer Abuse) includes, but is not limited to:

- Physical and sexual abuse
- Sexual harassment and violence
- Emotional harm
- Online and offline bullying
- Teenage relationship abuse

It can even include grooming children for sexual and criminal exploitation.

## Contraception

Condom - Made of latex, put on to an erect penis before penetration

Abstinence - Restraining yourself from having any form of sexual contact

Contraceptive Pill - Contains hormones and is taken daily (often at the same time every day) by women. Stops the lining of the Womb thickening

Implant - A small tube inserted under the skin (usually in the arm). It releases hormones which prevent pregnancy

# Triple Science



# Space (TRIPLE)

## Threshold Concept

The Solar System is made up of many types of objects.

## Keywords

**Solar System** - the collection of eight planets and their moons in orbit round the Sun, together with smaller bodies in the form of asteroids, meteoroids, and comets.

**Orbit** - the curved path of a celestial object or spacecraft round a star, planet, or moon

**Sun** - the star around which the 8 planets of the Solar System orbits.

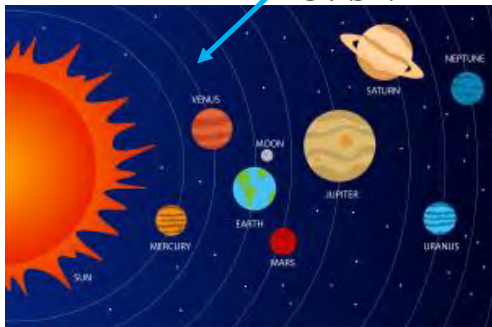
**Planet** - a celestial body moving in an elliptical orbit round a star.

**Moon** - a celestial body moving in orbit around a planet. They are natural satellites.

**Satellite** - an object, either natural (e.g. The Moon), or artificial, that orbits a moon, planet or star. Artificial satellites are for information gathering.

## Solar System

## Orbit



Link to information on the whole topic, consisting of slides, videos, and quizzes

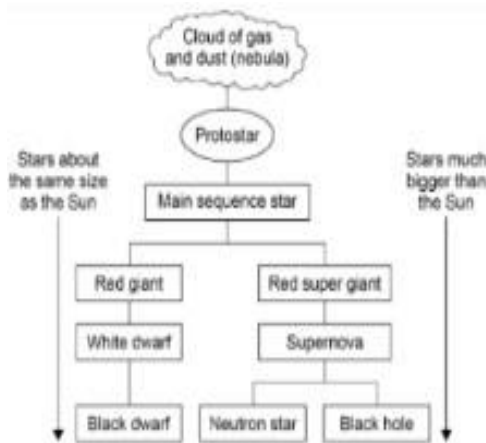
## Orbital Motion & Satellites

Planets orbit in near-circular orbits: they maintain a constant speed but are always changing direction. This means they have a constant speed but NOT a constant velocity

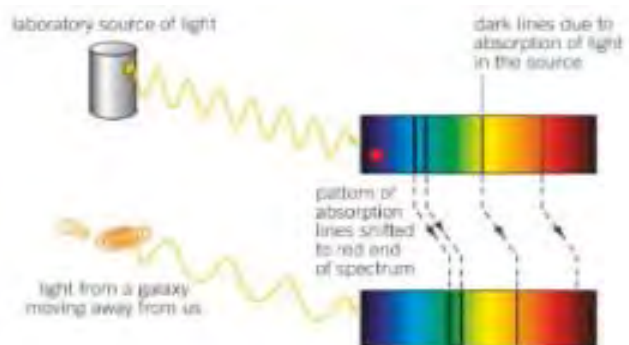
The Moon is a Natural Satellite. All other satellites of Earth are artificial, such as weather, military, ISS, GPS etc.

Geostationary satellites follow the same point above Earth, so have an orbital period of 24 hours.

## Life Cycle of Stars



## Red-shift and Big Bang



## Equations for this topic

## Required Practical

# Chemical analysis Triple

## Threshold Concept

How do we identify a substance?

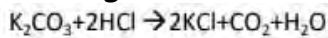
## Testing for metal ions

Metal ions will form coloured precipitates when they react with sodium hydroxide.

Metal Cation	Effect of adding NaOH
Aluminium ( $Al^{3+}$ )	White precipitate, dissolves in excess NaOH to form a colourless solution
Magnesium ( $Mg^{2+}$ )	White precipitate, insoluble so remains in excess NaOH
Calcium ( $Ca^{2+}$ )	White precipitate, insoluble so remains in excess NaOH
Copper (II) ( $Cu^{2+}$ )	Light blue precipitate, insoluble in excess
Iron (II) ( $Fe^{2+}$ )	Green precipitate, insoluble in excess
Iron (III) ( $Fe^{3+}$ )	Red-brown precipitate, insoluble in excess



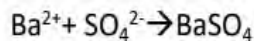
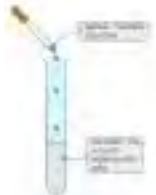
## Testing for carbonate ions $CO_3^{2-}$



Metal carbonate and hydrochloric acid forms carbon dioxide. Turns lime water cloudy.



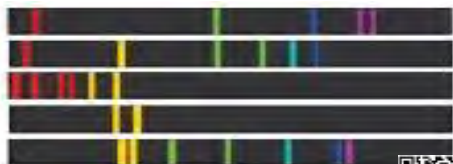
## Testing for Sulphate ions ( $SO_4^{2-}$ )



Add barium chloride. White precipitate formed.



## Flame emission spectroscopy



An instrumental technique used to identify metal ions.



## Keywords

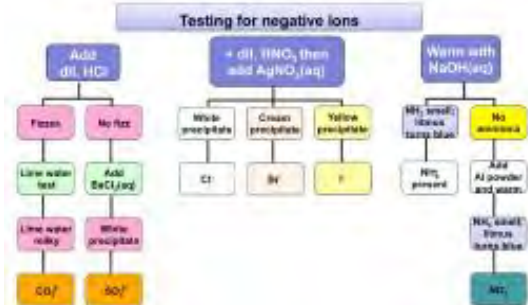
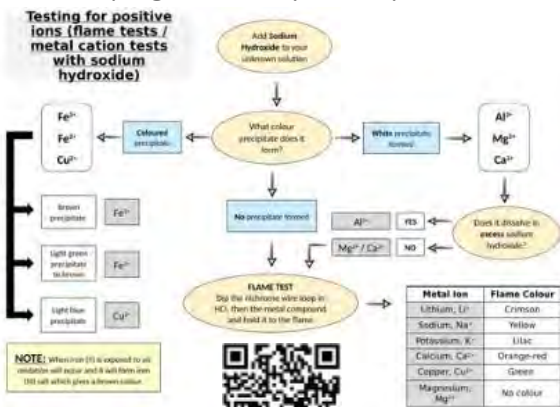
**Pure** - a substance made from just one element or compound

**Impure** - a substance made from more than one element or compound

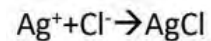
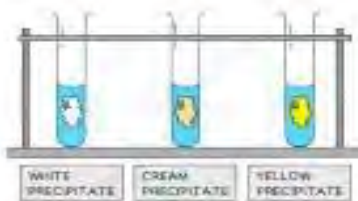
**Analyse** - to find the chemical composition of a substance

**Sample** - a portion of a substance taken from a larger amount

## Identifying ions required practical



## Testing for Halide ions (Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>)



Add nitric acid. Add a few drops of silver nitrate. Chloride forms a white precipitate. Bromide forms a cream precipitate. Iodide forms a yellow precipitate.

