

# Knowledge Organiser Booklet Year 10 Term 2 Core

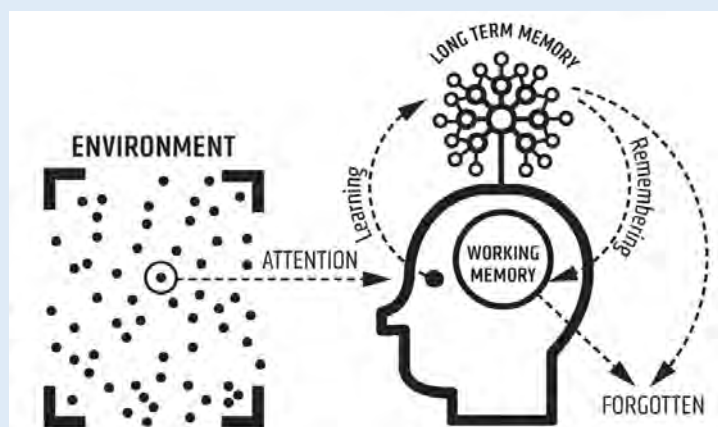


Our working memories can only store a limited amount of information, whereas our long term memories can store limitless information. To learn successfully, we need to store core knowledge into our long term memories, so we can retrieve it when we need it.

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:

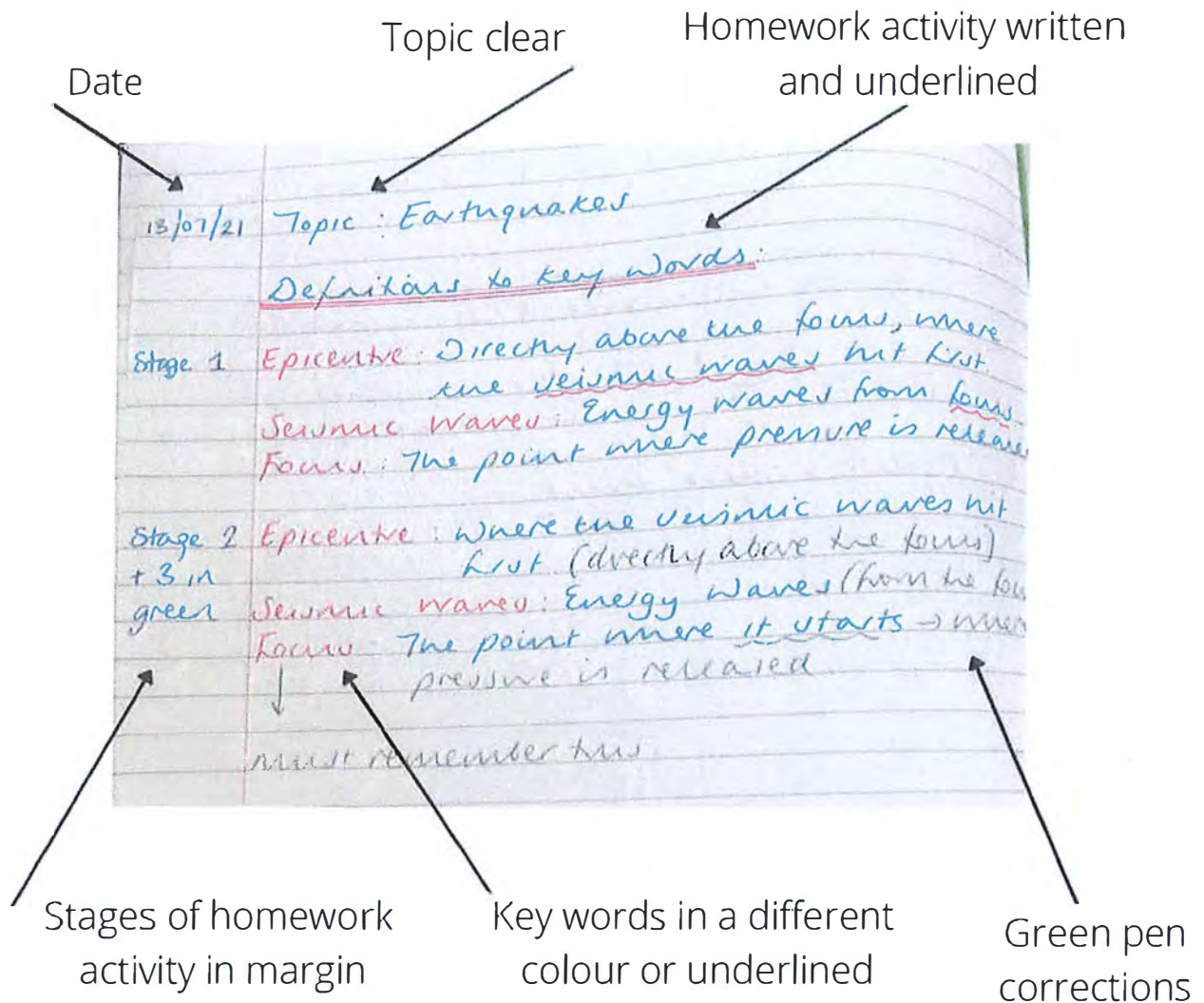
Key word:

Examples:

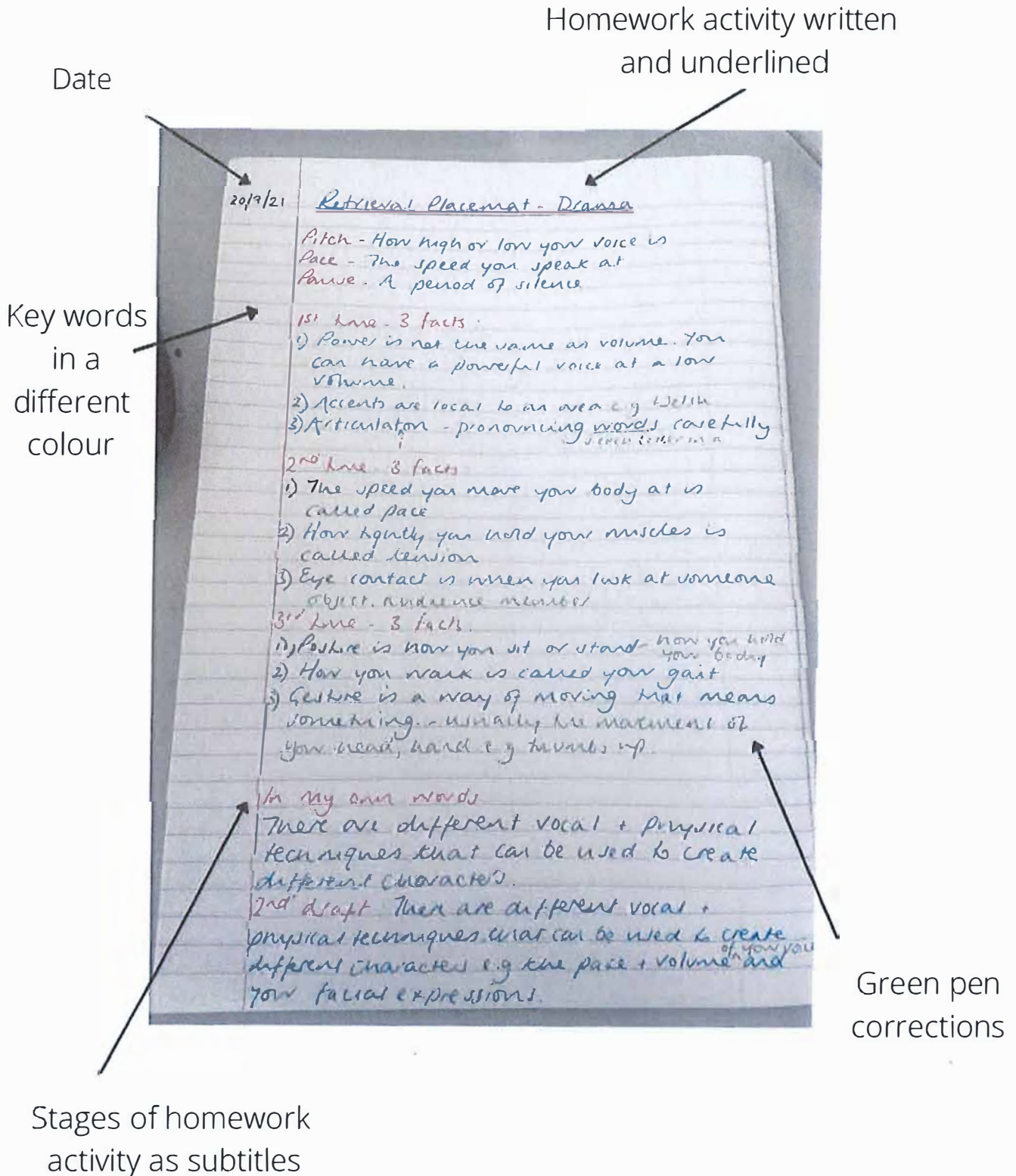
Non-examples:



# What should my knowledge organiser homework look like?



# What should my knowledge organiser homework look like?



Biology

# Inheritance

## Threshold Concept

Organisms pass on their DNA in order to survive.

## DNA



DNA is found in the nucleus of cells and contains all the genetic material to make the organism



## Keywords

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

**Nucleus** ..... The organelle inside cells that contains the cells genetic material

**DNA**..... The molecule inside cells that contains all the genetic information responsible for the development and function of an organism

**Chromosomes**..... A structure made up of proteins and DNA organised into genes inside the nucleus of a cell

**Gene** ..... Genes carry information that determine what characteristics are inherited from an organism's parents

**Reproduction**..... The production of offspring

## Sexual and asexual reproduction



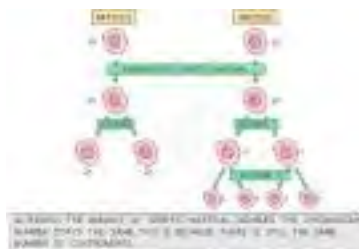
There are two main forms of reproduction: sexual and asexual reproduction. In sexual reproduction, an organism combines the genetic information from each of its parents and is genetically unique. In asexual reproduction, one parent copies itself to form a genetically identical offspring



## Mitosis / Meiosis

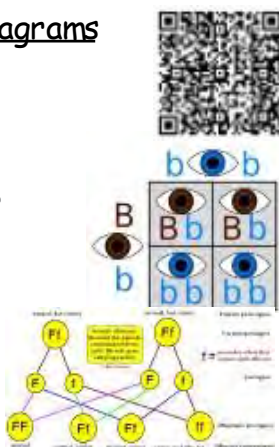
Mitosis is a form of cell division which produces two identical, diploid body cells.

Meiosis is a form of cell division which produces four non-identical, haploid sex cells or gametes (sperm and ova in humans)

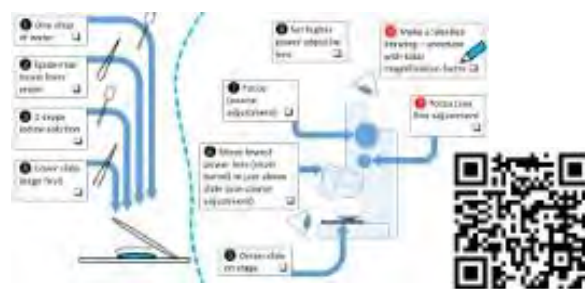


## Genetic cross diagrams

**Genetic crossing** describes breeding two selected individuals so their offspring can be studied to understand how a particular trait is inherited down the generations.



## Required Practical



## Equations for this topic

Image size = actual size x magnification



# Chemistry

# 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 helium	12 C carbon
16 O 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

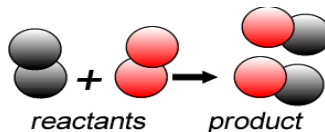
Gain - the process of gaining something

## Balancing Equations

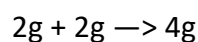
As the same number of elements are at the start and the end of reactions. The Equation needs to be balanced.



## Conservation of Mass



The reactants mass must always equal the mass of the products

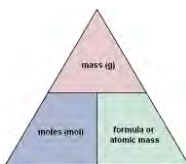


We can not destroy atoms.



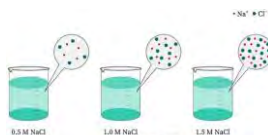
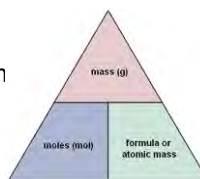
## Moles

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



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).

**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.

Mention techniques here!

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.

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!

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

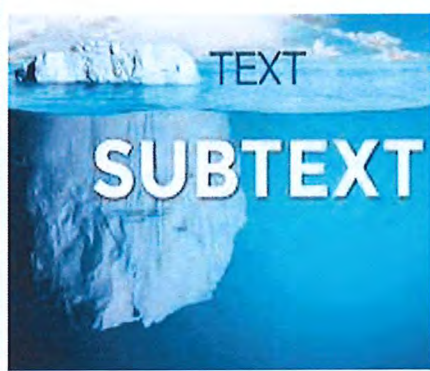
Use this to transform your responses from this...

**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.**

- |  |  |
|--|--|
| <p><b>Words that signal a comparison</b></p> <ul style="list-style-type: none"> <li>- As</li> <li>- Also</li> <li>- Like</li> <li>- Alike</li> <li>- Likewise</li> <li>- Resembles</li> <li>- Similar</li> <li>- Just as</li> <li>- Just like</li> <li>- Equally</li> <li>- Same both</li> </ul> | <p><b>Words that signal a contrast</b></p> <ul style="list-style-type: none"> <li>- however</li> <li>- Although</li> <li>- Whereas</li> <li>- In contrast</li> <li>- Yet</li> <li>- Differs from</li> <li>- Instead</li> <li>- Unlike</li> <li>- On the contrary</li> <li>- Different from</li> <li>- On the other hand</li> </ul> |
|--|--|

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.

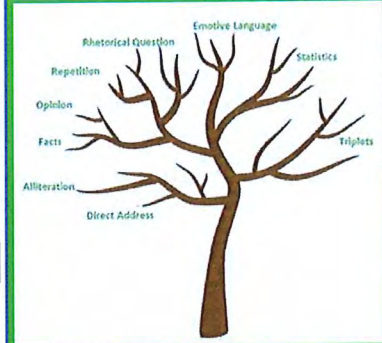
**Vocabulary:**

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



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

**Techniques:**



**Ask yourself these questions:**

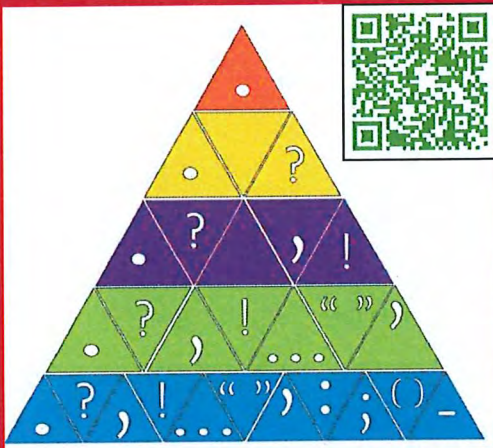
- Do I know, use and spell correctly plenty of better words for common words?
- Do I push myself to use more ambitious words in all my work- not just English?

**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- Poetry:**

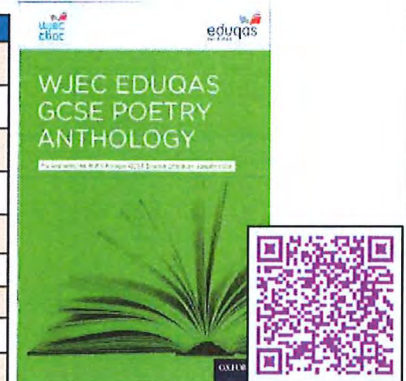
TC1 - Understanding texts

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 think about how the poems can be compared to others?

E.g. Dulce Et Decorum Est explores the horrors of war, while the soldier makes out going to war as noble.

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

<b>Form</b>	Sonnet? Ballad? Free verse? Ode? Narrative poem?
<b>Language</b>	Word choices? Adjectives/adverbs? Verbs? Lexical fields? Connotations?
<b>Imagery</b>	Similes? Metaphors? Personification? Hyperbole? Senses? Alliteration? Onomatopoeia?
<b>Rhyme/structure</b>	Rhyme scheme? Enjambment? Caesura?
<b>Tone</b>	Joyful? Depressed? Angry? Ironic? Nostalgic? Shifing?



**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.



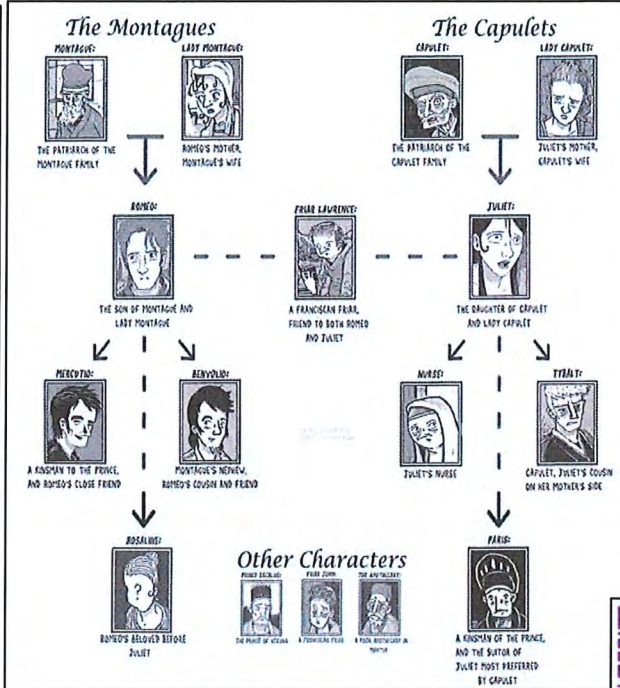
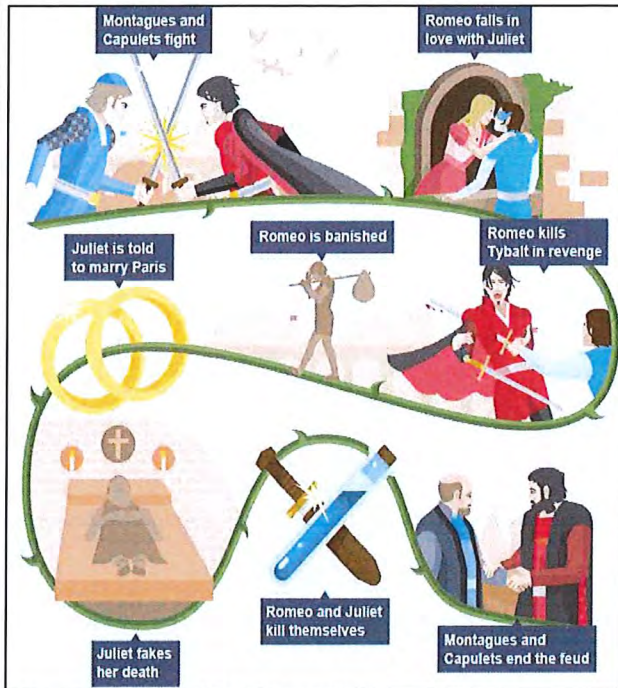
Each of the poems have stories behind them that inspired the writers- make sure you know them and mention them to showcase your knowledge!

**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.

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

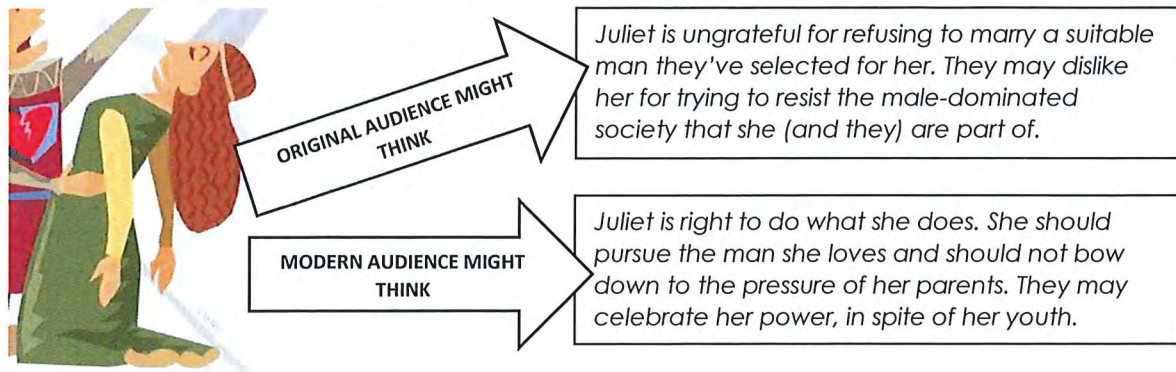
In order to be successful, **you must know a range of different moments** from the whole play. For example, other moments where violence is important include:

- 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:



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.

Maths

# YEAR 10 — GEOMETRY...

@whisto\_maths

# Angles and bearings

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

By the end of this unit you should be able to:

- Understand and represent bearings
- Measure and read bearings
- Make scale drawings using bearings
- Calculate bearings using angle rules
- Solve bearings problems using Pythagoras and trigonometry

## Keywords

**Cardinal directions:** the directions of North, South, East, West

**Angle:** the amount of turn between two lines around their common point

**Bearing:** the angle in degrees measured clockwise from North

**Perpendicular:** where two lines meet at  $90^\circ$

**Parallel:** straight lines always the same distance apart and never touch. They have the same gradient

**Clockwise:** moving in the direction of the hands on a clock

**Construct:** to draw accurately using a compass, protractor and or ruler or straight edge.

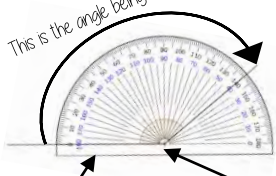
**Scale:** the ratio of the length of a drawing to the length of the real thing

**Protractor:** an instrument used in measuring or drawing angles.

## Measure angles to $180^\circ$

R

This is the angle being measured



Read from  $0^\circ$  on the base line. Remember to use estimation. This is an obtuse angle so between  $90^\circ$  and  $180^\circ$

The base line follows the line segment

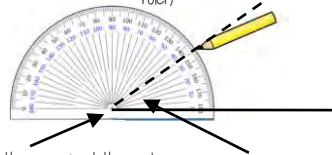
Make sure the cross is at the point the two lines meet

## Draw angles up to $180^\circ$

R

Draw a  $35^\circ$  angle

Make a mark at  $35^\circ$  with a pencil. And join to the angle point (use a ruler)

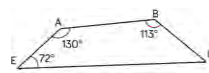


Make sure the cross is at the end of the line (where you want the angle)

The angle

## Angle notation

The letter in the middle is the angle. The arc represents the part of the angle



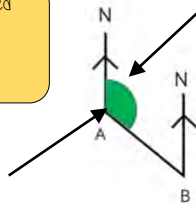
**Angle Notation:** three letters **ABC**. This is the angle at  $B = 113^\circ$

$\angle ABC$  is also used to represent the angle at B

## Understand and represent bearings

- A bearing is always measured from **NORTH**
- It is always given as three figures

The bearing of B from A is calculated by measuring the highlighted angle



The angle indicated starts from the North line at A and joins the path connecting A to B

This angle shows the bearing of B from A

The sentence... "Bearing of \_\_\_ from \_\_\_" is really important in identifying the bearing being represented

Using **estimation** it is clear this angle is between  $090^\circ$  and  $180^\circ$

## Scale drawings

R

1 : 20

For every 1cm on the model there are 20cm in real life

Remember: Scale drawings **ONLY** change lengths and distances. Angles remain the same

## Directions



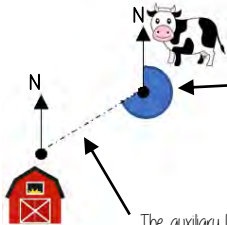
Clockwise

Anti-Clockwise



## Measure and read bearings

The bearing of the cow to the barn

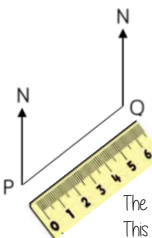


This angle is measured from **NORTH**. It is measured in a clockwise direction. **Estimation** indicates this angle is between  $180^\circ$  and  $270^\circ$ . Use a protractor to measure accurately. Remember: bearings are written as three figures.

The auxiliary line is drawn to help you measure and draw the angle that is measured to represent the bearing

## Scale drawings using bearings

Remember — angles **DO NOT** change size in scaled drawings



The bearing measurements do not change from "real life" to images

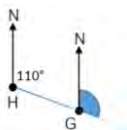
The units in the ratio scale are the same

The scale may need to be calculated from the image. This represents 30km from P to Q

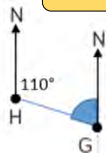
6cm = 30km  
6:3,000,000

## Bearings with angle rules

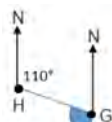
Because two North lines are **PARALLEL**....



They form **corresponding angles** and therefore are the same size



They form **co-interior angles** and add up to  $180^\circ$



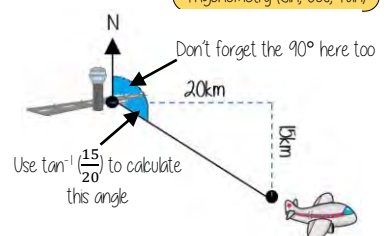
They form **alternate angles** and therefore are the same size

## Bearings with right-angled geometry

"Due West" bearing of  $270^\circ$  makes a  $90^\circ$  angle

"Due East" bearing of  $090^\circ$  makes a  $90^\circ$  angle

A plane flies East for 20km then turns South for 15km. Find the bearing of the plane from where it took off.



Use  $\tan^{-1}(\frac{15}{20})$  to calculate this angle

Look for Right-angles  
Pythagoras  
Trigonometry (Sin, Cos, Tan)

Don't forget the  $90^\circ$  here too

# YEAR 10 — GEOMETRY...

# Working with circles

@whisto\_maths

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

By the end of this unit you should be able to:

- Recognise and label parts of a circle
- Calculate fractional parts of a circle
- Calculate the length of an arc
- Calculate the area of a sector
- Understand and use volume of a cone, cylinder and sphere.
- Understand and use surface area of a cone, cylinder and sphere.

## Keywords

**Circumference:** the length around the outside of the circle — the perimeter

**Area:** the size of the 2D surface

**Diameter:** the distance from one side of a circle to another through the centre

**Radius:** the distance from the centre to the circumference of the circle

**Tangent:** a straight line that touches the circumference of a circle

**Chord:** a line segment connecting two points on the curve

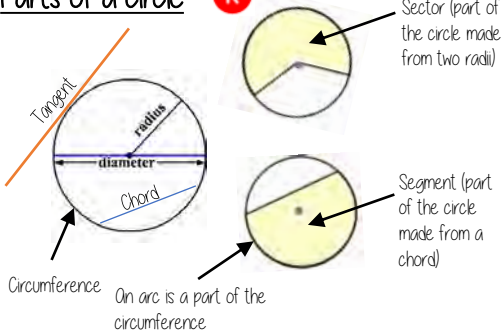
**Frustrum:** a pyramid or cone with the top cut off

**Hemisphere:** half a sphere

**Surface area:** the total area of the surface of a 3D shape.

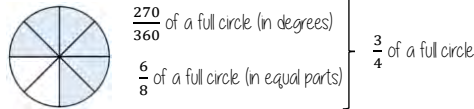
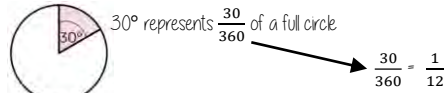
## Parts of a circle

R



## Fractional parts of a circle

A circle is made up of  $360^\circ$

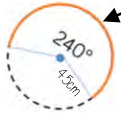


Formula to remember:  
Area of a circle =  $\pi r^2$   
Circumference of a circle =  $\pi d$  or  $2\pi r$

The fraction of the circle is as  $\frac{\theta}{360}$   
 $\theta$  represents the degrees in the sector

## Arc length

Remember an arc is part of the circumference  
Circumference of the whole circle =  $\pi d = \pi \times 9 = 9\pi$



Arc length =  $\frac{\theta}{360} \times \text{circumference}$

$= \frac{240}{360} \times 9\pi$   
 $= \frac{2}{3} \times 9\pi = 6\pi$

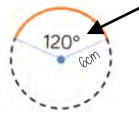
## Perimeter

Perimeter is the length around the outside of the shape  
This includes the arc length and the radii that enclose the shape

Perimeter =  $\frac{\theta}{360} \times \text{circumference} + 2r = 6\pi + 9$

## Sector area

Remember a sector is part of a circle  
Area of the whole circle =  $\pi r^2 = \pi \times 6^2 = 36\pi$



Sector area =  $\frac{\theta}{360} \times \text{area of circle}$

$= \frac{120}{360} \times 36\pi$   
 $= \frac{1}{3} \times 36\pi = 12\pi$

## Volume of a cone and a cylinder

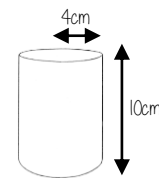
Volume Cylinder =  $\pi r^2 h$



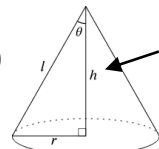
Volume Cone =  $\frac{1}{3} \pi r^2 h$

A cylinder is a prism — cross section is a circle

A cone is a pyramid with a circular base



$V = \pi r^2 h$   
 $= \pi \times 4^2 \times 10$   
 $= \pi \times 160$   
 $= 160\pi \text{ cm}^2$



The height of a cone is the perpendicular height from the vertex to the base

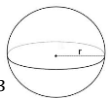
Give your answer in terms of  $\pi'$  means NOT in terms of pi  $= 502.7 \text{ cm}^2$

Look out for trigonometry or Pythagoras theorem — the radius forms the base of a right-angled triangle

## Volume of a sphere



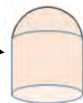
Volume Sphere =  $\frac{4}{3} \pi r^3$   
 $= \frac{4}{3} \times \pi \times 3^3$   
 $= \frac{4}{3} \times \pi \times 27 = 36\pi$



Volume Sphere =  $\frac{4}{3} \pi r^3$

NOTE: This is now a cubed value

Look out for hemispheres being placed on other 3D shapes, e.g. cones and cylinders



A hemisphere is half the volume of the overall sphere  $= 36\pi \div 2 = 18\pi$

## Surface area of a sphere

Surface area =  $4\pi r^2$



Radius = 5cm

Surface area =  $4\pi r^2$

$= 4 \times \pi \times 5^2$   
 $= 4 \times \pi \times 25$

The curved surface area of a sphere

$= 100\pi$

A hemisphere has the curved surface AND a flat circular face



$= 100\pi \div 2 = 50\pi$

Hemisphere  $= 50\pi + \pi \times 5^2$   
 $= 75\pi$

## Surface area of cones and cylinders

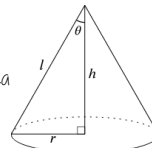
Surface area cylinder =  $2\pi r^2 + \pi dh$



The area of two circles (top and bottom face) + the area of the curved face

The length of shape B is the circumference of the circles

Curved surface area Cone =  $\pi r l$



Look out for the use of Pythagoras to calculate the length  $l$

Total surface area = curved face + circle face (area of base)



# YEAR 10 — GEOMETRY...

@whisto\_maths

# Vectors

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

By the end of this unit you should be able to:

- Understand and represent vectors
- Use and read vector notation
- Draw and understand vectors multiplied by a scalar
- Draw and understand addition of vectors
- Draw and understand addition and subtraction of vectors

## Keywords

**Direction:** the line our course something is going

**Magnitude:** the magnitude of a vector is its length

**Scalar:** a single number used to represent the multiplier when working with vectors

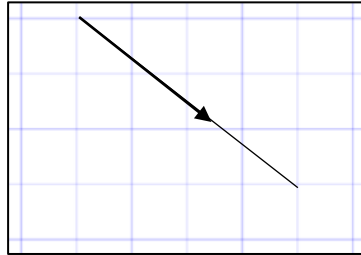
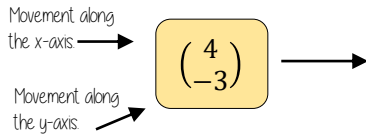
**Column vector:** a matrix of one column describing the movement from a point

**Resultant:** the vector that is the sum of two or more other vectors

**Parallel:** straight lines that never meet

## Understand and represent vectors

Column vectors have been seen in translations to describe the movement of one image onto another



Vectors show both direction and magnitude

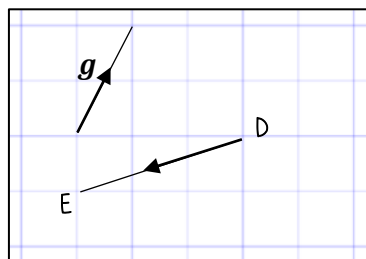
The arrow is pointing in the direction from starting point to end point of the vector.

The direction is important to correctly write the vector

The magnitude is the length of the vector (This is calculated using Pythagoras theorem and forming a right-angled triangle with auxiliary lines)

The magnitude stays the same even if the direction changes

## Understand and represent vectors



Vector notation  $\overrightarrow{DE}$  is another way to represent the vector joining the point D to the point E

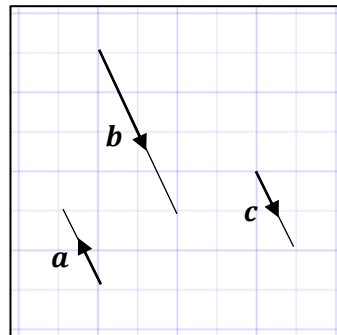
$$\overrightarrow{DE} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

The arrow also indicates the direction from point D to point E

Vectors can also be written in bold lower case so  $\mathbf{g}$  represents the vector  $\mathbf{g} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

## Vectors multiplied by a scalar

Parallel vectors are scalar multiples of each other



$$\mathbf{b} = 2 \times \mathbf{c} = 2\mathbf{c}$$

Multiply  $\mathbf{c}$  by 2 this becomes  $\mathbf{b}$ . The two lines are parallel

$$\mathbf{a} = -1 \times \mathbf{c} = -\mathbf{c}$$

The vectors  $\mathbf{a}$  and  $\mathbf{c}$  are also parallel. A negative scalar causes the vector to reverse direction

$$\mathbf{b} = -2 \times \mathbf{a} = -2\mathbf{a}$$

## Addition of vectors

$$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$\overrightarrow{BC} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

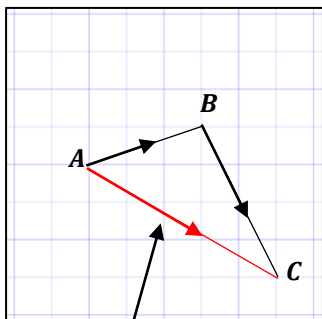
$$\overrightarrow{AB} + \overrightarrow{BC}$$

$$= \begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

$$= \begin{pmatrix} 3+2 \\ 1+(-4) \end{pmatrix}$$

$$\overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$$

Look how this addition compares to the vector  $\overrightarrow{AC}$



The resultant

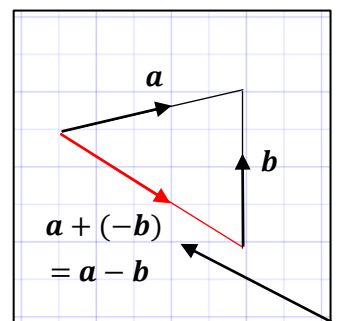
$$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$$

## Addition and subtraction of vectors

$$\mathbf{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$$

$$\mathbf{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$$

$$\mathbf{a} + (-\mathbf{b}) = \begin{pmatrix} 5+(-0) \\ 1+(-4) \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$$



$$\mathbf{a} + (-\mathbf{b}) = \mathbf{a} - \mathbf{b}$$

The resultant is  $\mathbf{a} - \mathbf{b}$  because the vector is in the opposite direction to  $\mathbf{b}$  which needs a scalar of  $-1$

# YEAR 10 — PROPORTION...

# Ratios and fractions

@whisto\_maths

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

By the end of this unit you should be able to:

- Compare quantities using ratio
- Link ratios and fractions and make comparisons
- Share in a given ratio
- Link Ratio and scales and graphs
- Solve problems with currency conversions
- Solve 'best buy' problems
- Combine ratios

## Keywords

**Ratio:** a statement of how two numbers compare

**Equivalent:** of equal value

**Proportion:** a statement that links two ratios

**Integer:** whole number, can be positive, negative or zero

**Fraction:** represents how many parts of a whole

**Denominator:** the number below the line on a fraction. The number represent the total number of parts.

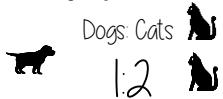
**Numerator:** the number above the line on a fraction. The top number. Represents how many parts are taken

**Origin:** (0,0) on a graph. The point the two axes cross

**Gradient:** The steepness of a line

## Compare with ratio R

'For every dog there are 2 cats'



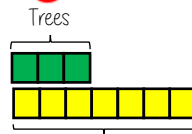
The ratio has to be written in the same order as the information is given.  
eg. 2:1 would represent 2 dogs for every 1 cat.

Units have to be of the same value to compare ratios

## Ratios and fraction R

Trees: Flowers

3:7



Fraction of trees

Number of parts of in group: 3  
Total number of parts: 10

Ratio

Fraction

## Sharing a whole into a given R

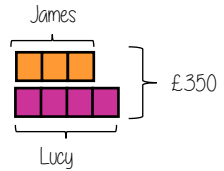
ratio

James and Lucy share £350 in the ratio 3:4  
Work out how much each person earns

Model the Question

James: Lucy

3:4



Find the value of one part

Whole: £350

7 parts to share between (3 James, 4 Lucy)

$$£350 \div 7 = £50$$

□ = one part = £50

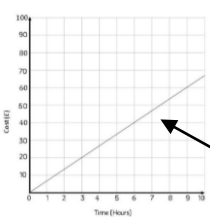
Put back into the question

James = 3 x £50 = £150



Lucy = 4 x £50 = £200

## Ratio and graphs R



Graphs with a constant ratio are directly proportional

- Form a straight line
- Pass through (0,0)

The gradient is the constant ratio

## Ratio and scale R

A picture of a car is drawn with a scale of 1:30

The car image is 10cm

Image: Real life  
1cm: 30cm  
10cm: 300cm



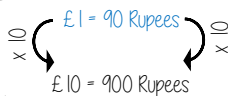
## Conversion between currencies R



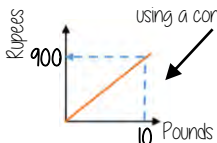
£1 = 90 Rupees

Currency is directly proportional

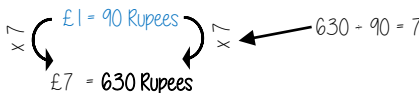
For every £1 I have 90 Rupees



Currency can be converted using a conversion graph



Convert 630 Rupees into Pounds

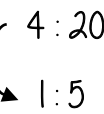


## Ratios in 1:n and n:1

This is asking you to cancel down until the part indicated represents 1

Show the ratio 4:20 in the ratio of 1:n

The question states that this part has to be 1 unit. Therefore Divide by 4



This side has to be divided by 4 too - to keep in proportion

the n part does not have to be an integer for this type of question

## Best buys



4 pens costs £2.60



10 pens costs £6.00

1 pen costs... £2.60 ÷ 4 = £0.65  
1-pound buys... 4 ÷ 2.60 = 1.54 pens

10 pens costs... £6.00 ÷ 10 = £0.60  
10 ÷ 6 = 1.67 pens

You could work out how much 40 pens are and then compare

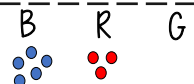
Compare the solution in the context of the question

The best value has the lowest cost 'per pen'

The best value means £1 buys you more pens

## Combining ratios

The ratio of Blue counters to Red counters is 5:3



The ratio of Red counters to Green counters is 2:1



Ratio of Blue to Red to Green



10 : 6 : 3

Use equivalent ratios to allow comparison of the group that is common to both statements

Lowest common multiple of the ratio both statements share

# YEAR 10 — PROPORTION...

# Percentages and Interest

@whisto\_maths

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

By the end of this unit you should be able to:

- Convert and compare FDP
- Work out percentages of amounts
- Increase/ decrease by a given percentage
- Express one number as a percentage
- Calculate simple and compound interest
- Calculate repeated percentage change
- Find the original value
- Solve problems with growth and decay

## Keywords

**Exponent:** how many times we use a number in multiplication It is written as a power

**Compound interest:** calculating interest on both the amount plus previous interest

**Depreciation:** a decrease in the value of something over time.

**Growth:** where a value increases in proportion to its current value such as doubling

**Decay:** the process of reducing an amount by a consistent percentage rate over time.

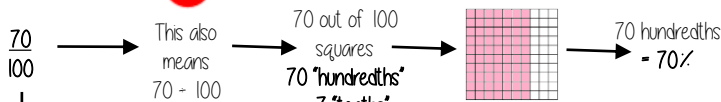
**Multiplier:** the number you are multiplying by

**Equivalent:** of equal value.

## Compare FDP



Comparisons are easier in the same format.



Using a calculator



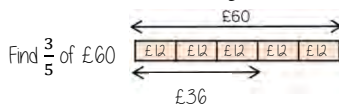
Convert to a decimal

This will give you the answer in the simplest form

× 100 converts to a percentage

Be careful of recurring decimals  
e.g.  $\frac{1}{3} = 0.3333333$   
 $\frac{2}{3} = 0.\dot{6}$   
The dot above the 3

## Fraction/ Percentage of amount



Remember

$$\frac{3}{5} = 60\%$$

$$10\% \text{ of } £60 = £6$$

$$50\% \text{ of } £60 = £30$$

$$60\% \text{ of } £60 = £36$$



Remember

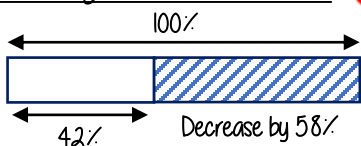
$$\frac{3}{5} = 60\% = 0.6$$

$$60\% \text{ of } £60$$

$$= 0.6 \times 60$$

$$= £36$$

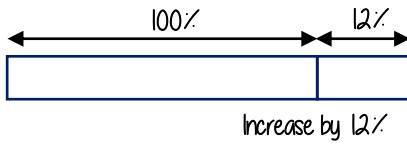
## Percentage increase/decrease



$$100\% - 58\% = 42\%$$

$$100 - 0.58 = 0.42$$

Multiplier  
Less than 1

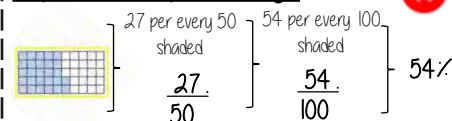


$$100\% + 12\% = 112\%$$

$$100 + 0.12 = 1.12$$

Multiplier  
More than 1

## Express as a percentage



$$\frac{13}{30} \rightarrow \frac{13}{30} \rightarrow \times 100$$

$$43.3333...%$$

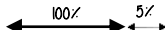
$$\rightarrow 43\%$$

Can't use equivalence easily to find 'per hundred'

Decimal percentages are still a percentage.

## Simple and compound interest

### Simple Interest

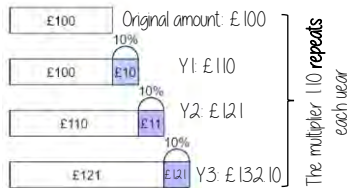


James invests £2,000 at 5% simple interest

The original value increases by this amount every year

### Compound Interest

Tess invests £100 at 10% compound interest for 3 years



## Repeated percentage change



Tess invests £100 at 10% compound interest for 3 years

Original amount → Repeated multiplier → Number of occurrences

### Depreciation

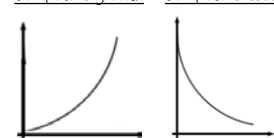
Depreciation calculations use multipliers less than 1

Multipliers are commutative — an overall multiplier effect can be calculated by combining the multipliers separately.



## Growth and decay

Compound growth    Compound decay



Compound growth and compound decay are exponential graphs

**Decay** — the values get closer to 0  
The constant multiplier is less than one

**Growth** — the values increase exponentially  
The constant multiplier is more than one

## Find the original value

Percentage calculations

$$\text{Original amount} \times \text{Multiplier} = \text{Final Value}$$

In a test Lucy scored 60% of her questions correctly. Her score was 24. How many questions were on the test?

$$\text{Original} \times 0.6 = 24$$

$$24 \div 0.6 = 40 \text{ marks}$$

$$10\% = 6$$

$$100\% = 40$$

Total questions on test

A car sold for a profit of £3000 with a profit of 20%. How much was the car originally?



$$\text{Original} \times 1.2 = 3000$$

$$120\% = £3000$$

$$10\% = £250$$

$$100\% = £2500$$

# YEAR 10 — PROPORTION...

# Probability

@whisto\_maths

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

By the end of this unit you should be able to:

- Add, Subtract and multiply fractions
- Find probabilities using likely outcomes
- Use probability that sums to 1
- Estimate probabilities
- Use Venn diagrams and frequency trees
- Use sample space diagrams
- Calculate probability for independent events
- Use tree diagrams

## Keywords

- Event:** one or more outcomes from an experiment
- Outcome:** the result of an experiment
- Intersection:** elements (parts) that are common to both sets
- Union:** the combination of elements in two sets
- Expected Value:** the value/ outcome that a prediction would suggest you will get
- Universal Set:** the set that has all the elements
- Systematic:** ordering values or outcomes with a strategy and sequence
- Product:** the answer when two or more values are multiplied together.

## Add, Subtract and multiply fractions

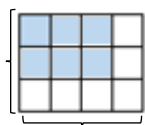
Addition and Subtraction

$$\frac{4}{5} - \frac{2}{3} = \frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

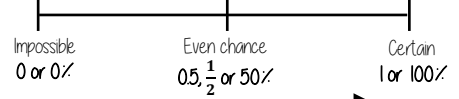
Use equivalent fractions to find a common multiple for both denominators

Multiplication

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Modelled:  Total number of parts in the diagram

## Likelihood of a probability



The more likely an event the further up the probability it will be in comparison to another event (it will have a probability closer to 1)

## Sum to 1

Probability is always a value between 0 and 1

The probability of getting a blue ball is  $\frac{1}{5}$   
 ∴ The probability of NOT getting a blue ball is  $\frac{4}{5}$

The sum of the probabilities is 1

## Experimental data

Theoretical probability

What we expect to happen

Experimental probability

What actually happens when we try it out

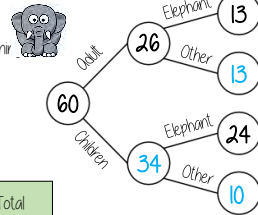
The more trials that are completed the closer experimental probability and theoretical probability become

The probability becomes more accurate with more trials.  
 Theoretical probability is proportional

## Tables, Venn diagrams, Frequency trees

### Frequency trees

60 people visited the zoo one Saturday morning. 26 of them were adults. 13 of the adults' favourite animal was an elephant. 24 of the children's favourite animal was an elephant.



Frequency trees and two-way tables can show the same information

The total columns on two-way tables show the possible denominators

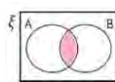
$$P(\text{adult}) = \frac{26}{60}$$

$$P(\text{Child with favourite animal as elephant}) = \frac{13}{37}$$

### Two-way table

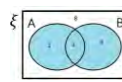
	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

### Venn diagram



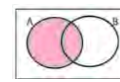
in set A AND set B

$$P(A \cap B)$$



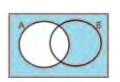
in set A OR set B

$$P(A \cup B)$$



in set A

$$P(A)$$



NOT in set A

$$P(A')$$

## Sample space

The possible outcomes from rolling a dice

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

$$P(\text{Even number and tails}) = \frac{3}{12}$$

## Independent events

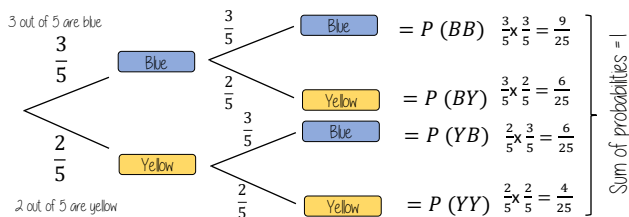
The outcome of two events happening. The outcome of the first event has no bearing on the outcome of the other

$$P(A \text{ and } B) = P(A) \times P(B)$$

### Tree diagram for independent event

Isobel has a bag with 3 blue counters and 2 yellow. She picks a counter and replaces it before the second pick.

Because they are replaced the second pick has the same probability



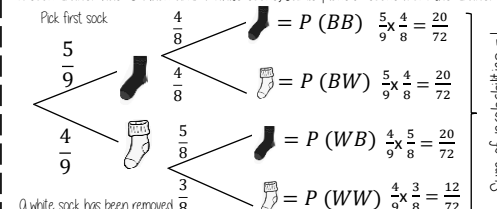
Sum of probabilities = 1

## Dependent events

### Tree diagram for dependent event

The outcome of the first event has an impact on the second event

A sock drawer has 5 black and 4 white socks. Jamie picks 2 socks from the drawer.



Sum of probabilities = 1

NOTE: as 'socks' are removed from the drawer the number of items in that drawer is also reduced ∴ the denominator is also reduced for the second pick

PSHE

# Year 10 - PSHE Studies Knowledge Organiser - Health and Wellbeing and Living in the Wider World

## Key Terms

Mental Health	A person's condition with regard to their psychological and emotional well-being
Self-Harm	An intentional act of self-poisoning or self injury
Work Experience	A short-term experience of employment
Anxiety	A feeling of worry, nervousness, or unease about something with an uncertain outcome

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

### Mental Ill Health

There will be times in most people's life when they struggle with their mental health - usually this only lasts a short time.

Mental ill health is a clinically diagnosable illness affecting how a person thinks and feels, behaves and interacts with other people

## Key Skills

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

### Healthy Lifestyle and Cancer Prevention

Lifestyle, including smoking and drinking, diet and exercise can increase the risk of someone potentially developing various illnesses including cancer.

Thinking about how you are treating your body can reduce possible health risks.

## Work Experience

Work experience is a short-term experience of employment.

It gives you a chance to try a job that you are interested in and to see what it might be like to have a job in the future.



### Threshold Concepts:

TC6	Know the characteristics of mental and emotional health
TC7	Know that there are a range of strategies — cognitive and practical — for promoting emotional wellbeing, for avoiding negative thinking and for ways of managing mental health concerns
TC8	That you can make informed lifestyle choices regarding sleep, diet and exercise
TC9	Understand how to research, secure and take full advantage of any opportunities for work experience that are available

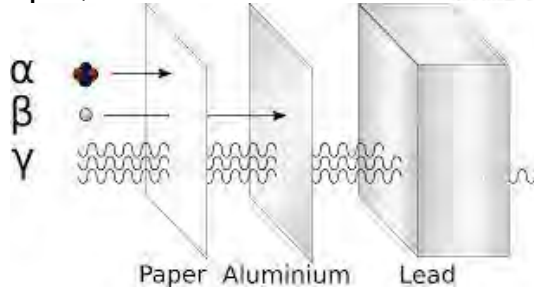
# Physics

# Atomic Structure

## Threshold Concept

Identify that there are three types of radiation

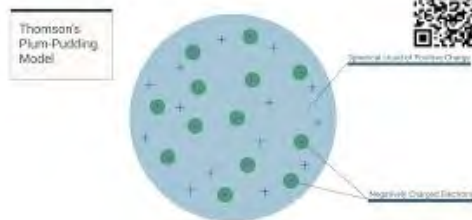
## Alpha, Beta and Gamma



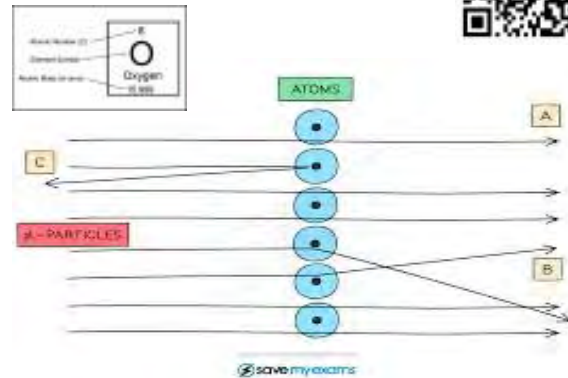
## Keywords

Atom - the smallest particle of a chemical element that can exist  
 Proton - positively charged particle  
 Neutron - Particle with no charge  
 Electron - Negatively charged particle  
 Wave - Energy transfer method

## Plum Pudding Model

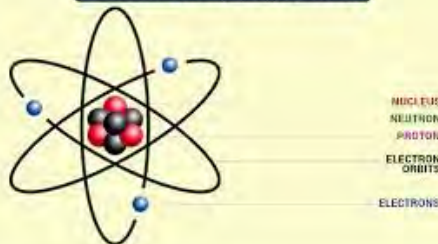


## Rutherford's Scattering Experiment



## Nuclear Model

### Rutherford's Model Of Atoms



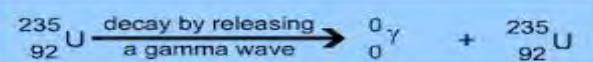
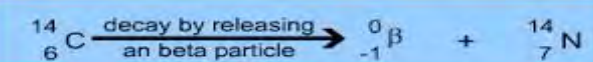
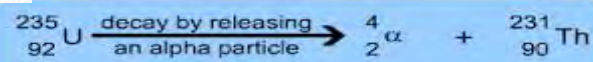
## Half Life



## Uses and Dangers of Radiation

	Irradiation	Contamination
Description	Object is exposed to radiation but does not become radioactive.	Object becomes radioactive and emits radiation.
Source	Danger is from radiation emitted outside the object.	Danger from radiation emitted within the object.
Prevention	Prevented by using shielding, such as lead clothing.	Prevented by safe handling of sources and wearing safety clothing.
Causes	Caused by the presence of radioactive sources outside the body.	Caused by inhalation or ingestion of radioactive sources.

## Equations for this topic





# Particle Models of Matter

## Threshold Concept

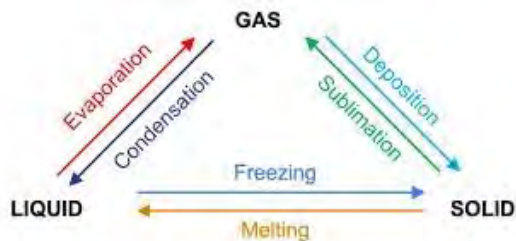
Changes of state are caused by energy changes

## States of matter

Solid Liquid Gas



## Changes of state



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

## Equations for this topic

$$P = F/A \text{ Pressure} = \text{Force} / \text{Area}$$

$$P = m/V \text{ Density} = \text{mass} / \text{volume}$$

$$\Delta E = m \times c \times \Delta\theta \text{ Change in Energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature}$$

$$\Delta E = m \times L \text{ Change in Energy} = \text{mass} \times \text{Specific Latent Heat}$$

$$P = \rho \times g \times h \text{ Pressure in a liquid column} = \text{density} \times \text{gravity} \times \text{height (TRIPLE ONLY)}$$

$$\text{For gases: } p \times v = \text{constant} \text{ For Gases: pressure} \times \text{volume} = \text{constant} \text{ (TRIPLE ONLY)}$$

## Keywords

**States of matter** - solid, liquid or gas.

**Particles** - the smallest part that a substance can be broken down into.

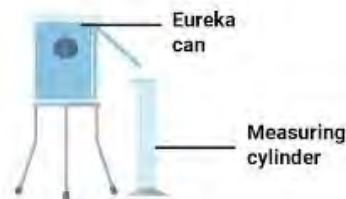
**Energy** - a property of a substance that is stored or transferred in order for things to be done.

**Density** - how compact a substance is.

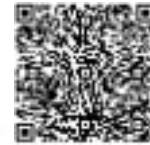
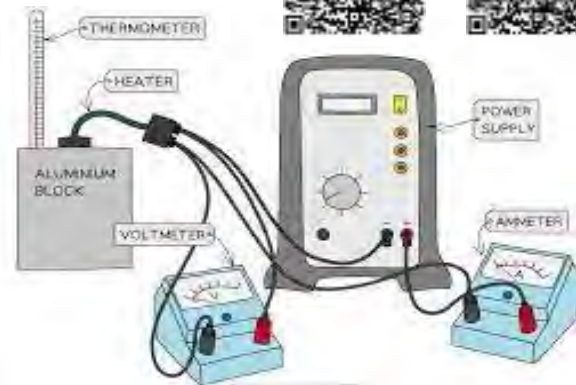
**Pressure** - continuous force acted on or against an object.

## Required Practical

### Density



### Specific Heat Capacity



RSE

# Year 10 - RSE - Respectful Relationships/Intimate and Sexual Relationships

## Key Terms

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

## Pornography

Printed or visual material containing the explicit description or display of sexual organs or activity. It rarely shows sex as it is in real-life - often showing violent behaviours, lack of consent and use of contraception

## Sexualisation in the Media

The media uses images of sex to get people's interest and to sell products. This can lead to issues with body image and unrealistic ideas about how people should act.

## Delaying Sexual Activity

There is sometimes pressure on young people to start having sex. There are many positives to delaying sexual activity. Sexual activity should always involve consent.

Sexting	Sending sexually explicit messages or photos electronically, primarily between mobile phones and/or the internet
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Pornography	Printed or visual material containing the explicit description or display of sexual organs or activity
-------------	--

Body Image	How and what you think and feel about your body
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Revenge Porn	Sexually suggestive images or videos of someone, typically a former romantic partner, that are posted online or otherwise shared without the person's consent.
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## Sexting and Sexual Images

Sexting is illegal for anyone under 18 - This is child pornography

### REVENGE PORN

Known as Image Based Sexual Abuse

The criminal offence broadly has three elements which need to be proven:

1. Disclosure of a private sexual photograph or film;
2. Without the consent of the person depicted; and
3. With the intention of causing that individual distress

It is punishable by up to 2 years in prison

# Triple Science





# 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 helium	12 C carbon
16 O 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

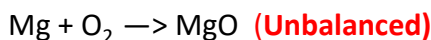
Equation - symbol representation of a chemical reaction

Loss - the process of losing something

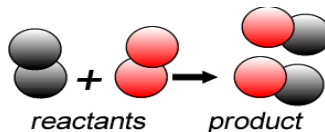
Gain - the process of gaining something

## Balancing Equations

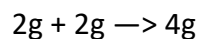
As the same number of elements are at the start and the end of reactions. The Equation needs to be balanced.



## Conservation of Mass



The reactants mass must always equal the mass of the products

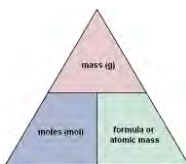


We can not destroy atoms.



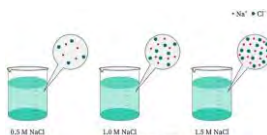
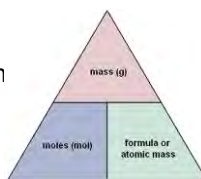
## Moles

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

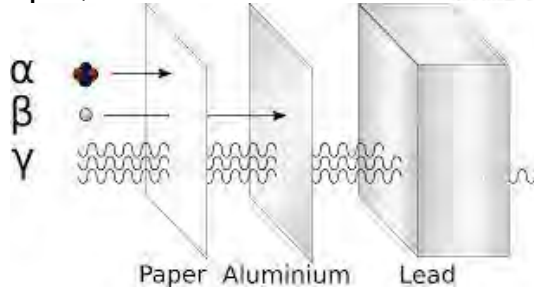


# Atomic Structure

## Threshold Concept

Identify that there are three types of radiation

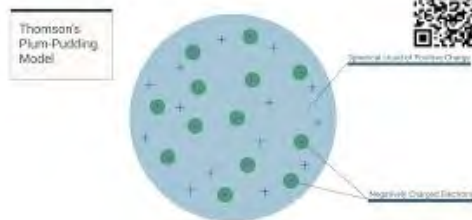
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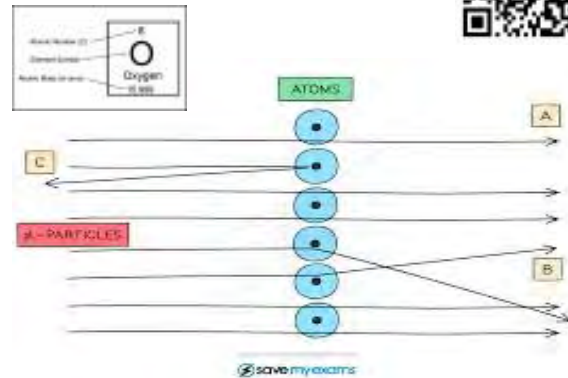
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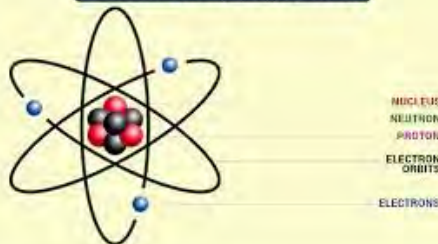


## Rutherford's Scattering Experiment

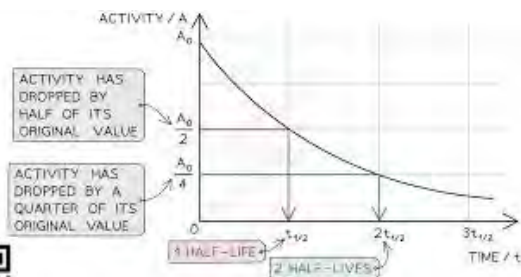


## Nuclear Model

### Rutherford's Model Of Atoms



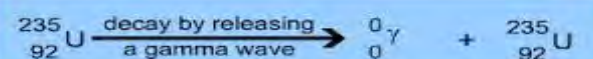
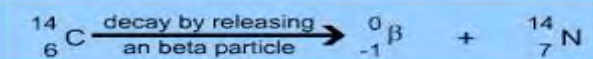
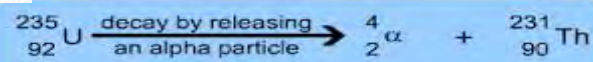
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Source	Danger is from radiation emitted outside the object.	Danger from radiation emitted within the object.
Prevention	Prevented by using shielding, such as lead clothing.	Prevented by safe handling of sources and wearing safety clothing.
Causes	Caused by the presence of radioactive sources outside the body.	Caused by inhalation or ingestion of radioactive sources.

## Equations for this topic





# Particle Models of Matter

## Threshold Concept

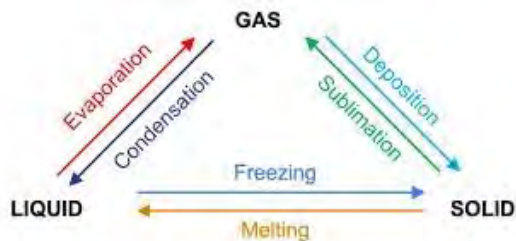
Changes of state are caused by energy changes

## States of matter

Solid Liquid Gas



## Changes of state



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

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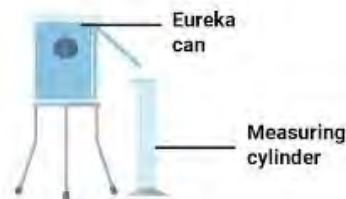
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## Required Practical

### Density



### Specific Heat Capacity

