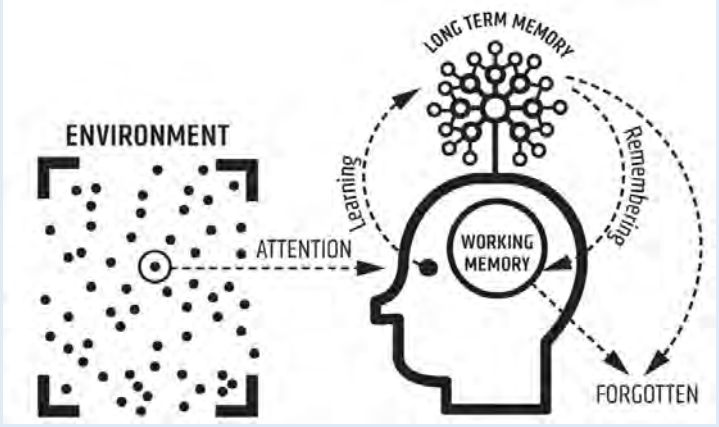
# Knowledge Organiser Booklet Year 10 Term 1 Core

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.

# 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)

**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)

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

# How to complete homework your teacher has set

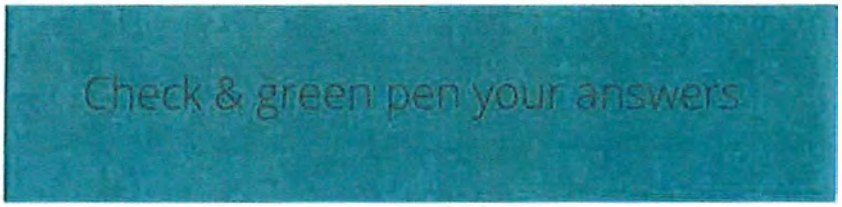
| | LOOK, COVER, WRITE, CHECK | DEFINITIONS TO KEY WORDS | FLASHCARDS | DUAL CODING |
|---|---|---|---|---|
| STAGE 1 | Look at & study an area of your knowledge organiser  | Write down the key words & definitions  | Write key words, dates/formulae, equations/quotes on one side & answers on the other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

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

# Retrieval Placemat

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

| First time: Look. Cover. State 3 facts | Second time: Look. Cover. State 3 facts | Third time: Look. Cover. State 3 facts |
|---|---|---|




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:

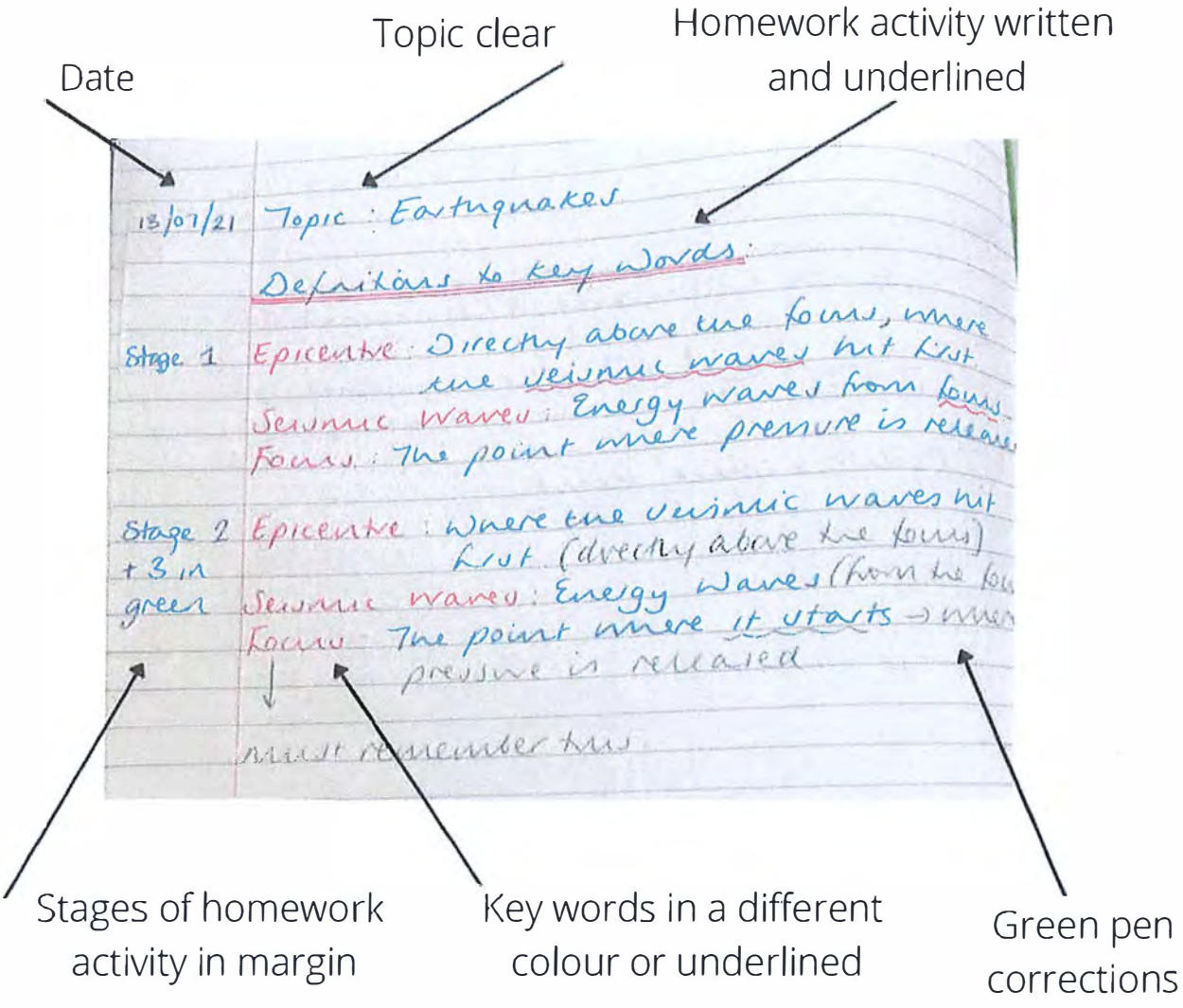
Characteristics:

Key word:

Examples:

Non-examples:

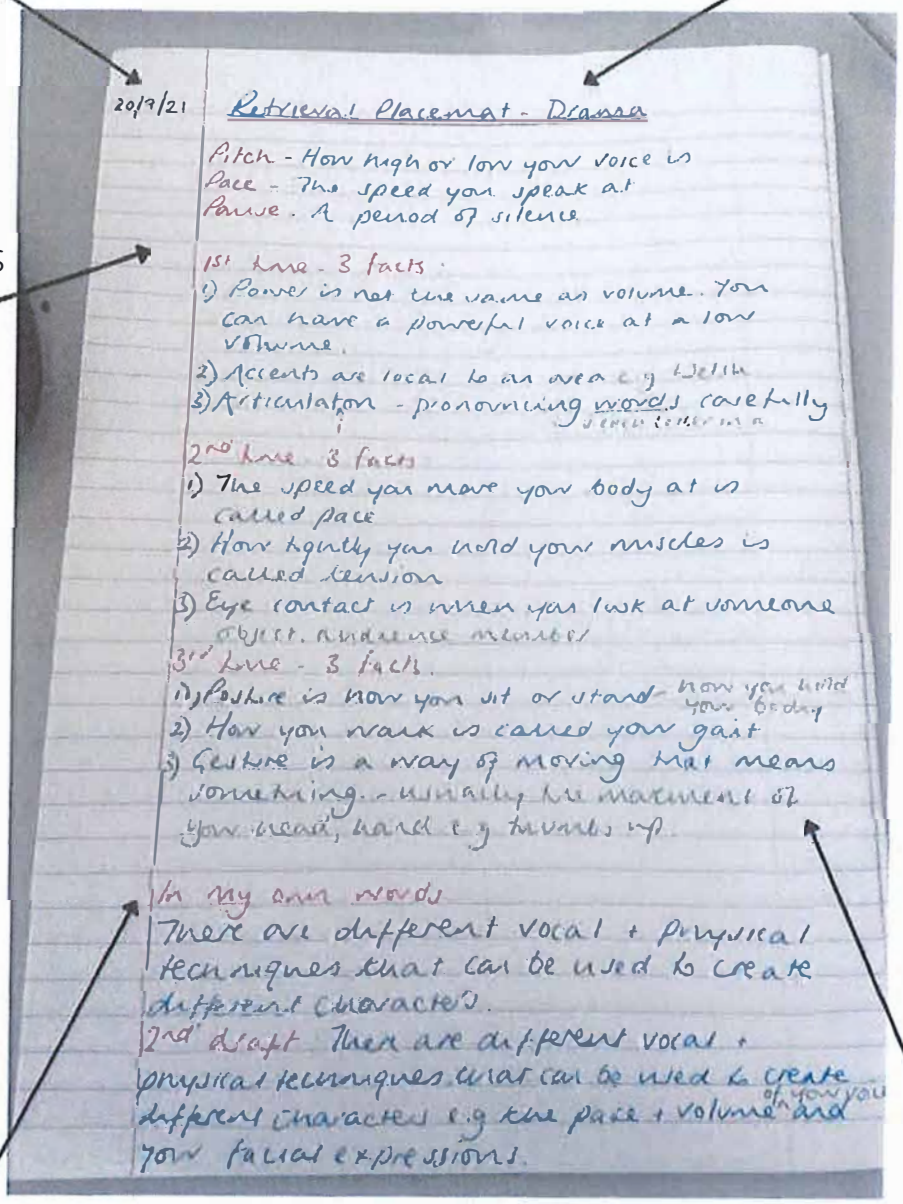
# What should my knowledge organiser homework look like?



# What should my knowledge organiser homework look like?

Homework activity written and underlined

Date




Key words in a different colour

Green pen corrections

Stages of homework activity as subtitles

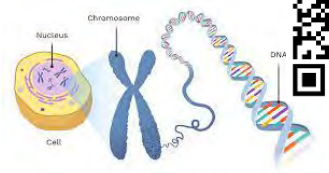
# Biology

# Inheritance

## Threshold Concept

Organisms pass on their DNA in order to survive.

## DNA

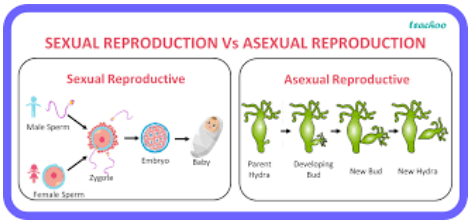



DNA is found in the nucleus of cells and contains all the genetic material to make the organism

## 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

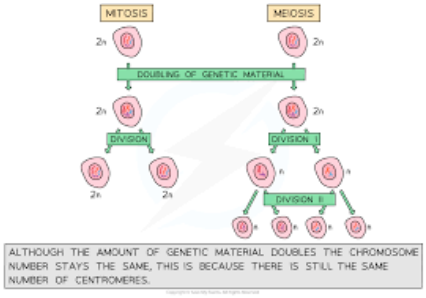
## Sexual and asexual reproduction




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

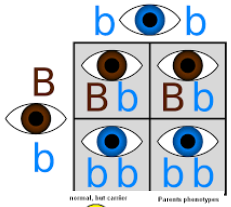
## Mitosis / Meiosis

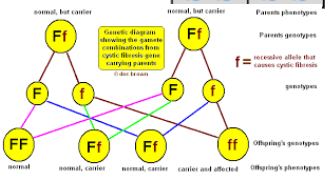
Mitosis is a form of cell division which produces two identical, diploid body cells. Meiosis is a form of cell division which produces four non-identical, haploid sex cells or gametes (sperm and ova in humans



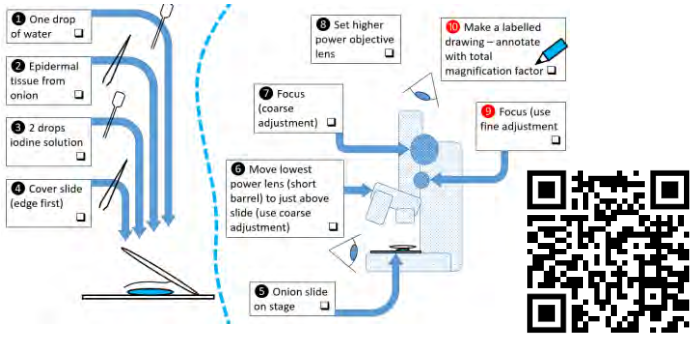

## Genetic cross diagrams

**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

# Using Resources

## Threshold Concept

Understand how to reduce, re -use and recycle the Earth's resources.

## Resources and sustainability

Reducing doesn't just reduce the use of that specific material, but also reduces the use of any materials used to manufacture it in the first place.

## Keywords

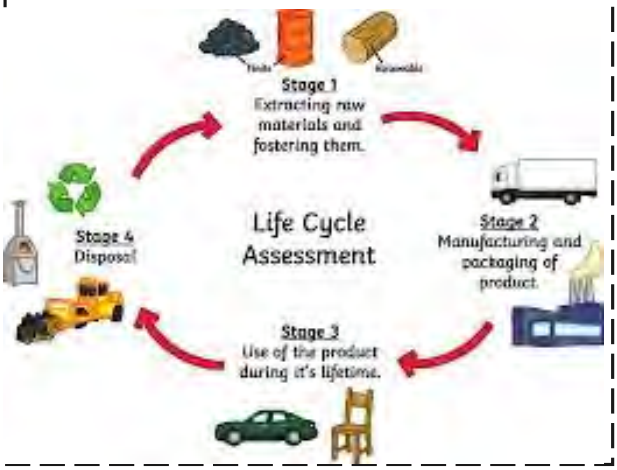
**Reduce** – using materials/resources less
**Reuse** – using materials/resources again
**Recycle** – converting waste into reusable material
**Renewable** – when a resource is produced at least at the same rate that it is being used
**Non-renewable** – when a resource is being used at a faster rate than it can be made
**Sustainable** – fulfilling the needs of the current generation without compromising the needs of future generations

## Bioleaching


## Phytomining


## Life Cycle Assessments

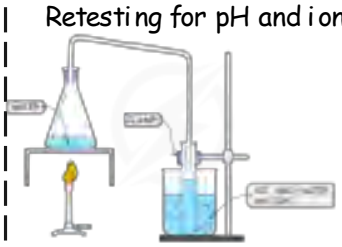
A 'cradle to grave' analysis of the impact of a manufactured product on the environment.

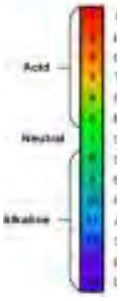



## Potable Water (inc Required Practical)

Don't forget to click on the worksheet tab to try some tasks.

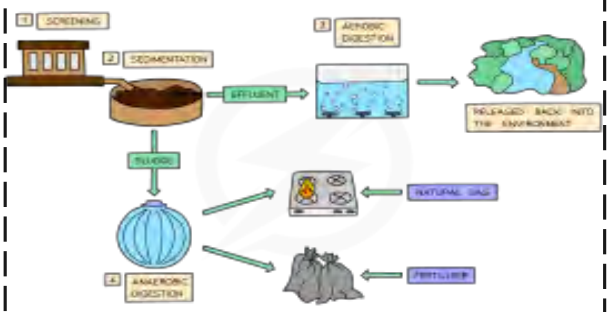
Required Practical involves:
- pH testing using a pH meter, then neutralisation using titration, if needed.
- Ion testing (flame testing)
- Distillation
- Retesting for pH and ions.






## Waste Water Treatment

Don't forget to click on the exam questions tab to try some tasks.



# Organic Chemistry

## Threshold Concept

Hydrocarbons are chains of hydrogen and carbon

## Keywords

**Hydrogen** - a non-metallic element that is the simplest and lightest of the elements
**Carbon** - a non metallic chemical element with atomic number 6
**Formula** - a chemical formula isa way of presenting information about the chemical proportions of atoms that make up a particular chemical compound or molecule
**Equation** - A word or symbol representation of a reaction.

## Crude oil and hydrocarbons

Crude oil is a fossil fuel. It's formed from the remains of plants and animals, mainly plankton, that died millions of years ago.

It is a non -renewable fuel; one day it will run out.

Crude oil is a mixture of lots of different hydrocarbons,

Hydrocarbons are the simplest organic compounds.

There are two types of hydrocarbon:

- Alkane
- Alkene

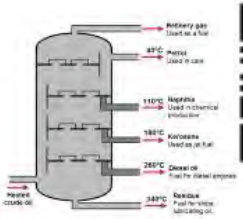
Hydrocarbon properties changes as the chain gets longer.

The shorter the chain the:

1. Less viscous the substance is (this means they are more runny)
2. More volatile the substance is (this means they have a lower boiling point)
3. More flammable the substance is (this means they are easier to ignite)

## Fractional distillation

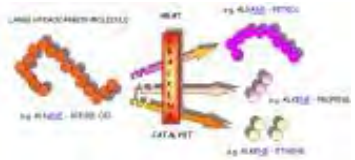
Crude oil can be used to make thousands of useful things but first the different 'fractions' need to be separated out. This is done by fractional distillation.



Video

Method and uses

## Cracking



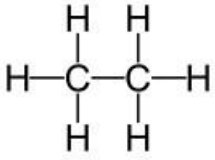
This is the process of breaking long chain hydrocarbons down into shorter ones.
Shorter chains are more flammable and therefore make better fuels.
Cracking will produce alkanes and alkenes.

## Alkanes

Contain only single c -c bonds.

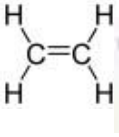
Have the general formula $C_nH_{2n+2}$

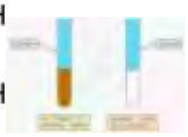
Are 'saturated' - each carbon forms 4 single covalent bonds.



## Alkenes

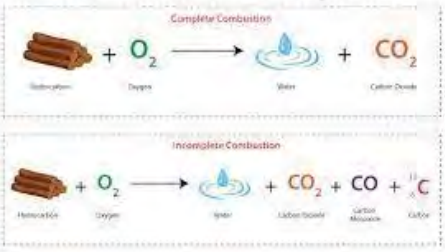
An alkene will contain at leas one c=c double bond.
Have the general formula $C_nH_{2n}$
Are 'unsaturated'.





Bromine water is used to test for alkenes.

## Combustion




## Required Practical

## Equations for this topic

# 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.

**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!

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

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.

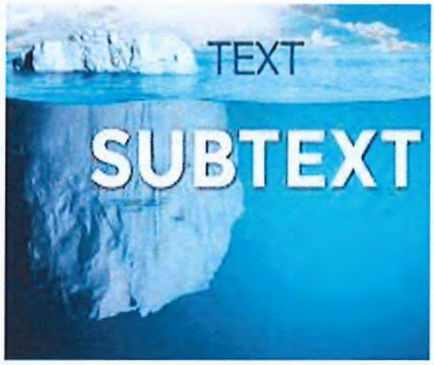
## Expressing higher order ideas in explanations (for analysis/evaluation).

**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 thing 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.

Use this to transform your responses from this…

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<br>Metaphor<br>Personification<br>Adjective<br>Adverb | Lists<br>Repetition of words<br>Lexical (word) patterning<br>Repetition of a technique<br>Tone shift |

*Make sure you can confidently identify these!*

Use this to transform your responses from this…

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

To this…

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

## Comparing successfully- using comparative connectives.

| Words that signal a comparison | Words that signal a contrast |
|---|---|
| As | however |
| Also | Although |
| Like | Whereas |
| Alike | In contrast |
| Likewise | Yet |
| Resembles | Differs from |
| Similar | Instead |
| Just as | Unlike |
| Just like | On the contrary |
| Equally | Different from |
| Same both | 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.

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

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

**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.

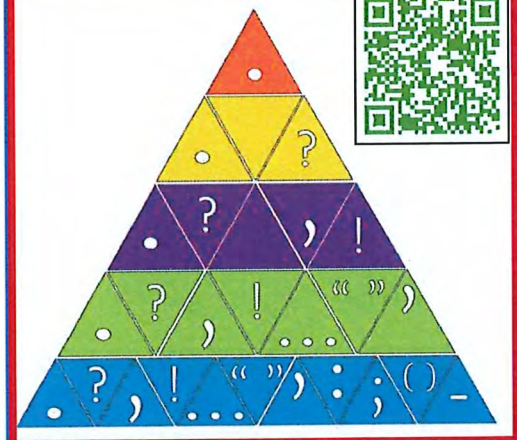
## Techniques:


### 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**



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 Chares 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.

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.

**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.**

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

**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.**

**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.**

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.

INSPIRED

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.

# Maths

# YEAR 10 – SIMILARITY...

@whisto_maths

# Congruence, similarity & enlargement

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

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

- Enlarge by a positive scale factor
- Enlarge by a fractional scale factor
- Identify similar shapes
- Work out missing sides and angles in similar shapes
- Use parallel lines to find missing angles
- Understand similarity and congruence

## Keywords

**Enlarge**: to make a shape bigger (or smaller) by a given multiplier (scale factor)
**Scale Factor**: the multiplier of enlargement
**Centre of enlargement**: the point the shape is enlarged from
**Similar**: when one shape can become another with a reflection, rotation, enlargement or translation
**Congruent**: the same size and shape
**Corresponding**: items that appear in the same place in two similar situations
**Parallel**: straight lines that never meet (equal gradients)

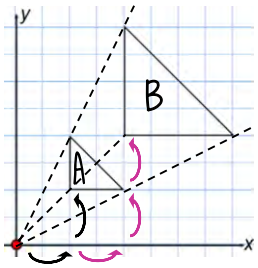
## Positive scale factors (R)

Enlargement from a point

Enlarge shape A by SF 2 from (0,0)

The shape is enlarged by 2

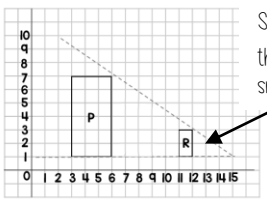
The distance from the point enlarges by 2




## Fractional scale factors (R)

Fractions less than 1 make a shape SMALLER

R is an enlargement of P by a scale factor $\frac{1}{3}$ from centre of enlargement (15,1)

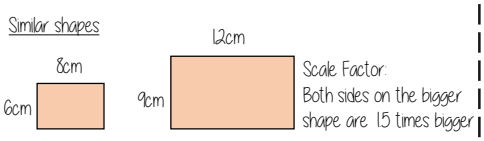



SF: $\frac{1}{3}$ - R is three times smaller than P

## Identify similar shapes

Angles in similar shapes do not change.
e.g. if a triangle gets bigger the angles can not go above 180°

Similar shapes

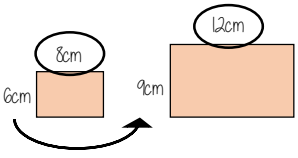



Scale Factor: Both sides on the bigger shape are 1.5 times bigger

Compare sides: 6 : 9 = 2 : 3 ; 8 : 12 = 2 : 3

Both sets of sides are in the same ratio

## Information in similar shapes




x 1.5

Compare the equivalent side on both shapes

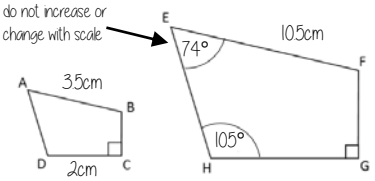
Scale Factor is the multiplicative relationship between the two lengths

Shape ABCD and EFGH are similar

Notation helps us find the corresponding sides

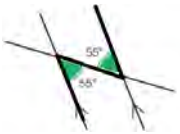
**AB and EF are corresponding**

Remember angles do not increase or change with scale



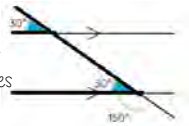

## Angles in parallel lines (R)

**Alternate angles**




Because alternate angles are equal the highlighted angles are the same size

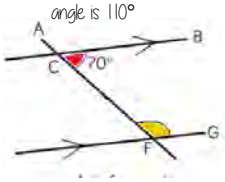
**Corresponding angles**



Because corresponding angles are equal the highlighted angles are the same size

**Co-interior angles**

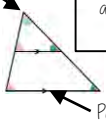
Because co-interior angles have a sum of 180° the highlighted angle is 110°




Os angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

## Similar triangles

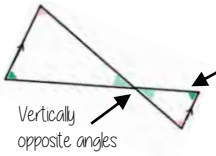
Shares a vertex



Because corresponding angles are equal the highlighted angles are the same size

Parallel lines – all angles will be the same in both triangle

Os all angles are the same this is similar – it only one pair of sides are needed to show equality

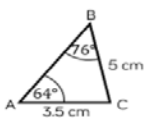


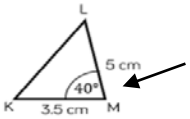
All the angles in both triangles are the same and so similar

Vertically opposite angles

## Congruence and Similarity

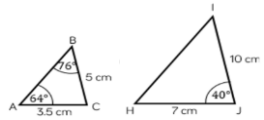
Congruent shapes are identical – all corresponding sides and angles are the same size




$A\hat{C}B = K\hat{M}L$

Because all the angles are the same and AC=KM BC=LM triangles ABC and KLM are **congruent**




Because all angles are the same, but all sides are enlarged by 2 ABC and HIJ are **similar**

## Conditions for congruent triangles

Triangles are congruent if they satisfy any of the following conditions

**Side-side-side**

All three sides on the triangle are the same size

**Angle-side-angle**

Two angles and the side connecting them are equal in two triangles

**Side-angle-side**

Two sides and the angle in-between them are equal in two triangles (it will also mean the third side is the same size on both shapes)

**Right angle-hypotenuse-side**

The triangles both have a right angle, the hypotenuse and one side are the same

# YEAR 10 – SIMILARITY...

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# Trigonometry

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

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

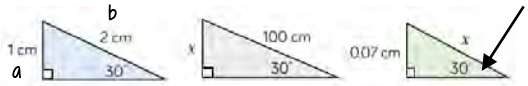
- Work fluently with hypotenuse, opposite and adjacent sides
- Use the tan, sine and cosine ratio to find missing side lengths
- Use the tan, sine and cosine ratio to find missing angles
- Calculate sides using Pythagoras' Theorem

## Keywords

**Enlarge:** to make a shape bigger (or smaller) by a given multiplier (scale factor)
**Scale Factor:** the multiplier of enlargement
**Constant:** a value that remains the same
**Cosine ratio:** the ratio of the length of the adjacent side to that of the hypotenuse. The sine of the complement
**Sine ratio:** the ratio of the length of the opposite side to that of the hypotenuse.
**Tangent ratio:** the ratio of the length of the opposite side to that of the adjacent side.
**Inverse:** function that has the opposite effect.
**Hypotenuse:** longest side of a right-angled triangle. It is the side opposite the right-angle.

## Ratio in right-angled triangles

When the angle is the same the ratio of sides a and b will also remain the same




a : b
1 : 2

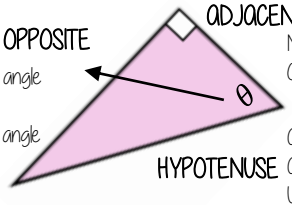
$\frac{a}{b} = \frac{1}{2}$

a : b
x : 100
50 : 100

a : b
0.07 : x
0.07 : 0.14

## Hypotenuse, adjacent and opposite

ONLY right-angled triangles are labelled in this way




**OPPOSITE**
Always opposite an acute angle
Useful to label second
Position depend upon the angle in use for the question

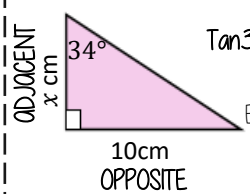
**ADJACENT**
Next to the angle in question
Often labelled last

**HYPOTENUSE**
Always the longest side
Always opposite the right angle
Useful to label this first

## Tangent ratio: side lengths

$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}}$

Substitute the values into the tangent formula



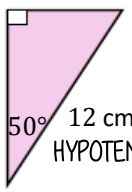

$\tan 34 = \frac{10}{x}$

Equations might need rearranging to solve

$x \times \tan 34 = 10$

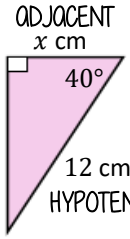
$x = \frac{10}{\tan 34} = 14.8\text{cm}$

## Sin and Cos ratio: side lengths




$\sin\theta = \frac{\text{opposite side}}{\text{hypotenuse side}}$

NOTE
The $\sin(x)$ ratio is the same as the $\cos(90-x)$ ratio

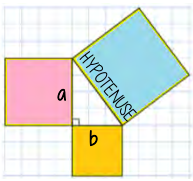



$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenuse side}}$

Substitute the values into the ratio formula

Equations might need rearranging to solve

## Pythagoras theorem R



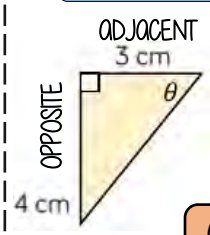

$\text{Hypotenuse}^2 = a^2 + b^2$

This is commutative – the square of the hypotenuse is equal to the sum of the squares of the two shorter sides

Places to look out for Pythagoras
- Perpendicular heights in isosceles triangles
- Diagonals on right angled shapes
- Distance between coordinates
- Any length made from a right angles

## Sin, Cos, Tan: Angles

Inverse trigonometric functions




Label your triangle and choose your trigonometric ratio

Substitute values into the ratio formula

$\tan\theta = \frac{3}{4}$

$\theta = \tan^{-1}\frac{3}{4}$

$\theta = 36.9°$

$\theta = \tan^{-1}\frac{\text{opposite side}}{\text{adjacent side}}$

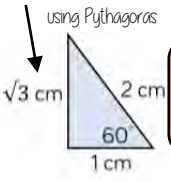
$\theta = \sin^{-1}\frac{\text{opposite side}}{\text{hypotenuse side}}$

$\theta = \cos^{-1}\frac{\text{adjacent side}}{\text{hypotenuse side}}$

## Key angles

This side could be calculated using Pythagoras

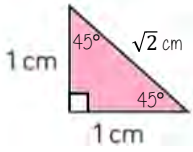
Because trig ratios remain the same for similar shapes you can generalise from the following statements




$\tan 30 = \frac{1}{\sqrt{3}}$ $\tan 60 = \sqrt{3}$

$\cos 30 = \frac{\sqrt{3}}{2}$ $\cos 60 = \frac{1}{2}$

$\sin 30 = \frac{1}{2}$ $\sin 60 = \frac{\sqrt{3}}{2}$




$\tan 45 = 1$

$\cos 45 = \frac{1}{\sqrt{2}}$

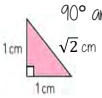
$\sin 45 = \frac{1}{\sqrt{2}}$

## Key angles 0° and 90°

$\tan 0 = 0$

~~$\tan 90$~~

This value cannot be defined – it is impossible as you cannot have two 90° angles in a triangle




$\sin 0 = 0$ $\sin 90 = 1$

$\cos 0 = 1$ $\cos 90 = 0$

# YEAR 10 – DEVELOPING ALGEBRA...

# Representing solutions of equations and inequalities

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

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

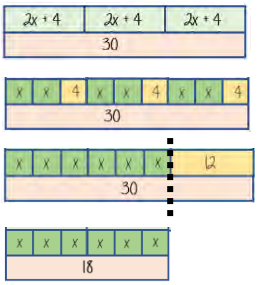
- Form and solve equations and inequalities
- Represent and interpret solutions on a number line as inequalities
- Draw straight line graphs and find solutions to equations
- Form and solve equations and inequalities with unknowns on both sides

## Keywords

**Solution:** a value we can put in place of a variable that makes the equation true
**Variable:** a symbol for a number we don't know yet
**Equation:** an equation says that two things are equal – it will have an equals sign =
**Expression:** numbers, symbols and operators grouped together to show the value of something
**Identity:** An equation where both sides have variables that cause the same answer includes ≡
**Linear:** an equation or function that is the equation of a straight line
**Intersection:** the point that two lines meet
**Inequality:** an inequality compares two values showing if one is greater than, less than or equal to another.

## Solve equations (R)

$3(2x + 4) = 30$




$3(2x + 4) = 30$

Expand the brackets

$6x + 12 = 30$

$-12 \quad -12$

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

$6x = 18$

$\div 6 \quad \div 6$

$x = 3$

## Form and solve inequalities (R)

Two more than treble my number is greater than 11

**Form**

$x \rightarrow \times 3 \rightarrow +2 \rightarrow 11$

$3x + 2 > 11$

**Solve**

$x \leftarrow \div 3 \leftarrow -2 \leftarrow 11$

$x > 3$

## Solutions on a number line

$x < 1$ $\quad x \leq 1$

Both represent values less than 1

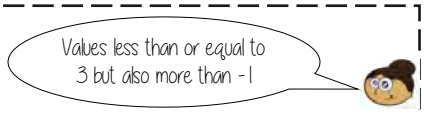
Includes the value 1

$x > 1$ $\quad x \geq 1$

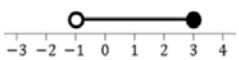
Both represent values more than 1

Includes the value 1

- Includes the value it sits above
- Does NOT include the value it sits above



Values less than or equal to 3 but also more than -1



$-1 < x \leq 3$

This includes the integer values 0, 1, 2, 3

## Plotting straight line 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)

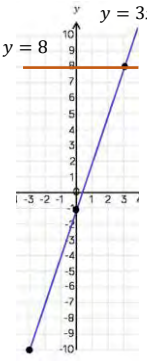
Remember to join the points to make a line

## Find solutions graphically

For linear equations there is only one point the graph meets the x value

$x = 2$
$y = 4$

These two lines will cross at (2,4) because they are just x= and y= they are parallel to axes and meet in one place



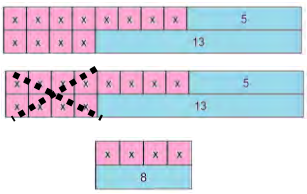

$3x - 1 = 8$

Remember equation of a line format is $y = mx + c$

The solution is the point the two lines meet (3,8)

## Equations: unknown on both sides (R)

$8x + 5 = 4x + 13$




$8x + 5 = 4x + 13$
$-4x \quad -4x$
$4x + 5 = 13$
$-5 \quad -5$
$4x = 8$
$\div 4 \quad \div 4$
$x = 2$

## Inequalities: unknown on both sides

$8x + 5 \leq 4x + 13$ → $x \leq 2$


Only value 2 or less will satisfy this inequality

# YEAR 10 – DEVELOPING ALGEBRA...

# Simultaneous Equations

@whisto_maths

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

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

- Determine whether (x,y) is a solution
- Solve by substituting a known variable
- Solve by substituting an expression
- Solve graphically
- Solve by subtracting/ adding equations
- Solve by adjusting equations
- Form and solve linear simultaneous equations

## Keywords

**Solution:** a value we can put in place of a variable that makes the equation true
**Variable:** a symbol for a number we don't know yet
**Equation:** an equation says that two things are equal – it will have an equals sign =
**Substitute:** replace a variable with a numerical value
**LCM:** lowest common multiple (the first time the times table of two or more numbers match)
**Eliminate:** to remove
**Expression:** a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)
**Coordinate:** a set of values that show an exact position
**Intersection:** the point two lines cross or meet

## Is (x, y) a solution?

x and y represent values that can be substituted into an equation

Does the coordinate (1,8) lie on the line y=3x+5?

This coordinate represents x=1 and y=8

$y = 3x + 5$

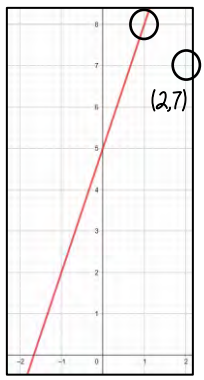
$8 = 3(1) + 5$

Os the substitution makes the equation correct the coordinate (1,8) IS on the line y=3x+5

Is (2,7) on the same line?

$7 \neq 3(2) + 5$

No 7 does NOT equal 6+5




## Substituting known variables

A line has the equation 3x + y = 14

Stephanie knows the point x = 4 lies on that line. Find the value for y

$3x + y = 14$

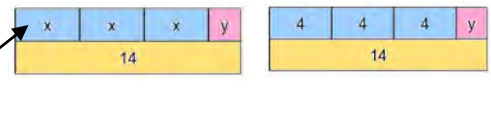
$3(4) + y = 14$

$12 + y = 14$

$-12 \quad -12$

$y = 2$

Two different variables, two solutions




$x = 4$

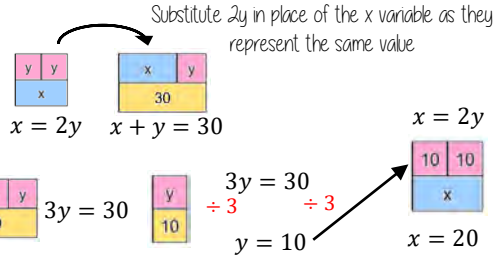
## Substituting in an expression

$x = 2y$

$x + y = 30$

Pair of simultaneous equations (two representations)

Substitute 2y in place of the x variable as they represent the same value




$x = 2y$

$x + y = 30$

$3y = 30$

$\div 3 \quad \div 3$

$y = 10$

$x = 20$

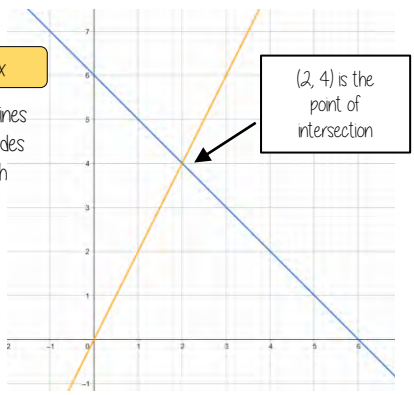
## Solve graphically

$x + y = 6$ $y = 2x$

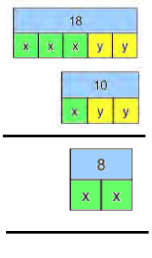
Linear equations are straight lines
The point of intersection provides the x and y solution for both equations

The solution that satisfies both equations is

$x = 2$ and $y = 4$




## Solve by subtraction




$3x + 2y = 18$
$x + 2y = 10$

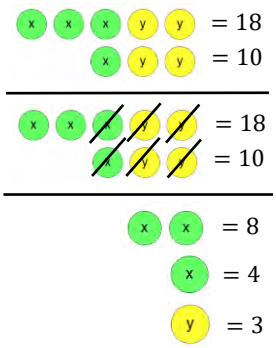
$2x = 8$

$\div 2 \quad \div 2$

$x = 4$

$x + 2y = 10$
$(4) + 2y = 10$
$-4 \quad -4$
$2y = 6$
$\div 2 \quad \div 2$
$y = 3$

$x = 4$
$y = 3$




## Solve by addition

$3x + 2y = 16$
$+ 6x - 2y = 2$

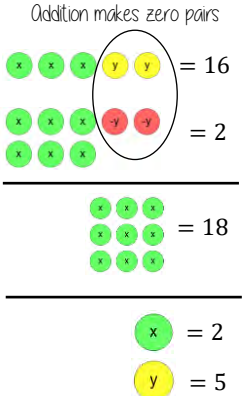
$9x = 18$

$\div 9 \quad \div 9$

$x = 2$

$3x + 2y = 16$
$3(2) + 2(y) = 16$
$6 + 2y = 16$
$-6 \quad -6$
$2y = 10$
$y = 5$

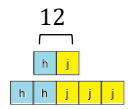
Addition makes zero pairs



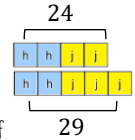

## Solve by adjusting one

$h + j = 12$
$2h + 2j = 29$

No equivalent values




$2h + 2j = 24$
$2h + 2j = 29$




By proportionally adjusting one of the equations – now solve the simultaneous equations choosing an addition or subtraction method

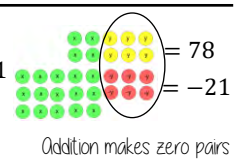
## Solve by adjusting both

$2x + 3y = 39$
$5x - 2y = -7$


Use LCM to make equivalent x OR y values. Because of the negative values using zero pairs and y values is chosen choice

$4x + 6y = 78$
$15x - 6y = -21$

Now solve by addition




Addition makes zero pairs

# PSHE

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

## Key Terms

| | |
|---|---|
| Child Sexual Exploitation | When an individual or group of people takes advantage of someone under 18 to coerce, manipulate or deceive them into sexual activity |
| Slavery (Modern Day) | Condition in which one human being is owned or controlled by another person |
| Honour Based Violence | A form of domestic abuse perpetrated in the name of honour usually based around a set of rules by male members of the family / community and women who don't abide by rules are punished for bringing shame on the family |

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

## Employment Rights

As an employee you have certain rights and responsibilities

You are entitled to a minimum wage, holidays, sick pay and maternity/paternity pay

## Key Skills

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

## Keeping Data Safe

Personal data online can be used in many ways, including scams. It is important to be aware of what data you are allowing people to access. It is also vital to know how criminals target data into order to make money

## Payslips

- When you have a job, you will receive a payslip. This payslip contains important information.
- Features of a payslips: gross and net pay, tax code and National Insurance Number
- Amount and type of deductions, including: PAYE (Income Tax), National Insurance, Student Loans and Pensions

## Threshold Concepts:

| | |
|---|---|
| TC1 | Understand that there are ways to identify risk and manage personal safety in increasingly independent situations, including online. |
| TC2 | Understand that there are strategies for identifying risky and emergency situations, including online; ways to manage these and get appropriate help, including where there may be legal consequences (e.g. drugs and alcohol, violent crime and gangs) |
| TC3 | Understand that there are skills and attributes that employers value. |
| TC4 | Understand that there are a range of opportunities available for career progression, including in education, training and employment. |
| TC5 | Understand that there are rights and responsibilities at work including health and safety procedures. |

# Physics

# Motion

## Threshold Concept

Speed equals distance travelled in a given time

## Keywords

- **Speed:** Distance travelled in a certain time
- **Distance**: how far an object has travelled. It is a scalar quantity
- **Time**: how long something takes
- **Metres**: a unit measurement of distance (m)
- **Seconds**: a unit measurement of time (s)

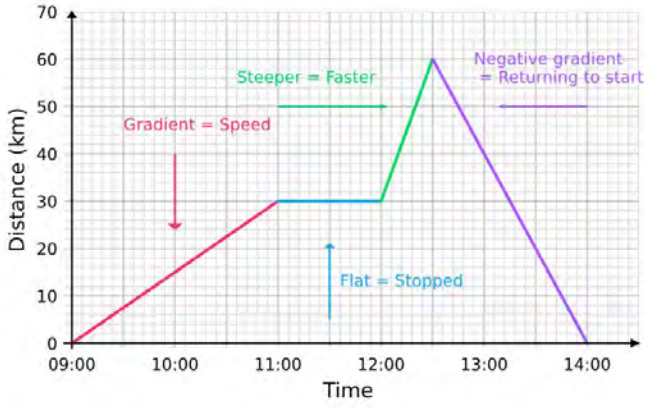
## Speed, distance, time

-Speed is measured in metres per second (m/s)
-Distance is measured in metres (m)
-Time is measured in second (s)


## Scalar and vector quantities

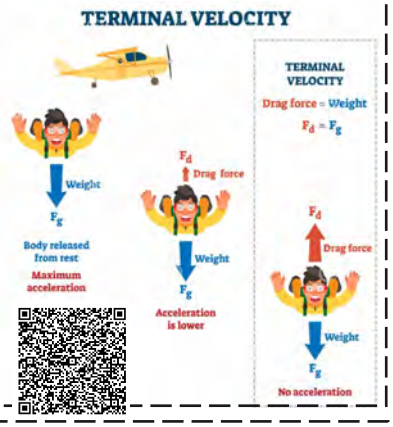
Scalar – a measurement of something. They only have MAGNITUDE (size)
Vector – a measurement of something. They have DIRECTION & MAGNITUDE (size)


## Distance – Time Graphs

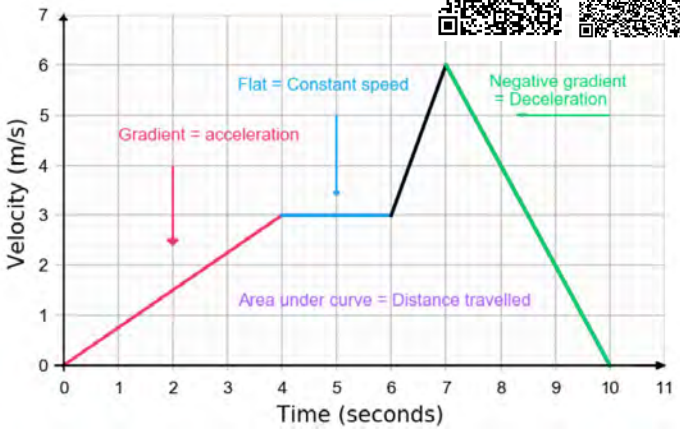



## Terminal velocity

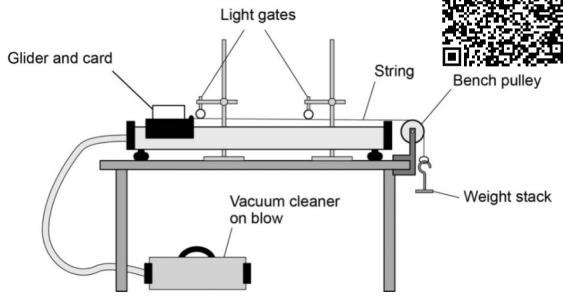
At terminal velocity, the object moves at a steady speed in a constant direction because the **resultant force** acting on it is zero




## Velocity – Time graphs




## Required practical – Acceleration




## Equations for this topic

Speed = Distance ÷ Time
Change in Velocity = Acceleration x Time
Force = Mass X Acceleration

# Atomic Structure

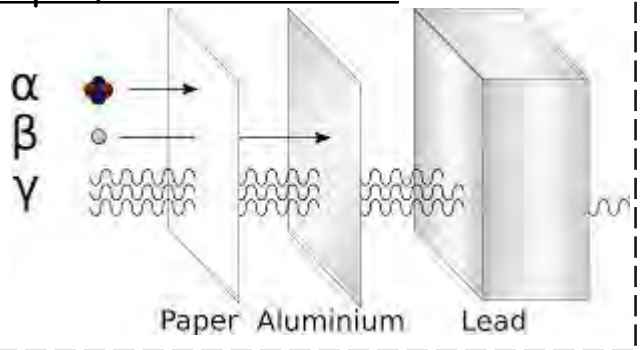
## Threshold Concept

Identify that there are three types of radiation

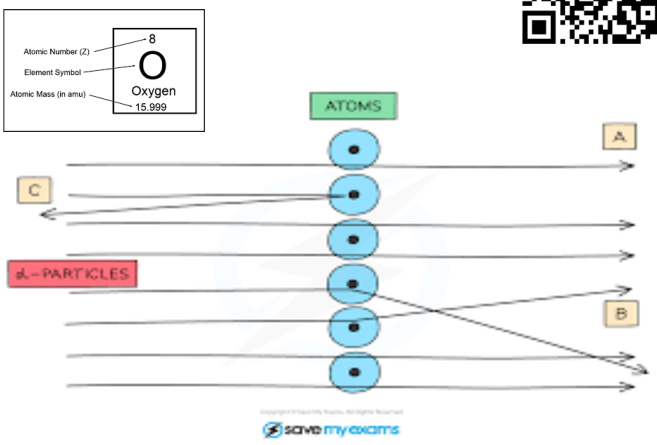
## Keywords

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

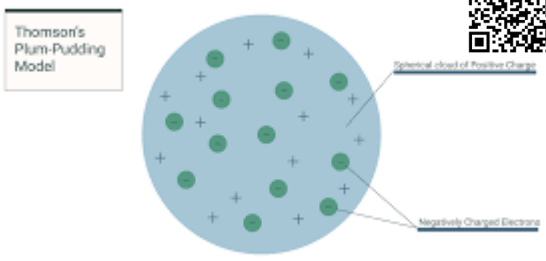
## Alpha, Beta and Gamma



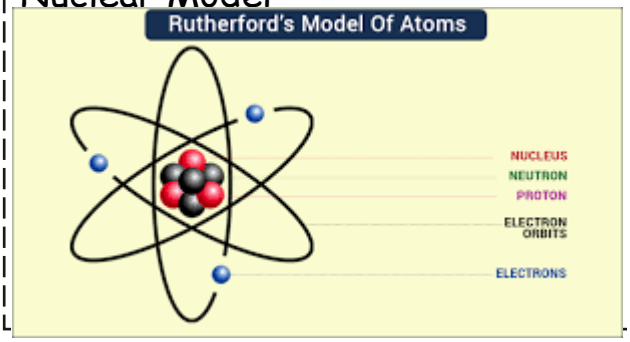

## Rutherfords Scattering Experiment



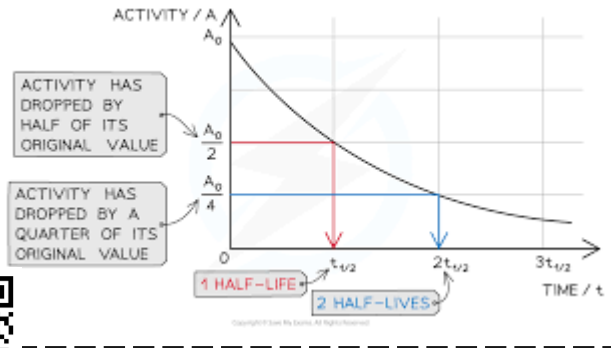

## Plum Pudding Model




## Nuclear Model




## 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 airtight safety clothing |
| Causes | Caused by the presence of radioactive sources outside the body | Caused by inhalation or ingestion of radioactive sources |

## uations for this topic

$^{235}_{92}U$ decay by releasing an alpha particle $\rightarrow$ $^{4}_{2}\alpha$ + $^{231}_{90}Th$

$^{14}_{6}C$ decay by releasing an beta particle $\rightarrow$ $^{0}_{-1}\beta$ + $^{14}_{7}N$

$^{235}_{92}U$ decay by releasing a gamma wave $\rightarrow$ $^{0}_{0}\gamma$ + $^{235}_{92}U$

# RSE

# Year 10 – RSE – Respectful Relationships/Being Safe

## Key Terms

| | |
|---|---|
| Conflict | A disagreement, argument or clash between people |
| Conflict Management | Being able to stop an argument getting out of hand, and to take steps to find a resolution |
| Grief | Intense sorrow, felt usually after a death but can also be felt at the end of a long-term relationship |
| FGM (Female Genital Mutilation) | All procedures that involve partial or total removal of the external female genitalia, or other injuries to the female genital organs for non-medical reasons |

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



## Relationships and Partners

For a romantic relationship to be healthy it will have certain qualities. These can include: good communication, trust, independence, safety and affection.

Sometimes relationships break down and people split up. This can be a painful experience and can happen for many reasons.

## Key Skills

- Active listening and communication
- Teamwork
- Presentation and debate

## #MeToo and Time's Up Movement

These campaigns have started in recent years, their aim is to draw awareness to the treatment of women. Their focus is sexual harassment and abuse of women.

## Domestic Abuse and Violence

This is abuse which happens in the home. It can include physical, emotional, financial or sexual abuse.

## Forced Marriage

Forced marriage is one in which one or both spouses do not or, in the case of some adults with learning or physical disabilities or mental incapacity, cannot consent.

# Triple Science

# Chemical analysis - Triple

## Threshold Concept

What other organic compounds are made out of?

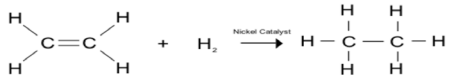
## Keywords

**Functional group** – a group of atoms that are responsible for how a compound reacts
**Homologous series** – a group of compounds that share a functional group and react similarly
**Alcohol** – a group of compounds with the functional group OH
**Carboxylic acids** – a group of compounds with the functional group COOH
**Esters** – a group of compounds with the functional group COO

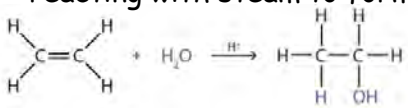
## Reactions of Alkenes

Alkenes will go through a number of different addition reactions to form new products.

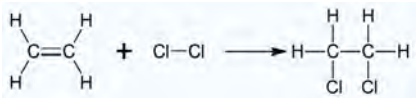
Hydrogenation – reacting with hydrogen to form alkanes




Hydration – reacting with steam to form alcohols

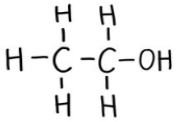


Halogenation – reacting with halogens to form a haloalkane



## Alcohols

Alcohols are a group of compounds with the functional group is OH.
The general formula is $C_nH_{2n+1}OH$

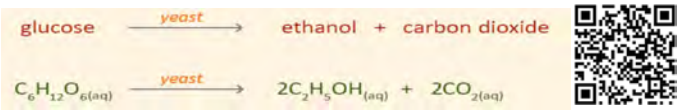


Ethanol

Uses:
- Alcoholic drinks
- Solvents
- Fuels

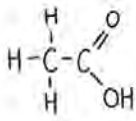
## Fermentation

Ethanol can be produced by fermentation.
Glucose is converted into ethanol using enzymes in yeast.




## Carboxylic acids

Carboxylic acids are weak acids with the functional group COOH.



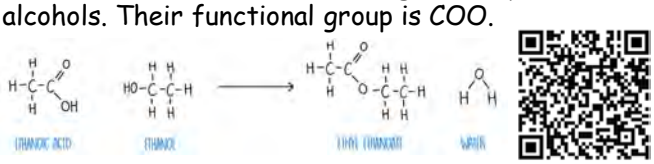
Ethanoic acid

Carboxylic acids behave like other acids and react with metals/metal compounds to form salts.

CARBOXYLIC ACID + METAL ⟶ SALT + HYDROGEN

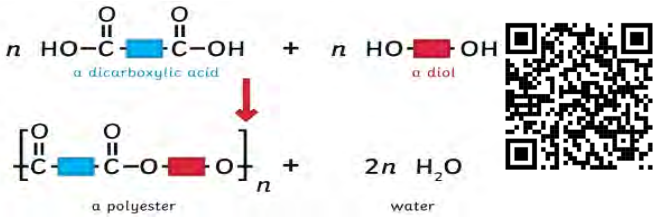
ETHANOIC ACID + CALCIUM ⟶ CALCIUM ETHANOATE + HYDROGEN

Esters are formed from reacting carboxylic acids and alcohols. Their functional group is COO.



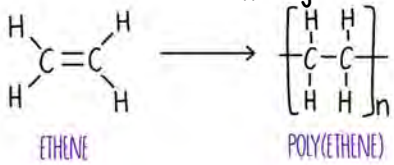

## Condensation polymerisation

Condensation polymerisation requires 2 monomers; a diol and a dicarboxylic acid.
Water is always a by-product of this type of polymerisation.



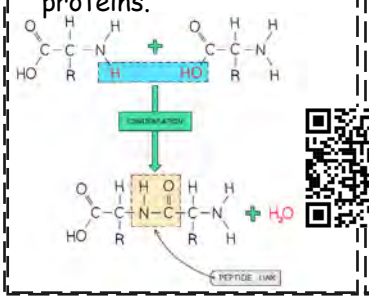

## Addition polymerisation

Addition polymerisation involves breaking the carbon-carbon double bond of the monomer which allows them to join and form a polymer.




## Naturally occurring polymers

Amino acids can join to form a polypeptide. These long chains form proteins.




DNA is a large natural polymer. It's monomers are called nucleotides and the form a double helix structure.