



**Year 9**

**Knowledge Organiser**

**Work hard. Be kind. Belong.**

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# THS

TIVERTON HIGH SCHOOL

## Year 9

## Art

**Work hard. Be kind. Belong.**

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## 1. Identity

Identity is all about who we are. This is complex and ever changing and can be linked to where we come from, our religions/traditions, our families and our friends. We might also be influenced by our ambitions and hopes for the future. We have individual identities but we also have collective identities, what it means to be British, or female, for example.

## 2. Portraiture

Portraits are images about people. They might contain the face, the full body or sometimes neither! They can be made in various different media and they are often attempting to capture the essence of the person through their expression, posture, clothing/styling.



## 3. Symbolism

<https://youtu.be/ep9-An5DTiU>

Objects can represent other things for example an extinguished candle represents how life can end at any moment.

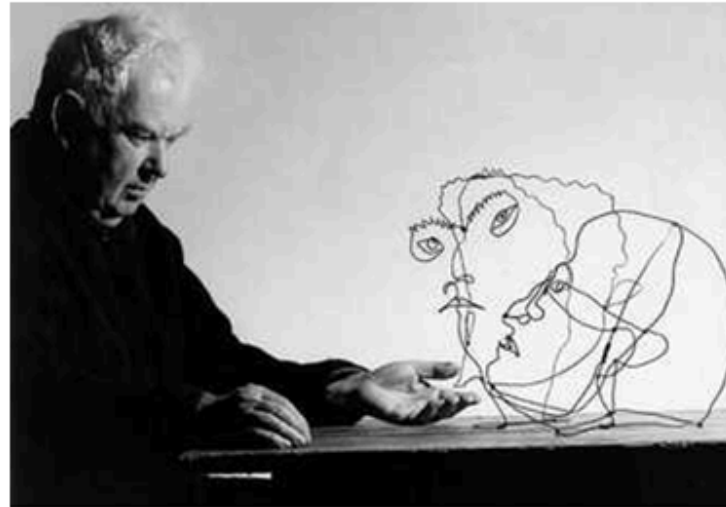


## 4.

### Alexander Calder

<https://youtu.be/CIEqgnSu7M>

Prolific artist who made continuous line, wire sculptures of faces. These can lay flat or be made more 3D by using a stand.



## 5. Henry Moore

Henry Spencer Moore (1898-1986) was one of the most important British artists of the twentieth century and arguably the most internationally celebrated sculptor of the period. He is renowned for his semi-abstract monumental bronzes, which can be seen all over the world.



## 6.

### Artist analysis

Your page should have a title, an image and a study/copy of their work. Use in keeping colours and materials that show your understanding of the artist.

#### Content – What is the work about?

- What is the work about/of? Are there any clues/evidence to support this?
- What is the purpose or meaning of the work?
- Who would the intended audience be for this artwork? Why? How do you know?

#### Process – How was the work made?

- What materials do you think the artist has used...and why?
- How have they been used? (layering)
- What are the stages the artist has gone through to get to the final outcome? (designing/drawing/Maquettes etc.)

#### Form – How has the artist used composition/basic elements?

- Describe how the artist has used the basic elements? (How have they been used to convey meaning?). What effect does this create?
- Describe the composition of the work (fore/mid/back ground, Rule of thirds, landscape/portrait). What effect does this create?

#### Connections – links and ideas

- How does their work connect to your project?
- How will this work inspire the development of your final outcome? (AO2)
- What are your next steps?



# Experimenting

7.

## Developing your ideas through experiments and different materials

Understanding the properties of different materials can help you make effective choices in art and design work. Try different materials to find out which you enjoy working with, and which produce effects you are interested in. Even if something is unsuccessful, you will have shown that you have tried and learned valuable lessons.

8.

## Recording your experiments through annotation

<https://youtu.be/cfQrwIsiAVs?list=PLqYzJxUXOdUgrNosQ0sov62LZRSEMIq2i>

It is important to record your experiments with materials and techniques. Concentrate on those that worked well - these can be useful later on when presenting and evaluating your work. Keep a reference to the unsuccessful experiments too - these can be useful to look back on and reflect on your choices.



9.

**Dry media** - Materials which are used dry include: pencil, charcoal, pen and pastels.

### Pencil

Graphite pencils come in different grades: 6H (very hard) to 6B (very soft). The harder pencils can be used to create very precise lines. They are useful for detailed design work. Softer pencils are less good for detail as the marks they make tend to be thicker and less precise. Using a softer pencil allows you to produce very dark tones or to blend tones.

### Techniques

- Vary the pressure of the pencil or use the pencil on its side.
- Create graduated tone by blending from light to dark.
- Cross-hatch – build up criss-cross lines to create different tonal values.
- Directional line – curve your lines and shading with the shape of the object.



10.

<https://youtu.be/ppBdlj2pEUc>

### Collage

Gluing tissue, newspaper and other papers down onto your surface to create your artwork. Papers can be torn or cut and bring texture to your work.



11.

### Ink

<https://youtu.be/ca-pUms6bw>

Ink comes as a liquid and has many of the same properties as watercolour. It is good for creating images with vibrant colours. You could try using sticks, twigs or other objects instead of a brush..



12.

### Watercolour



<https://youtu.be/aOSaQ50xeAM>

The paint is transparent and works best on light paper. Colours can be lightened by adding water rather than adding white.

### Techniques

- Use watercolour or ink as a wash all across your paper to create a coloured background.
- Experiment with painting into wet watercolour and dry watercolour.

13.

### Mixed media

<https://youtu.be/rQp9DLilcoc>

Using a combination of different media. This may be as simple as combining drawing and painting, oil pastel with paint or creating a background of different papers to work over with paint or ink.



14.

**Acrylic** <https://youtu.be/cDzcoyeaRKI>

Acrylic paint is opaque and therefore you can layer light colours over dark ones as well. This allows you to add down a background first then layer your colours and tones over the top. It also means that you can easily rectify any mistakes.





15.

Recording

Recording in Art can be done by drawing, taking photographs and annotating.

16.

How to annotate

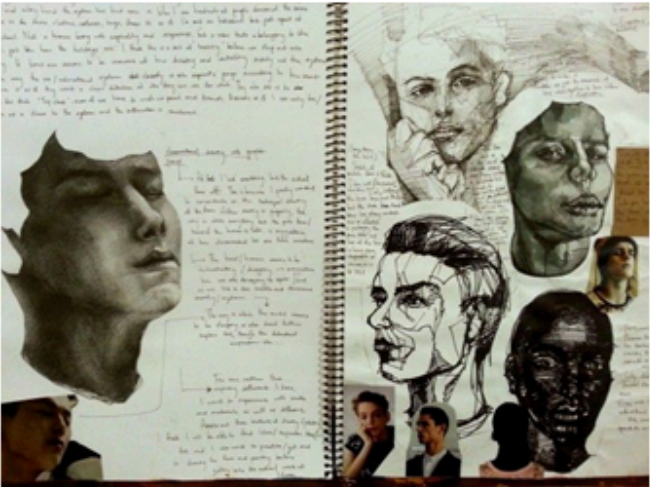
Explaining your ideas and thinking using subject specific language and terminology. Labelling and evaluating yours and other peoples work and how it links into your project.

17.

Drawing

Drawing is a key part of developing any art, craft or design work. It is an important method of researching, investigating, developing and communicating ideas. Drawing and mark making can be used to:

- record observations about a subject
- experiment and develop use of formal elements such as line and colour
- work out and present your ideas



18.

Checklist for a successful drawing

Choice of object – In drawing this object you will be able to demonstrate your skills

Sharp pencil – To help you add accurate detail

Size – work large so you can fit in more visual information

Shape – ensure the shape is accurate

Sketching you have used a sketched line rather than a heavy solid line

Detail - from observations you have included every aspect of the object.

Tone – It is important to use a large range of tone in your drawings, especially when drawing shiny objects such as bottles and glasses.



19.

Facial Proportion

<https://youtu.be/cdSzAOgSuew>

There are lots of rules when drawing the face that can help us be accurate in our representation.

Faces are generally symmetrical.

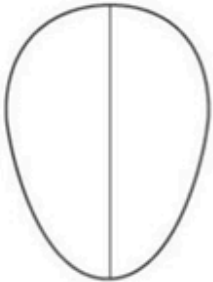
Drawing out feint guide lines to map out where the facial features sit on the face is a great way to start a portrait.

Proportions of the Face

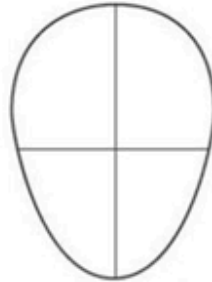
Draw these steps to fill one page in your sketchbook



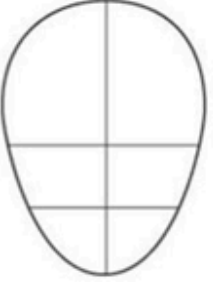
To begin drawing a portrait you will first need to draw an egg shape. Remember that the narrow part of the egg points down as this will become the chin.



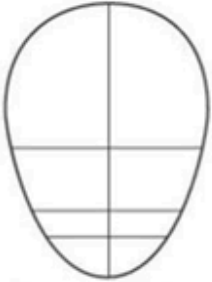
Draw a line vertically right through the centre of the egg. This line will make sure that you line up the nose, mouth and eyes correctly.



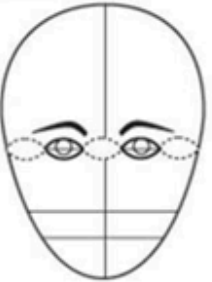
Draw a horizontal line half way down the egg. This is where the eyes and top of the ears will go.



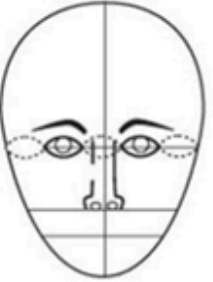
Half way between the eye line and the chin draw a second horizontal line. This is where the bottom of the nose and ears will go.



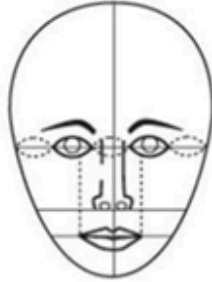
A third of the way down from the nose line draw a third horizontal line. This is where the mouth will go.



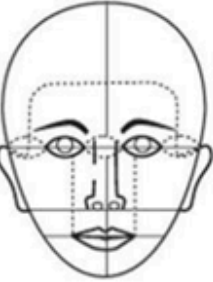
Draw in the eyes with the corners on the line. To ensure the eyes are the correct size you should be able to fit five equal eye widths across the head.



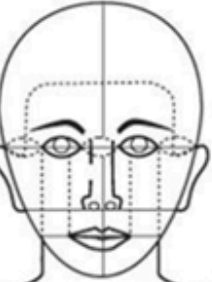
Draw the bottom of the nose. The nostrils should rest on the line.



Draw in the mouth with the line dividing the two lips. By measuring a third in from the inside corner of the eye and drawing a line vertically on each side, you can achieve an accurate mouth width.



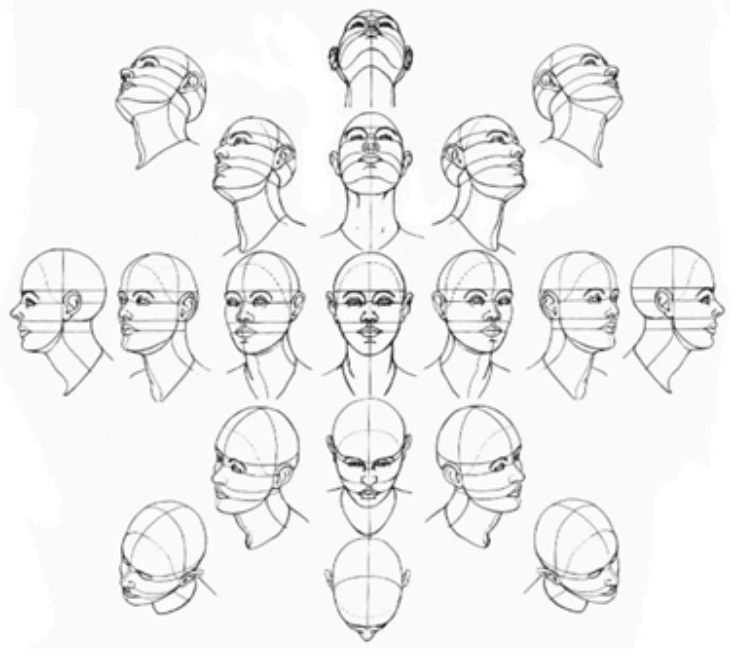
Draw in the ears and the hairline. The hairline can help determine the shape of the face. Remember the ears should fit snugly between the eye and nose lines.



Draw the neck by drawing a vertical line from the outer corner of the eye on each side to achieve the correct width.

20.

Drawing faces from different angles.



21. Drawing Facial features

<https://youtu.be/u6-bCgRmcko?list=PLtG4P3lq8RHHFhiyJP4UT-yUo7pC13GQ>





22.

**AO4 – Final outcomes and bodies of work.**

“Present a personal and meaningful response that realises intentions and demonstrates understanding of visual language”

All of your preparatory work leads up to your personal response or final piece. To make a successful final piece, you must:

- Clearly link your final piece with your preparatory work.
- Make sure your final piece links to your artist research.
- Review and refine your ideas so that you are completely happy with them.
- Complete your experiments with materials, composition and construction so that you feel in control of what you are doing before you start your final piece.



24.

**Foreground, Midground, Background**

**Foreground**

The part of a scene that is nearest to the viewer. It doesn't have to be front and center in a composition.

**Background**

The scene behind the main object of the composition, which gives context and a framework for the piece.

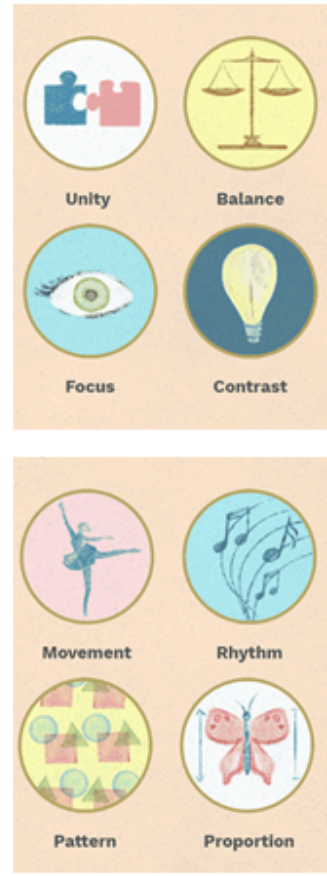
**Middle ground**

The middle ground is everything between the foreground and background.

23.

**Elements of composition in art** <https://youtu.be/VwUZ3PivD6I>

- Unity:** Do all the parts of the composition feel as if they belong together, or does something feel awkwardly out of place?
- Balance:** Balance is the sense that the painting "feels right" and not heavier on one side. Having a symmetrical arrangement adds a sense of calm, whereas an asymmetrical arrangement creates a more dynamic feeling.
- Movement:** There are many ways to give a sense of movement in a painting, such as the arrangement of objects, the position of figures, the flow of a river. You can also use leading lines (a photography term applicable to painting).
- Rhythm:** In much the same way music does, a piece of art can have a rhythm or underlying beat that leads your eye to view the artwork at a certain pace. Look for the large underlying shapes (squares, triangles, etc.) and repeated color.
- Focus:** The viewer's eye ultimately wants to rest on the "most important" thing or focal point in the painting, otherwise the eye feels lost, wandering around in space.
- Contrast:** Paintings with high contrast—strong differences between light and dark, for example—have a different feel than paintings with minimal contrast in light and dark. In addition to light and dark, contrast can be differences in shape, color, size, texture, type of line, etc.
- Pattern:** A regular repetition of lines, shapes, colors, or values in a composition.
- Proportion:** How things fit together and relate to each other in terms of size and scale; whether big or small, nearby or distant.



25.

**Leading lines**

Leading lines can be used to direct the viewer's eye into and around the painting. Leading lines can be actual lines, such as the lines of a fence or railroad, or they can be implied lines, such as a row of trees or curve of stones or circles.



26.

**Rule of odds**

The "rule of odds" suggests that an odd number of subjects in an image is more interesting than an even number. So if you have more than one subject in your picture, the suggestion is to choose an arrangement with at least three subjects.



27.

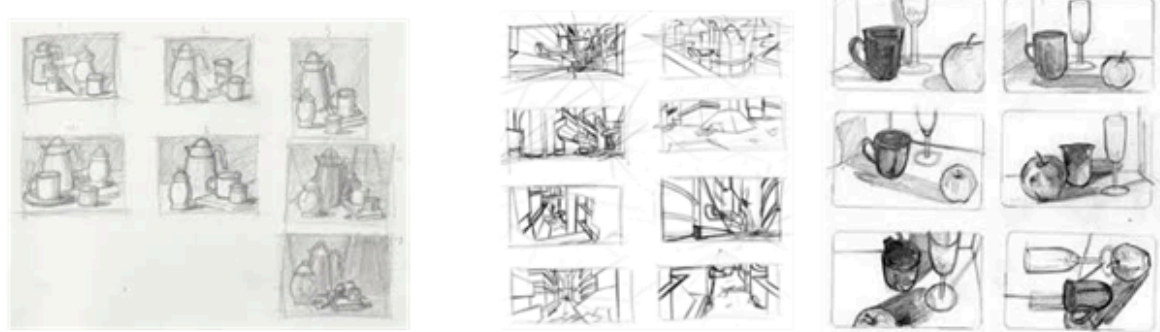
**Rule of thirds**

The rule of thirds is a composition guide that states that arranging the important features of an image on or near the horizontal and vertical lines that would divide the image into thirds horizontally and vertically is visually pleasing.



28. Planning a photoshoot using thumbnail drawings

- Draw a rectangular box either landscape or portrait
- Sketch the objects lightly in pencil in the composition you want
- Add shading
- Add notes to explain your ideas – viewpoint/composition/lighting etc



29. Using the photography room IBOOKS

Instead of sketchbooks, for photography you have IBOOKs on your computer. You need to present your work clearly on pages within this IBOOK.

Uploading

In order to put your photos into your IBOOK you must upload them. To do this use a USB lead to connect your camera to the computer. Make sure the camera is switched on. Click on the application ‘photos’. Click on the photos you want to upload then click ‘upload selected items’

Editing photographs

Tutorials on how to use photoshop are in student resources. To access these follow the instructions below:  
Sign into 365, then go to sharepoint.  
Click on student resources and find the ‘photography GCSE’ folder. You can then look through the tutorials in the folder ‘Photoshop tutorials’.

30. Photographers toolkit

- View point: Birds eye view, from below or straight on...
- Location: Inside, outside...
- Lighting: Natural sunlight, spotlight, torch...
- Props: Objects that suggest something to the viewer
- Camera mode: Automatic, landscape, close up, manual...

31. DSLR Cameras

A digital single-lens reflex camera (digital SLR or DSLR) is a digital camera that combines the optics and the mechanisms of a single-lens reflex camera with a digital imaging sensor.



32. AO1 – image analysis

Your page should you have a title, an image and a study/copy of their work. Use in keeping colours/backgrounds/fonts that show your understanding of the photographer.

Content – What is the work about?

- What is the work about/of? Are there any clues/evidence to support this?
- Who would the intended audience be for this work? Why? How do you know?

Process – How was the work made?

- How was the work made...and why?
- What are the stages the photographer has gone through to get to the final outcome?

Form – How has the photographer used composition/basic elements?

- Describe how the photographer has used the basic elements? (How have they been used to convey meaning?). What effect does this create?
- Describe the composition of the work (fore/mid/back ground, Rule of thirds, landscape/portrait). What effect does this create?

Connections – links and ideas

- How does their work connect to your project?
- How will this work inspire the development of your work? (AO2)
- What is the purpose or meaning of the work?
- What are your next steps?



33.

### Developing your ideas through experiments and different materials

Understanding the properties of different materials can help you make effective choices in art and design work. Try different materials to find out which you enjoy working with, and which produce effects you are interested in. Even if something is unsuccessful, you will have shown that you have tried and learned valuable lessons.

34.

### Recording your experiments through annotation

It is important to record your experiments with materials and techniques. Concentrate on those that worked well - these can be useful later on when presenting and evaluating your work. Keep a reference to the unsuccessful experiments too - these can be useful to look back on and reflect on your choices.



35.

### Cardboard Construction

[https://youtu.be/mlOabQ1\\_98I](https://youtu.be/mlOabQ1_98I)

Different types of cardboard:

Corrugated – good for curves

Single layer – good for modelling easy to cut

2 ply Easier to cut – quite sturdy

3 ply Hard to cut – very strong

- Fold – lightly score with a knife and then bend
- Slot - create two slots on the pieces you want to join and move one into the other.
- Flange - Cut strips around the shape to bend back
- Bend – score lines down the cardboard to allow it to bend

Adhesives:

- Hot glue
- PVA glue
- Sticky tape
- Masking tape



36.

### Mod roc

Mod roc bandages are fabric that is covered in plaster of paris. The plaster of paris is wetted and then dries to a hard finish. This is great for casting around objects.

### Health and safety

Gloves and an apron. Use vaseline or cling film. Make sure you don't put anything down the sink.



37.

### Wire sculpting

Wire can be used to create some interesting frameworks and shapes. It's like 3d drawing! through bending and joining.

Health & Safety

Use of pliers- must be counted back in.

Use of goggles to protect eyes. Gloves must be worn.



38.

### Mixed media

Using a combination of different media. This may be as simple as combining cardboard and wire, clay and mod roc with paint or creating a framework that you cover in another material.



39.

### Clay

Clay or ceramics can be used to create a wide range of sculptures and effects. We have a kiln in school which fires the clay to a hard finish.

Health and safety

Clay knives must be counted back in.

Clay dust must be kept to a minimum.





40.

## Graphic Design

The term graphic design can refer to a number of artistic and professional disciplines which focus on visual communication and presentation. Various methods are used to create and combine symbols, images and/or words to create a visual representation of ideas and messages. A graphic designer may use typography, visual arts and page layout techniques to produce the final result. Common uses of graphic design include magazines, advertisements, product packaging and web design. For example, a product package might include a logo or other artwork, organized text and pure design elements such as shapes and color which unify the piece.

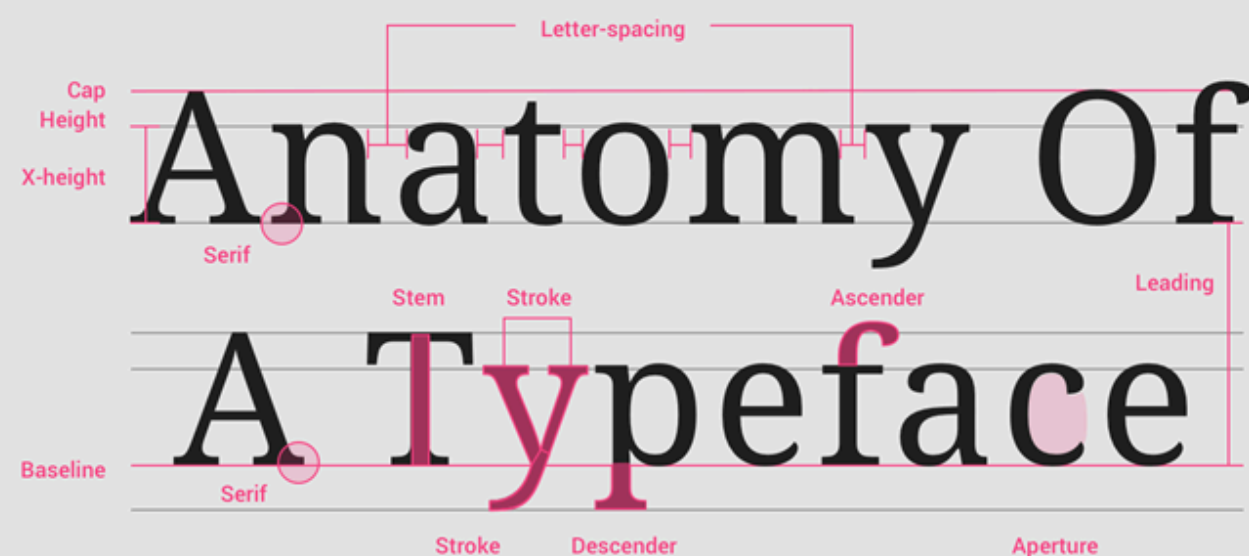
41.

## Typography

[https://youtu.be/xic\\_5zduz1A](https://youtu.be/xic_5zduz1A)

Typography is the art and technique of arranging type to make written language legible, readable, and appealing when displayed. The arrangement of type involves selecting typefaces, point sizes, line lengths, line-spacing, and letter-spacing, and adjusting the space between pairs of letters.

A serif is a decorative stroke that finishes off the end of a letters stem (sometimes also called the “feet” of the letters). In turn, a serif font is a font that has serifs, while a sans serif is a font that does not (hence the “sans”).



42.

## Meaning of colour

Colour theory is a term used to describe the collection of rules and guidelines regarding the use of color in art and design. Colour theory informs the design of color schemes, aiming at aesthetic appeal and the effective communication of a design message on both the visual level and the psychological level.

## Key terms

Harmonious: based on three colours located next to each other on the wheel

Complementary: one or more pairs of colours that, when combined, cancel each other out (i.e., they produce high contrast)





43. Presenting work

You don't get loads of marks for presentation so you don't want to spend too long on it and you want to keep it fairly simple. It is meant to enhance your work and show it off, not distract from it. To the side are some examples of students who have successfully linked their presentation with the artist they are looking at.

'In-keeping' presentation

'In-Keeping' means that the choices you make on how to present your work need to reflect what you trying to present. For example if you are doing a page on an artist who uses collage, then your background and title could be made from collage. Another example would be that you are presenting a design idea for your final piece and this design idea uses light blues in watercolour, therefore you use that colour and media for your background and title.

Titles

Think about the font and the media you use for your titles,

Backgrounds

In keeping colour scheme and materials. Do not just paint your page one colour in acrylic paint. Look carefully at the work you are presenting for inspiration.



44. Annotating your sketchbook pages

Annotations are written explanations or critical comments added to art or design work that record and communicate your thoughts. Annotations can be used for your own reference.

They can also be used to communicate information to the examiner that will help explain your thoughts and decision-making processes.

There are several reasons annotation may be used, for example to:

- analyse the work of an inspirational artist or designer
- analyse the success of a technique, idea or **composition**
- record a technique or explain an idea
- explain how a particular artist style or technique has influenced your work

What to include in annotation

Carefully placed annotation can complement your visual work as well as explaining it

To annotate your work successfully, you should explain:

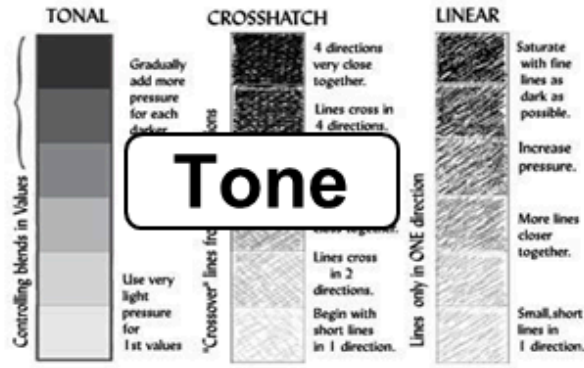
- what you have done and why you did it
- how you did it, such as the **media** and techniques used
- why you chose a particular medium or technique
- how an artwork or design fits in with your project
- what aspects you like
- how you could improve the work
- what you think you will do next



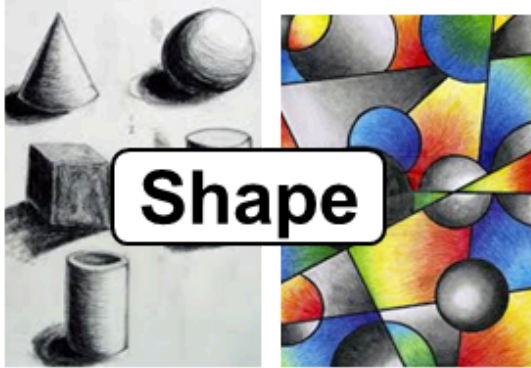
BASIC ELEMENTS



Line



Tone



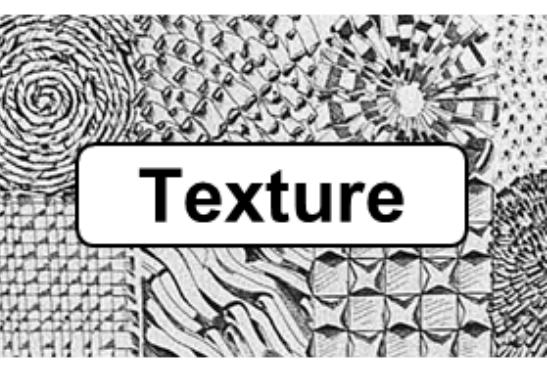
Shape



Colour



Pattern



Texture





# **Year 9**

## **Computing**

**Work hard. Be kind. Belong.**

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# Tiverton High School Year 9 Computing

## Autumn Term Knowledge Organiser

### Number Bases and Data Representation

#### Number bases and units of storage | Key Construct 5: Data Representation

Binary means base-2

Denary means base-10

Hexadecimal means base-16

Humans traditionally use **denary (base 10)** when dealing with numbers. Computers always use **binary (base 2)** to store and process digital data.

Electronic computers contain millions of tiny **transistor** components. A transistor behaves like a **switch**, that can only be turned **on** or **off**. Because binary only uses two possible digits, these closely match the on/off states of the transistors that computers are made of. The **on** or **off states** of transistors can be used to represent the two different number symbols that binary uses:

off means 0  
on means 1

A **bit** is the **smallest** amount that a computer can store - one **binary digit**.

**8-bit binary** means a **pattern** of exactly **8 binary-digits**.

**8-bits** allow **256 possible combinations** between **00000000** and **11111111**.

This is why 8 bits can represent between **0** and **255** in base ten.

1 byte = 8 bits (an ASCII character takes 1 byte)  
1 kilobyte = 1000 bytes  
1 megabyte = 1000 kilobytes (or 1000 x 1000 bytes)  
1 gigabyte = 1000 megabytes (or 1000 x 1000 x 1000 bytes)  
1 terabyte = 1000 gigabytes (or 1000 x 1000 x 1000 x 1000 bytes)

#### Converting Binary (base two) to Denary (base ten)

|     |    |    |    |   |   |   |   |
|-----|----|----|----|---|---|---|---|
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 0   | 1  | 0  | 0  | 1 | 0 | 1 | 0 |

$(1 \times 64) + (1 \times 8) + (1 \times 2) = 74$  in base ten

#### Converting Hexadecimal (base sixteen) to Denary (base ten)

Hexadecimal is a more **compact** and **convenient** way to represent **large** numbers than binary.

Large numbers can be represented using **fewer** hexadecimal digits.

Hexadecimal numbers can only use the symbols **0123456789ABCDEF**

A means 10  
B means 11  
C means 12  
D means 13  
E means 14  
F means 15

|    |   |
|----|---|
| 16 | 1 |
| 2  | D |

2 groups of 16, plus D units.  
 $(2 \times 16) + (D \times 1)$   
 $(2 \times 16) + (13 \times 1)$   
 $32 + 13$   
**45** in base 10.

#### How computers store images | Key Construct 5: Data Representation

**Bitmap Images** are **pictures** that are made up of **pixels** (picture elements).

A **pixel** is a small coloured dot in a picture.

All of the pixels are arranged in a grid, a little bit like a mosaic.

The **colour** of each pixel is stored in the memory of the computer using binary digits... **1s** and **0s**.

The **bit-depth** of an image means **how many binary digits are used to store each pixel**.

A **1-bit image** uses exactly **1 bit** to store each pixel in the picture. This allows **2 possible colours**.  
A **2-bit image** uses exactly **2 bits** to store each pixel in the picture. This allows **4 possible colours**.  
An **8-bit image** uses exactly **8 bits** to store each pixel in the picture. This allows **256 possible colours**.

Photoshop uses **24-bit images**. It uses **24 bits** to store each pixel. This allows **16,777,216 possible colours** for **realistic** pictures.

Resolution means the **density** of the pixels in an image: **how many pixels will fit into a certain area**. The **resolution** of an image defines how large the individual pixels are drawn. The higher the resolution, the more life-like the image/better quality, but the more data will be included in the bitmap file.

Most computer **screens** use **72 dots per inch** - large pixels.  
Many **printers** use **150 dots per inch** or **300 dots per inch** - the smaller pixels produce a more **detailed** picture on paper.

The **colour-model** used by a program controls **how colours are mixed together** to make pictures.

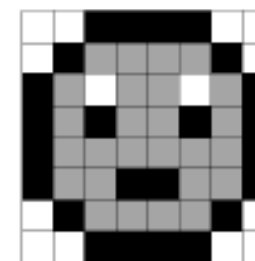
Most computer programs use the **RGB (Red-Green-Blue) colour model** to display images on the screen. The colour of any pixel can be made by mixing **red light**, **green light** and **blue light** together in varying amounts.

Many printers use the **CMYK model**. They combine the colours **Cyan**, **Magenta**, **Yellow** and **Black** in different amounts.

Many image files contain **extra data**, as well as the pixel data. The extra data is called **meta-data**.

**Meta-data** can be used by programs to **reconstruct** and display images from a file of binary data: It includes the **width**, the **height**, the **resolution** and the **bit-depth** of the image.

Extra meta-data can also be included in an image file, such as the **file format**, the **date/time it was created**, **who owns the copyright** and the **GPS coordinates of where a photo was taken**.



#### How computers store text | Key Construct 5: Data Representation

A **character** is a **symbol** that can be represented and stored by the computer system. The full collection of ALL of the characters that a computer can represent/store is called a **character set**. Each character symbol is represented using a **special number** called a **character code**.

**ASCII** is the **American Standard Code for Information Interchange**. It can be used for writing in the English language. Plain **ASCII text** is often stored using **7 bits** per character.

A better version of ASCII is **Extended ASCII**. This can be used for writing in **English**, **French**, **German**, **Spanish** or **Italian**. **Extended ASCII** allows more characters than original ASCII, but uses **8 bits (1 byte)** to store each different character code.

Lächeln      bonjour à tous      ¡Rápidamente!

**Unicode** is a better character set. It can represent **any** language in the world, including Russian and Chinese, not just English. **Unicode** uses up to **32 bits (4 bytes)** to store each character code.

**Emoji** pictures are character symbols from the Unicode character set. ASCII and Extended-ASCII do not contain any emojis.

中文      русский      日本語      😊

#### How computer store audio (sounds and music) | Key Construct 5: Data Representation

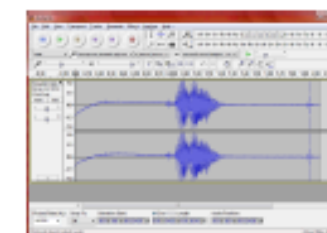
To represent audio/sound inside a computer, soundwaves are converted to digital data.

First of all, a sound wave must be captured by a microphone as electrical signals. The **height of the sound wave** can then be **measured** at regular intervals. We call each measurement a **sample**. The **number of sample measurements that are generated each second** is called the **sample-rate**. This is **measured in Hertz (Hz)**. Each sample/measurement is stored in the computer using a binary number. The **number of binary digits used in each sample** is called the **sample-size**.

A higher sample rate and sample size, leads to a larger audio-file, but a better-quality recording. A realistic audio file will need to use thousands of samples a second. Common sample rates include **22050 Hz** or **44100 Hz**.

To reconstruct a sound from binary data, a audio file needs to contain extra meta-data that describes how the binary data is structured and how to play it back:

**Duration** of the sound (how many **seconds** the recording lasts).  
**Sample-Rate** (how many **samples** were used each second e.g. 8000 Hz).  
**Sample-Size** (how many **bits** each sample contains e.g. 32 bits).  
**Channels** (how many **speakers** are needed e.g. 1 for mono, 2 for stereo).  
**Date & time** that the audio file was **created** or **last changed**.  
**Author**, **genre** or **copyright information** about **who** created the recording.







# Tiverton High School Year 9 Computing

## Spring Term Knowledge Organiser

### Problem-Solving and Developing Programs

#### Decomposing problems and developing solutions | Key Construct 6: Problem Solving and Programming

A **program** is a **sequence of instructions** that the computer will carry out (**execute**).  
Most programs need to be **planned** out very carefully in advance to make sure they don't crash or do the wrong thing.

**Decomposition** means **breaking a problem down into smaller parts**, until each part is easy enough to understand and solve.

**Abstraction** means **choosing only the most important details that are relevant to solving the problem**, while **ignoring** other details. When working out how to solve a problem, abstraction helps you avoid getting bogged down in too much detail.

An **algorithm** is a precise set of written steps that describe exactly how to solve a problem.

A **flowchart** is a diagram that shows how an algorithm works.

You can **plan** out the steps of a new program using **pseudo-code**... "false" code.  
Pseudo-code is **not** a real **programming language** - you can't type pseudo-code into a computer and then run it.

The point of pseudo-code is that it lets you write out the **precise** steps that will solve a problem.  
It helps people make sure they really **understand** the problem they are trying to solve **before** writing real program code.

Once you have written out a pseudo-code solution and checked it is correct, you are **much** less likely to build errors into your real program code.

You can then use your pseudo-code solution as a guide to help you to develop your real computer program using a programming language, such as **Python, BASIC, C, C++, C#** or **Java**.

#### Writing solutions to problems using pseudo-code | Key Construct 6: Problem Solving and Programming

A **sequence** is a group of program statements that are executed in the correct order, one after the other.

**Input** means gathering some data from the keyboard or other input device and storing it in a **variable**:  
`INPUT width`

**Output** means displaying something on the screen:  
`PRINT "Your final score is"`  
`PRINT score`  
`PRINT "You have", lives, " left"`

A **variable** is a **named value** that can **change** while your program is running e.g. **score**

**Assignment** means **giving a value to a variable**:  
`x = 3`  
`password = "or1bLe"`

**Iteration** means **repeatedly** executing parts of the program again and again in a **loop**:  
`FOR time = 1 TO 10`  
  
`WHILE time < 60`

**Selection** means making a **decision**.  
Your program can select which part of the program code should be executed next:  
`IF lives > 0 THEN`  
`PRINT "Lost a life"`  
`ELSE`  
`PRINT "Game Over"`  
`ENDIF`

#### Developing computer programs using Python | Key Construct 6: Problem Solving and Programming

Python is a **high-level programming language**. It can be used by beginners to create computer programs.

Many people use **IDLE** to create Python code. This is an **Integrated Development Environment**. It contains a **text-editor** for writing Python code and other tools that are helpful to programmers.

When you **save** a new Python program, the filename needs to end in **.py** so the computer knows it can be **executed** using Python.

If you make a mistake or type an error in your program, the code may not make sense when Python tries to execute it. Python will stop running your program and try to show you **where** the error is in your code so you can fix it. This is called a **syntax error**.

A **comment** is a line of text in your program code that the computer **will not execute**. It will be used by the computer when running a Python program. It is used as a **reminder** or as an **explanation** to someone about how your code works.

**To make text into a comment**, type in the **#** symbol at the start of the line of text.  
`# Main menu starts here`

Your programs can work with different **kinds** of data values. We call these **data-types**.

|                  |                                                                                              |                                                                             |
|------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Integer</b>   | a <b>whole number</b>                                                                        | e.g. 32, -7, 0                                                              |
| <b>Real</b>      | a number that can contain a <b>decimal point</b> , these are called "float" values in Python | e.g. 3.14                                                                   |
| <b>Boolean</b>   | a value that can only hold one of two possible states, either <b>True</b> or <b>False</b>    |                                                                             |
| <b>Character</b> | a <b>SINGLE character symbol</b> .                                                           | e.g. one <b>letter</b> , one <b>digit</b> , a <b>punctuation mark</b> . '?' |
| <b>String</b>    | a <b>sequence of characters</b> .                                                            | e.g. 'This cheese smells.'                                                  |

Most Python programs use **variables**. A variable is a named value that can be **changed** during the execution of a program. When we set the value for a variable, we call this **assignment** (we are assigning a value).  
Use the **= assignment operator** to **set a value** e.g. `password = '5ecRet123'`

A **print** statement **displays a line of text on the screen**. This is an **output**.  
Text enclosed by ' ' quotes will literally be displayed. Anything without quotes will display the value of a variable.  
`print( 'Hello' )`  
`print( password )`  
`print( 'You have ', lives, ' lives left.' )`

An **input** statement allows people to type useful data **into** a program once it is running.  
Whenever you type a data value into the computer, the value must be **stored** in a **variable** (so the computer does not lose it).  
`surname = input( 'Type in your surname... ' )`

A program can make **decisions** while it is running to **choose** what should happen next. This is called **selection**.  
It can **decide** whether or not something should happen, depending on whether a **condition** is found to be **True** or **False**.

|                                    |                                          |
|------------------------------------|------------------------------------------|
| <code>if guesses &lt;= 5 :</code>  | <code>if guesses &lt;= 5 :</code>        |
| <code>print( 'Try again.' )</code> | <code>print( 'Try again.' )</code>       |
|                                    | <code>else :</code>                      |
|                                    | <code>print( 'No guesses left.' )</code> |

**Iteration** means to carry out instructions **more than once**.

You can carry them out a certain, definite number of times using a **for** loop.  
A **for** loop always **counts** how many times something has happened.  
`for num in range( 1, 6 ) :`  
`print( num * 10 )`

You can also carry out a sequence of instructions only while a certain **condition** holds **True**, using a **while** loop.  
`while keepGoing == 'yes' :`  
`keepGoing = input( 'Do you want to keep running this program?' )`

#### Arithmetic operators

|   |                       |
|---|-----------------------|
| + | <b>Addition</b>       |
| - | <b>Subtraction</b>    |
| * | <b>Multiplication</b> |
| / | <b>Division</b>       |

#### Relational Operator Symbols when making comparisons

|    |                              |    |                                 |
|----|------------------------------|----|---------------------------------|
| <  | <b>less than</b>             | >  | <b>greater than</b>             |
| <= | <b>less than or equal to</b> | >= | <b>greater than or equal to</b> |
| == | <b>is the same as</b>        | != | <b>not the same as</b>          |





## Tiverton High School Year 9 Computing

### Autumn Term/Summer Term Knowledge Organiser

### Storage Devices, Files and Compression.

#### Storage Devices | Key Construct 3: Computer Systems

**Secondary storage devices** are used for **long term storage** of data and instructions.

Programs and data are stored in **files**. Files are stored **even when the computer is switched off**.

We say that secondary storage is "**persistent**" or "**non-volatile**".

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Magnetic Hard Disk Drive</b> | A <b>high capacity</b> device that can often store as much as <b>8 TB</b> of data on one drive. Data is stored using tiny <b>magnetised</b> areas on a rapidly spinning metal disk. Magnetic hard-disks can be <b>damaged</b> accidentally by a <b>sudden impacts</b> or if it is dropped. Data can be <b>corrupted</b> or <b>erased</b> accidentally by <b>magnetic fields</b> from <b>speakers</b> , or <b>heat</b> .                                                                                                                                                                                                                                                                               |
| <b>Solid State Drive</b>        | An alternative to using a magnetic hard disk drive, but does not contain any moving parts. Data is stored using <b>tiny components</b> in <b>solid-state circuits</b> called <b>flash memory</b> . Solid-state drives are not affected by magnetic fields or extreme temperatures. They are very <b>lightweight</b> and <b>impact-proof</b> , making them ideal for use in laptops. They cannot hold quite as much data as magnetic disk drives and are <b>more expensive per GB</b> . Solid State Drives can sometimes start to <b>wear out</b> after data has been written to the same area a large number of times. Areas of the drive can then become <b>less reliable</b> for storing your data. |
| <b>Flash Memory Card</b>        | A tiny, <b>portable memory card</b> that can be used to <b>transfer data between devices</b> . They can usually store between <b>64 GB</b> and <b>512 GB</b> of data, although some hold even more. They are used in <b>digital cameras</b> and <b>mobile phones</b> , but can be read by many laptops and PCs. They are <b>impact-proof</b> but can be damaged by <b>static-electricity</b> if not handled carefully.                                                                                                                                                                                                                                                                                |
| <b>USB Flash-Drive</b>          | A <b>removable storage device</b> that can be used to <b>transfer files from one computer to another</b> . They are similar to solid-state drives and flash memory cards. Their data is held in <b>flash memory</b> . Flash drives are often <b>encrypted</b> to prevent <b>breaches of sensitive data</b> if they are lost.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>CD-ROM</b>                   | A <b>removable optical disk</b> that stores data as tiny <b>pits</b> , burnt into the surface by a <b>laser beam</b> . A single CD-ROM can store as much as <b>900 MB</b> of data. Highly <b>portable</b> , making it ideal for <b>backing up files</b> or <b>transferring data</b> to other computers. Very <b>cheap to manufacture</b> , making them ideal to <b>distribute software utilities</b> and <b>audio</b> . CDs are <b>not very durable</b> . A <b>scratch</b> can make individual files or the whole disk <b>unreadable</b> .                                                                                                                                                            |
| <b>DVD-ROM</b>                  | A <b>removable optical disk</b> , similar to a CD-ROM, but with a much larger storage capacity. A single DVD-ROM can store enough compressed data for a <b>whole feature-length movie</b> . It can usually store at least <b>4.7 GB</b> of data, although some types of DVD can store much more. Because a DVD can hold more data than a CD, they are used as <b>installation disks</b> for software.                                                                                                                                                                                                                                                                                                 |
| <b>Blu-ray</b>                  | An <b>removable optical disk</b> that can store enough data for <b>several hours of HD video</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

#### Laws that govern how we use computer technology | Key Construct 1: Impact of Digital Technology

The **Data Protection Act 2018** covers **how personal data may be used by companies and organisations**. It describes **the type of data can be collected**, **how long data can be kept for** and the need to **keep data up to date/accurate**. It sets out **restrictions on sending and using data**. It also **defines who is allowed to view or make use of data**.

The **Computer Misuse Act 1990** makes it **illegal to use or to attempt to use computers to access computer systems without permission**. It also **make it illegal to access computer systems with intent to commit a criminal offence**, or to **alter data without permission** (e.g. through the use of viruses, physical deletion etc).

#### Compression and file-types | Key Construct 5: Data Representation

Music and video files can contain a lot of data. Large files and streams of data can take a long time to transfer over the Internet. If the file can be **compressed**, either by **reorganising** or **reducing the amount of data**, then it can be sent and received **faster**.

**Compression** re-organises a file of data and saves it as a new compressed file. The compressed file usually has a **smaller file size** than the original.

It takes the computer **time** to compress the data – it's got to work out how to organise the data in a more **efficient** way. Before you can use the data again, the computer needs to **de-compress** the file. It must **re-organise the data** again into a form that can be used easily.

Sometimes, parts of the original data are **removed** during compression. When the file is uncompressed again, some of the data will be **lost forever**. This is called **lossy compression**. The data that was removed can **never** be recovered again.

When compressing **executable programs** and **text documents** we need to use **loss-less compression**. Otherwise, if a program instruction was lost, **the program would not be the same**. The **meaning** of a text document could also be **changed**.

#### Text Documents

- .txt** is an uncompressed **plain text document**. The text file contains only **unformatted text characters**.
- .rtf** is an uncompressed **rich-text file**. The text file contains characters which can be **formatted** using **bold, italics, colour, font sizes** etc.
- .pdf** is an Adobe **Portable Document Format** file. It can hold **rich-text, font definitions** and high-quality **vector diagrams**. Because the file contains the **font definitions** for each font face used it is **portable** - the document will look the same, regardless of the type of computer or phone being used. PDF files can also compress text and pictures to reduce the amount of data that they hold.

#### Images

- .bmp** is an uncompressed **bitmap image** format used widely by Microsoft Windows programs.
- .tif** is an uncompressed **high-quality bitmap image** that can contain **millions of colours**. TIFF file sizes can be very large as they often contain so much uncompressed data.
- .jpg** is a bitmap image that uses **lossy compression**. JPEGs are used widely for **photographs** and can include **millions of colours**, making pictures very **realistic**.
- .gif** is a compressed bitmap image that can only use up to **256 different colours**. This is only suitable for **simple graphics** and **animations**, or regions of **flat colour** that are all the same.
- .png** is a **Portable Network Graphic**. This stores high-quality graphics using one or more separate layers.

#### Audio/Sound/Music

- .wav** is an **uncompressed audio waveform**. These files are often very large, but result in high-quality audio.
- .mp3** is an **audio file** that uses **lossy compression**. The MP3 file is usually approximately 10 times smaller than their original. The sound quality can be quite low.

#### Video/Movies

- .avi** is an **uncompressed video file** used widely by Microsoft Windows programs.
- .mp4** is a **video file** that uses **lossy compression**.

#### Programs

- .exe** is an uncompressed **executable program file**.





# THS

TIVERTON HIGH SCHOOL

**Year 9**

**Drama**

**Work hard. Be kind. Belong.**





# Scripted Performance: Blood Brothers

## Exploring Component Knowledge of Drama



### 1. Theatrical Elements



#### 1A: Vocal Skills



**Pace:** how fast or how slow the character speaks  
**Power:** how loud or how quiet a character speaks  
**Pitch:** how high or how low a character speaks  
**Pause:** moments where the character stops talking  
**Tone:** shows what the character is thinking or how they are feeling  
**Accent:** the way someone talks depending on where they come from.  
**Intonation:** the rise and fall of the voice. For example, a clear movement up at the end of a sentence when we ask questions, intonation also helps us to show what we mean  
**Emphasis:** adding stress to a word or phrase to add emotion or meaning



#### 1B: Physical Skills



**Facial expression:** showing emotion of the character through the face  
**Body Language:** using your body to show the character's emotion  
**Physicality:** using your body to show the character  
**Gesture:** a movement of part of the body to show meaning.  
**Mannerisms:** habitual gesture or way of speaking or behaving in role  
**Gait:** the way a character walks  
**Exaggeration:** Making performance bigger than real life.  
**Stance:** The way a character stands  
**Posture:** The physical alignment of the body (good posture / bad posture)  
**Eye Contact:** Looking directly at or avoiding looking at someone  
**Spatial Awareness:** The ability to be aware of props and other actors around you  
**Interaction with others:** This could include touch or use of close proxemics to show the audience something  
**Choral movement:** Where a group of actors move in the same way at the same time (synchronized)  
**Stillness:** Lack of movement for a dramatic effect  
**Timing:** Exactly when something is done on the stage  
**Physical Theatre:** Using your body to make props / setting  
**Proxemics:** The use of space to communicate meaning  
**Levels:** The use of height to communicate status

### 2. Command Words

#### Identify

When were specific Theatrical elements (vocal / physical skills) used in performance? How were they used – describe what the actor did, what did this show you about the character or the moment?

#### Analyse

Why were these skills used? What did it communicate to you as an audience member? What meaning was created through the use of these skills? What was the effect?

#### Evaluate

Were they successful when using these techniques / skills? If so, why? If not why not?



#### 4. Stage Positions



Stage positions are **ALWAYS** from the ACTORS perspective. This means when looking at the stage from the audience's point of view, stage left is on the right and stage right is on the left.

**Upstage** = far away from the audience

**Downstage** = close to the audience

|                 |                  |                |
|-----------------|------------------|----------------|
| Upstage right   | Upstage centre   | Upstage left   |
| Stage right     | Centre stage     | Stage left     |
| Downstage right | Downstage centre | Downstage left |

**AUDIENCE**

### 3. Stage Positions



# 4. Understanding of the Script



**Brief plot Summery:**  
*Blood Brothers*, a musical by Liverpoolian playwright Willy Russell, revolves around twin boys (Mickey and Edward) who are separated at birth and brought up in completely different environments in the city. The play, set in the 1960s, is divided into two acts, with songs throughout. Mickey is brought up with his seven older siblings by his struggling single mother, Mrs Johnstone. His twin brother, Edward, however is brought up as the only child of the wealthy Lyons family, who live nearby, after Mrs Lyons persuaded Mrs Johnstone to hand over one of her twins at birth. Mickey and Edward don't meet each other until they're seven years old, but immediately become best friends and blood brothers. The bond continues when the boys are teenagers and both live in the countryside, despite them both being in love with Mickey's neighbour Linda. However, as they get older, the huge difference in their backgrounds pulls them apart and eventually leads to their tragic deaths.

## 5. Understanding of the Script

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Contextual information:</b></p> <ul style="list-style-type: none"><li>- Willy Russell wrote Blood Brothers in 1981.</li><li>- It was first performed in Liverpool before transferring to the West End.</li><li>- It was first performed as a musical in 1983.</li><li>- Conservative Prime Minister Margaret Thatcher was in power at this time.</li><li>- There was a very high rate of unemployment at this time.</li><li>- The play is set in Liverpool, as areas of high unemployment within the industrial working class.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p><b>KEY QUOTES:</b></p> <ul style="list-style-type: none"><li>- 'Y'know the devil's got your number'</li><li>- 'And do we blame superstition for what came to pass? Or could it be what we, the English, have come to know as class?'</li><li>- 'The welfare have already been onto me'</li><li>- 'See this means that we're blood brothers, an' that we always have to stand by each other'</li></ul> | <p><b>Key characters:</b></p> <p><b>Narrator</b> – takes on multiple roles</p> <p><b>Mrs Johnstone</b> – Mother of the twins, impoverished.</p> <p><b>Mrs Lyons</b> – takes Eddie, privileged.</p> <p><b>Mickey</b> – poor twin, frequently downtrodden</p> <p><b>Eddie</b> – rich twin, not streetwise</p> <p><b>Sammy</b> - delinquent brother to Mickey</p> <p><b>Linda</b> – Mickey's girlfriend and Eddie's secret love</p> <p><b>Mr. Lyons</b> – Father of Edward</p> | <p><b>Genre: Book Musical.</b></p> <p><b>Links to Epic Theatre</b></p> <p><b>Themes:</b></p> <ul style="list-style-type: none"><li>Nature vs nurture</li><li>Class divide</li><li>Superstition</li><li>Motherhood</li><li>Fate/destiny</li><li>Power</li><li>Judgement</li><li>Love</li><li>Violence</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p><b>Stylistic features and symbols:</b></p> <p><b>Reprise</b> – a song or part of a song that is repeated. Often it is intermingled with a new song. E.g. Marilyn Monroe.</p> <p><b>Motif</b> – A dominant or recurring image or idea in a text e.g. the gun.</p> <p><b>Juxtaposition</b> – Two opposite ideas are near each other in a piece of writing.</p> <p><b>Foreshadowing</b> – when the author alludes to what is to come in the text.</p> <p><b>Parallel</b> – two corresponding things that run side by side, e.g. the school scenes.</p> <p><b>Cyclical</b> – the structure of the play is cyclical as it starts and ends in the same place.</p> <p><b>Soliloquy</b> – when a character speaks their thoughts aloud, to themselves. It is different to a monologue which is one-character speaking, but in front of others</p> <p><b>Antihero</b> – a central character in a story, film, or drama who lacks conventional heroic attributes.</p> <p><b>Narrator</b> – echoes the function of the Greek Chorus, asks the audience to detach and judge.</p> <p><b>Stage Directions</b> – used prolifically by Russell to describe the movement and actions of characters.</p> |                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p><b>How to approach question:</b></p> <p><b>Technical language</b> – use the accurate terminology to describe each aspect of a production, such as performance skills, design features and stage configurations</p> <p><b>Examples from the play</b> – include examples (e.g. quotes, context or events) that demonstrate understanding of the play and support the point your making.</p> <p><b>Detailed suggestions</b>– give specific details on how you would perform, design and direct a production that will help the examiner to visualise your ideas.</p> <p><b>Effect on the audience</b> – describe the desired effect of a production on the audience., as well as how this effect might be created using theatrical techniques.</p> |





# THS

TIVERTON HIGH SCHOOL

**Year 9**  
**DT**

**Work hard. Be kind. Belong.**

---



DT  
A.1

### STRENGTH

The ability of a material to stand up to forces being applied without it bending, breaking, shattering or deforming in any way.

### DUCTILITY

The ability of a material to change shape (deform) usually by stretching along its length.

### CONDUCTIVITY

The ability of a material to conduct electricity.

### ELASTICITY

The ability of a material to absorb force and flex in different directions, returning to its original position.

### PLASTICITY

The ability of a material to be change in shape permanently.

### MALLEABILITY

The ability of a material to be reshaped in all directions without cracking

## 1. Properties of Metals

### TOUGHNESS

A characteristic of a material that does not break or shatter when receiving a blow or under a sudden shock.

### TENSILE STRENGTH

The ability of a material to stretch without breaking or snapping.

### HARDNESS

The ability of a material to resist scratching, wear and tear and indentation.

# Metals

**2. An alloy** is a metal (parent metal) combined with other substances (alloying agents), resulting in superior properties such as; strength, hardness, durability, ductility, tensile strength and toughness. The parent metal is the majority of the alloy. For example, mild steel is 0.1 - 0.3% Carbon and 99.9 - 99.7% Iron.

## Metal lifecycle



Metals are a **finite** resource that are extracted from the ground. Because of this, it is more important to recycle our waste metal. If we don't this could have a massive impact on our living world.

### 2. Ferrous Metals

Ferrous metals contain iron, and are known for their strength. Think steel, stainless steel, carbon steel, cast iron. Ferrous metals are used in both [architectural](#) and [industrial](#) fabrication, such as skyscrapers, bridges, vehicles, and railroads. Thanks to their magnetic properties, ferrous metals are also used in appliances and engines. Ferrous metals also have a high carbon content, which generally makes them prone to rust. The exceptions are stainless steel, because of chromium, and wrought iron because of its high pure iron content.



Examples of ferrous metals are:

- [Steel](#): Iron plus carbon; widely used in construction and industrial metal fabrication
- Carbon steel: Even higher carbon content added to iron; exceptionally hard metal
- Stainless steel: An alloy steel made with added chromium,
- Cast iron: Iron, carbon, silicon; heavy, hard metal that is resistant to wear

### 2. Non-Ferrous Metals

Non-ferrous metals have been used since the Copper Age, around 5,000 B.C. Since non-ferrous metals don't contain iron, they're usually more corrosion-resistant than ferrous metals. Some examples of non-ferrous metals are aluminium, aluminium alloys, and copper, which are often used in industrial applications such as gutters, roofing, pipes, and electrical. Non-ferrous metals also include brass, gold, nickel, silver, tin, lead, and zinc. Other common properties of non-ferrous metals are non-magnetic, malleable, and lightweight. This makes them ideal for use in aircraft and other applications.

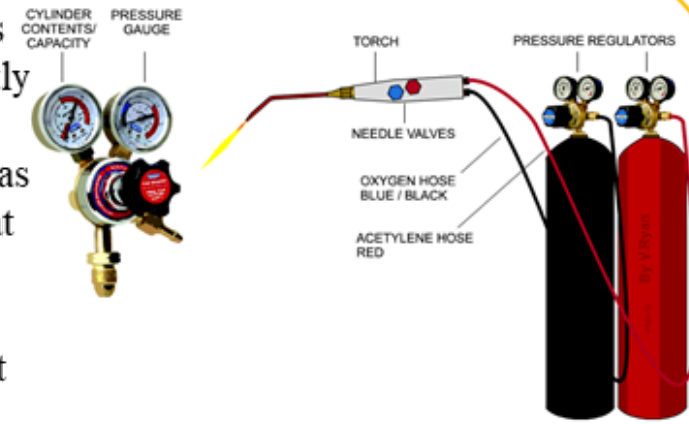




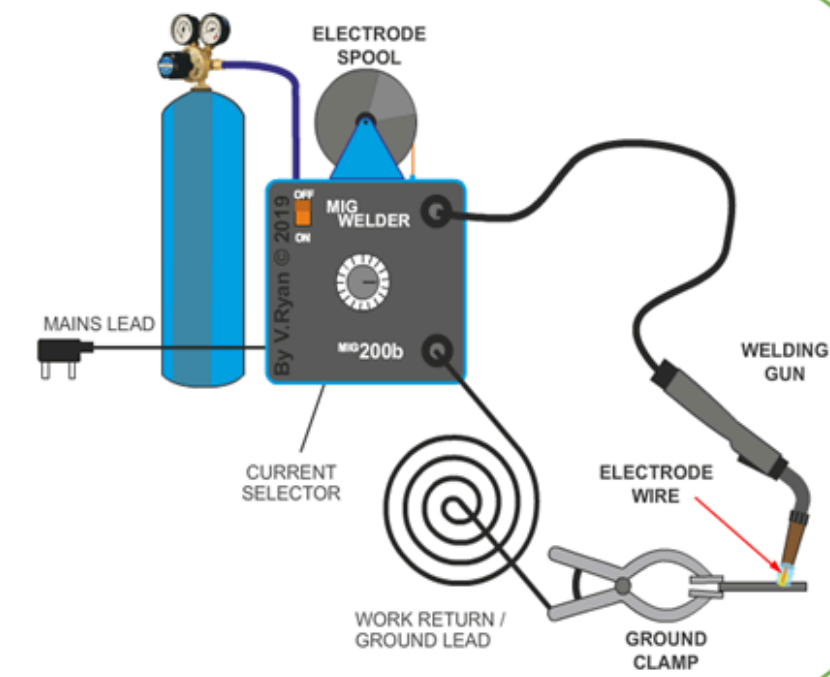
A.2

**Oxyacetylene gas welding** is commonly used to permanently join mild steel. A mixture of oxygen and acetylene, burns as an intense / focussed flame, at approximately 3,500 degrees centigrade. When the flame comes in contact with steel, it melts the surface forming a molten pool, allowing welding to take place.

This type of welding is suitable for the prefabrication of steel sheet, tubes and plates.

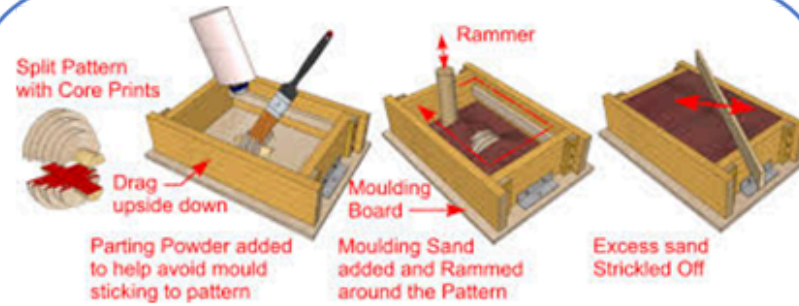


**MIG welding.** The electrode is a continuous stream of wire, with a direct current source, fed at a continuous rate through the welding gun. Carbon dioxide gas is supplied directly to the welding zone, which acts to protect the area from atmospheric contaminants. The wire electrode, produces an 'arc', which heats the welding area and fuses the wire electrode with the base metal (metal being welded). MIG welding is ideal for aluminium, mild steel, stainless steel, copper and copper alloys.

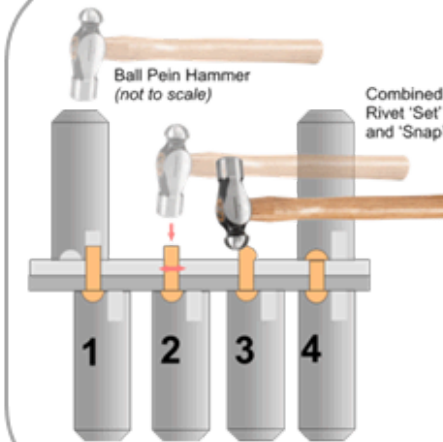


## Processes

# Metals



**Sand casting** is a process in which molten metal is poured into a mould cavity made by forming damp (*i.e.* **Green**) sand around a **Pattern**.



**Rivets** (*aka Rivits*) have various designs of head at one end and are used to fasten materials together by being passed through a punched or drilled hole and hammered over (*usually*) to form a head on the reverse side. They are available in several materials and sizes, can be solid or hollow and specialised designs also exist (*e.g.* 'Pop' Rivets).

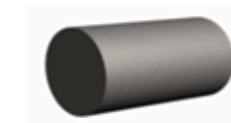


**Nuts and Bolts** are available in a wide variety of sizes, types of screw thread, shapes of head and materials to provide a very commonly used means of fastening components together such that they can be removed if needed.

## Stock Forms

### SECTIONS - SOLIDS AND TUBES

ROUND SECTION



HEXAGONAL SECTION



SQUARE SECTION



L-SECTION



ROUND TUBE



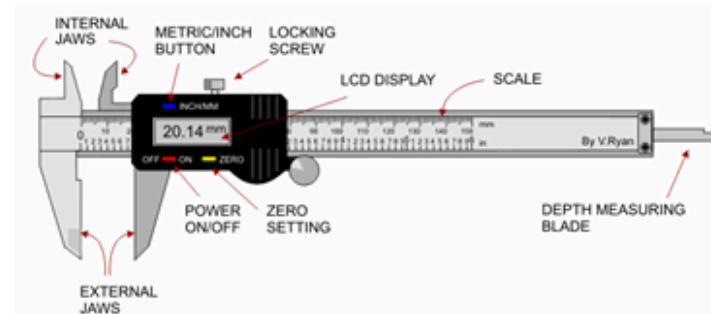
HEXAGONAL TUBE



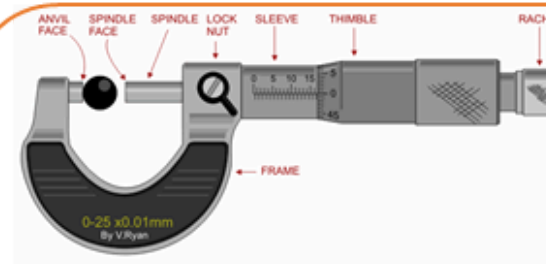
SQUARE TUBE



L-SECTION TUBE



**The Digital Caliper** (sometimes incorrectly called the Digital Vernier Caliper) is a precision instrument that can be used to measure internal and external distances extremely accurately



**The Micrometer** is a precision measuring instrument, used by engineers. Each revolution of the ratchet moves the spindle face 0.5mm towards the anvil face

### Metal Finishes

These are needed not only to make the metal look nice, but more importantly to stop ferrous metals from corrosion.





# B

## YEAR 9. Design and Technology. Knowledge Organiser; Sustainability- Boards and Plastics.

### Natural Plastics....

#### Natural sources of plastics include:

- plants - from which cellulose can be extracted
- trees - from which latex, amber and resin come
- animals - from which horn and milk (used to make glues) are obtained
- insects - from which shellac (used to make polish) is obtained

### Synthetic

#### Synthetic plastics are chemically manufactured from:

-Crude oil..... -Coal..... -Natural gas



**Acrylic ..** Stiff and brittle. Used to make signs and small 2D and 3D forms

**Polyvinyl sheet (PVC)** Stiff, strong, tough and resists scratching. Used to make 2D and 3D shapes and may be used for vacuum-forming

**High-density PVC foam.....** Stiff, hard, tough and lightweight, with a good resistance to chemicals. Machining of 2D and 3D shapes

**Polystyrene sheet (or styrene sheet)** Lightweight, hard, stiff, transparent and brittle. Good water resistance. Used for vacuum-forming

**Corrugated polypropylene** Lightweight and tough. Stiff, but not very strong. Hard but scratches easily. Resistant to chemicals. Used for making large constructions

**Acrylonitrile butadiene styrene (ABS)** Strong, tough, hard, lightweight, and durable. A good surface finish and resistant to chemicals. Used to make square or round shaped tubes and is good for making structures. Corrugated polypropylene is available in a range of shapes and colours

**Polystyrene foam (Styrofoam)** Brittle in tension, lightweight, with good heat and sound insulation. Available in blocks and used for product-modelling

**Cellophane** Tough, hard, stiff, lightweight, transparent, and non-flammable. Used for wrapping round products

**Polythene** Hard, stiff and able to be sterilised. Used to make bottles and for shrink-wrapping products.

### Social and moral issues

When creating a product, the designer should also consider how it will be made and how it will be used. Many of these decisions have implications for society as a whole and are based on moral judgements. This means that the designer has to be very aware of what is acceptable and what is not acceptable to society.



### Polymer

**The correct term for plastics is polymers.** Most polymers are good insulators. Some of the stronger polymers compare favourably with metals. They are not normally painted, but their colour can be changed by adding pigments to them.

Most polymers are **made from oil**, which is a non-renewable resource. They are made by a chemical reaction called **polymerisation**.

There are two main types of polymer: **thermosets and thermoplastics**.

**Thermosets** are normally made into products by moulding. Once moulded, they cannot be reshaped and they cannot be recycled.

**Thermoplastics** soften when heated and can be shaped when hot. The shape will harden when it is cooled, but can be reshaped when heated up again. Thermoplastics are softer and more flexible than thermosets. They can normally be recycled

### Fair trade

The result of the pattern of world trade is that the workers in primary industries in LEDCs often lose out. They receive low wages and often have poor standards of living. They cannot afford education for their children and many children are required to work to help their families earn a living.

Fair trade means that the producer receives a guaranteed and fair price for their product regardless of the price on the world market. This means their quality of life should improve, as well as the long-term prospects for their children.

Fair trade sets minimum standards for the pay and conditions of workers. The Fair Trade Organisation promotes Global Citizenship by guaranteeing a fair, minimum price for products. About 5 million people benefit from Fair Trade in 58 countries.

### Environmental and social impact

Making products uses resources, including the materials used in the product and the energy needed to make it. Using these resources has an impact on the environment and society.

The designer of electronic products should consider a number of factors in order to reduce environmental impact, including:

- the material used to make the product
- the life of the product
- disposal: what happens to the product at the end of its life?

### The life of the product

Electrical equipment awaiting recycling in a tip.

Most products are only expected to last for so long before they stop working, are worn out or are thrown away. How long a product will last is an important design consideration. The longer the product's life, the fewer new materials will be needed for replacements. However, a longer life also means that the manufacturer will sell fewer replacement products.

The life of a product can be extended by using materials with better properties: eg by using stronger materials or materials that resist corrosion. Another way is through design that allows product life to be extended by maintenance

**One-off production** is when only one product is made at a time. Every product is different so it is labour intensive. Products may be made by hand or a combination of hand and machine methods.

**Batch production** is when a small quantity of identical products are made. Batch production may also be labour intensive, but jigs and templates are used to aid production. Batches of the product can be made as often as required. The machines can be easily changed to produce a batch of a different product.

**Mass production** is when hundreds of identical products are made, usually on a production line. Mass production often involves the assembly of a number of sub-assemblies of individual components. Parts may be bought from other companies. There is usually some automation of tasks (eg by using Computer Numerical Control machines) and this enables a smaller number of workers to output more products.

**Continuous flow production** is when many thousands of identical products are made. The difference between this and mass production is that the production line is kept running 24 hours a day, seven days a week to maximise production and eliminate the extra costs of starting and stopping the production process. The process is highly automated and few workers are required

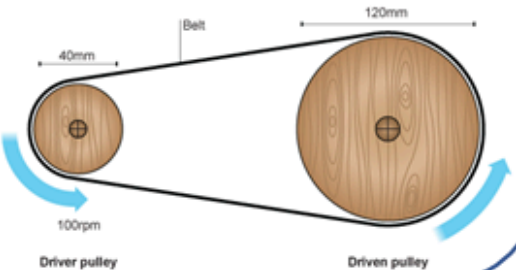


# C Year 9 Knowledge Organiser... Mechanisms, Systems and Motions

## Pulley systems

Pulleys are used to change the speed, direction of rotation, or turning force or torque.

A pulley system consists of two pulley wheels each on a shaft, connected by a belt. This transmits rotary motion and force from the input, or driver shaft, to the output, or driven shaft. A pulley system with one 40mm diameter pulley and a 120mm pulley, connected by a belt. The smaller pulley is rotating at 100rpm. If the pulley wheels are different sizes, the smaller one will spin faster than the larger one. The difference in speed is called the velocity ratio.



## Types of Motions

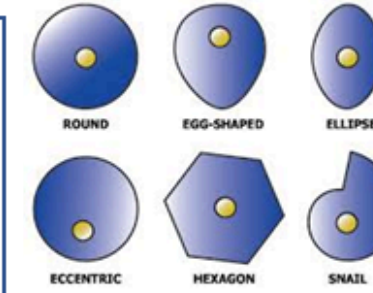
|                                                               |                                                          |                            |                                                                                   |
|---------------------------------------------------------------|----------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------|
|                                                               | Linear Motion<br>Motion in a straight line indefinitely. |                            | Reciprocal Motion<br>Back and forth motion.<br><i>Think, Pair share</i>           |
|                                                               | Rotation Motion<br>Motion in a circle.                   |                            | Oscillating Motion<br>Oscillation is a back and forth motion about a pivot point. |
| Task: Label the following pictures with the correct motion/s. |                                                          |                            |                                                                                   |
|                                                               | Fan                                                      |                            | Metronome                                                                         |
| Rotation                                                      | Oscillating                                              |                            | Piston                                                                            |
|                                                               | Sewing machine needle                                    |                            | Door                                                                              |
| Reciprocating                                                 | Oscillating                                              |                            | pedalling                                                                         |
|                                                               | Cam & Follower                                           |                            | Tightening a bench vice                                                           |
| Rotation into Reciprocating                                   | Reciprocating                                            |                            | Door handle                                                                       |
|                                                               |                                                          | Rotation and Reciprocating | Rotation                                                                          |

## Types of motion

There are four basic types of motion in mechanical systems:  
 Rotary motion is turning round in a circle, such as a wheel turning.  
 Linear motion is moving in a straight line, such as on a paper trimmer.  
 Reciprocating motion is moving backwards and forwards in a straight line, as in cutting with a saw.  
 Oscillating motion is swinging from side to side, like a pendulum in a clock.  
 Many mechanisms take one type of input motion, and output it as a different type of motion.

## Rack and pinion

A pinion is a round cog and the rack is a flat bar with teeth. The driver cog either moves along the rack, as in a rack and pinion (funicular) railway - or else the driver cog moves the rack, as in the steering system in cars. Rack and pinion changes rotary motion into linear motion.



Microcontrollers are widely used in everyday items such as washing machines, remote controls, microwave ovens, mobile phones and vending machines. A modern car can contain around 40 of them. Several different types are commonly used in school electronics projects, including PICs, PICAXE and GENIE microcontrollers.

## MECHANISMS

### WHAT IS A MECHANISM?

A machine is made up of a number of working parts called mechanisms. A mechanism changes an input force + movement into a desired output force + movement.

### INPUT

Force + Movement going into a ...

### MECHANISM

To convert or transmit energy to cause an ...

### OUTPUT

Force + Movement to satisfy a need

### SIMPLE MECHANISMS

These are the 5 simple mechanisms which form the basis of all machines.



inclined plane



screw



wheel and axle



wedge



lever

### EXAMPLES OF MECHANISMS



vice



lock



scissors

**Gears** consist of toothed wheels fixed to shafts. The teeth interlock with each other, and as the first shaft (the driver shaft) rotates, the motion is transmitted to the second or driven shaft. The motion output at the driven shaft will be different from the motion input at the driver shaft - in place, speed, direction and other ways.  
 A number of gears connected together are called a gear train. The input (eg a motor) is connected to the driver gear. The output, (eg the wheel of a buggy) is connected to the driven gear.

## Types of Gears

A gear is a wheel with teeth on its outer circumference connected to an axle. The teeth prevent slipping by engaging on another gear. The gear can be made to change direction, speed, and torque depending on its size, arrangement, and type.



**Worm Drive Gear**  
 Combines a worm screw and worm wheel (spur gear). The worm wheel may have straight or angular teeth. The shafts lie in parallel planes and may be at any angle between 0 to 90°. The worm meshes with and turns the spur gear, but the spur doesn't turn the worm.  
**Advantage:** Operates silently  
**Disadvantage:** Low efficiency due to heat production



**Spur Gear**  
 The most common type. Straight teeth are parallel to the axis of the shaft. Used to transmit power. Mounted in a series or parallel to each other.  
**Advantage:** Cost effective and highly reliable  
**Disadvantage:** Cannot transfer power in different directions



**Bevel Gear**  
 Two conical wheels that intersect at an angle, usually 90°. Teeth are tapered in both tooth thickness and height. Transmits power from one direction to another. Changes the direction of the shaft's rotation.  
**Advantage:** Able to change the operating angle  
**Disadvantage:** Gears have to be matched to work



**Helical Gear**  
 Teeth are inclined to axis of the shaft (15-50°) in the form of a helix. Used in high-speed applications. The angle helix creates instant contact with gear teeth.  
**Advantage:** Transmits motion and power between parallel and right-angled shafts  
**Disadvantage:** Generates heat



**Rack & Pinion Gear**  
 Combines a pinion gear with a rack (a toothed bar or rod). As the pinion turns, the rack moves in a straight line.  
**Advantage:** Converts rotational motion to linear motion  
**Disadvantage:** High-friction system



Guitar



Watch



Drill



Pencil sharpener



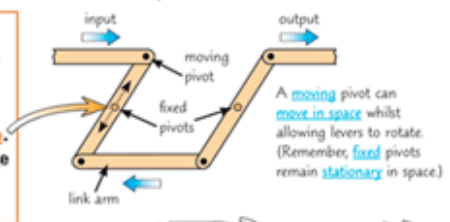
Cog railway system

## Mechanical Systems

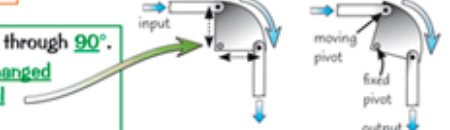
### Linkages Connect Different Parts of a Mechanism

Levers can be connected together to form linkages. Simple linkages can change the magnitude of the force and the direction of motion. Here are two examples:

- 1) Push/pull linkages use two fixed pivots.
- 2) The input and output motions of the linkage are in the same direction. The motion of the link arm is in the opposite direction.
- 3) Here, each fixed pivot is in the centre of an arm. Changing the position of these pivots will change the magnitude of the output force — often the easiest way to see this is by making a model.



- 1) A bell crank changes the direction of a force through 90°.
- 2) The magnitude of the output force can be changed by moving the fixed pivot so it's not an equal distance between the two moving pivots.



### Gear Trains Transmit or Change Rotary Motion

- 1) Gears are toothed wheels that interlock. They transfer motion from one part of a machine to another.
- 2) A gear train is where two or more gears are linked together. They can be used to change the direction of motion or change the magnitude of the input force (this is to do with the increase or decrease in the speed of rotation that can be generated by linking different-sized gears). Here are some examples:

The driver gear, turned by hand or a motor, turns the driven gear. Both will turn in opposite directions.



If you use a third gear (called an idler), the driver and the driven gears will both turn in the same direction. The size of the idler won't alter the speed of the other two gears.



If linked gears are different sizes, the smaller gear (i.e. the one with fewer teeth) will turn faster. The relationship between the driver and the driven gears can be described using a gear ratio. The size of this ratio describes how much the mechanism changes the speed of the gears from the input speed to the output speed. Here's an example of how gear ratios can be used in calculations:

$$\text{Gear ratio} = \frac{\text{no. of teeth on the driven gear}}{\text{no. of teeth on the driver gear}}$$

$$\text{Output speed} = \frac{\text{speed of driver gear (input speed)}}{\text{gear ratio}}$$

### EXAMPLE:

A gear train is made up of a driver gear with 10 teeth and a driven gear with 20 teeth. The driver gear is rotating at 500 rpm (revolutions per minute). Calculate the output speed of the gear train.

$$\text{Gear ratio} = 20 \div 10 = 2/1 \text{ or } 2:1 \text{ or } 2$$

$$\text{Output speed} = 500 \div 2 = 250 \text{ rpm}$$





# D

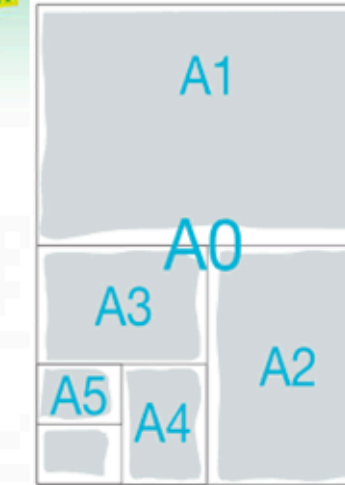
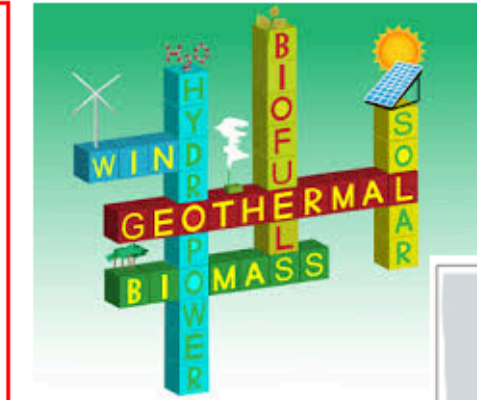
## Year 9 Design Technology. Materials and Product Analysis, Paper and Card, CAD/CAM

| Type of paper and board. | Functional properties                                                                                                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Layout paper             | Light weight, thin white paper. It is used for initial ideas. It also take colour media well and it is also cheap.                                                                                                     |
| Tracing paper            | This is thin translucent paper. Which is used to make copies of drawings. However it is also quite expensive. Its made buy reducing the fibres concentration by prolonged beating in water.                            |
| Copier paper             | Similar properties to cartridge paper. Its cheap when bought in bulk. The pulp is fed into the paper machine while the pulp is in the screen the water with in the pulp drops away letting the fibres bonded together. |
| Recycled paper           | Made from reused paper products. Used for most documents including reports, memo paper and forms. This has a positive effect on the environment due to it being recycled                                               |
| Corrugated board         | Good impact resistance. It has a good strength for weight and is also recyclable. From the paper mill it is sent to the corrugating plant and then it is then glued between two more sheets of non corrugated card     |
| Folding box board        | Excellent for scoring, bending and creasing without splitting. It also is a excellent printing surface. Its made up of multiple layers of chemical and mechanical pulp.                                                |
| Cartridge paper          | This is good quality white paper which is available in different weights. Medium cost.                                                                                                                                 |
| Mounting board           | Good quality thick card which is used for final models and is used for mounting work.                                                                                                                                  |

The reason why cardboard is so popular is because it has several unique properties:

A sheet of corrugated cardboard is made out of three sheets of ordinary Kraft paper glued together with glue made of corn starch. Paper and glue are relatively inexpensive, so cardboard is inexpensive.

- Cardboard is completely recyclable and biodegradable.
- Cardboard is about half air, making it very light for its size.
- Compared to a sheet of paper, cardboard is incredibly rigid.
- Cardboard has some give, so it provides a little padding for the things inside the box.
- Cardboard is strong and resists punctures, but it is also easy to cut with a knife.
- When a box gets crushed it tends to stay together rather than shattering like wood would.
- Cardboard boxes fold flat for shipping without losing strength, making transportation much easier and less expensive. It is also very easy to put the boxes together.

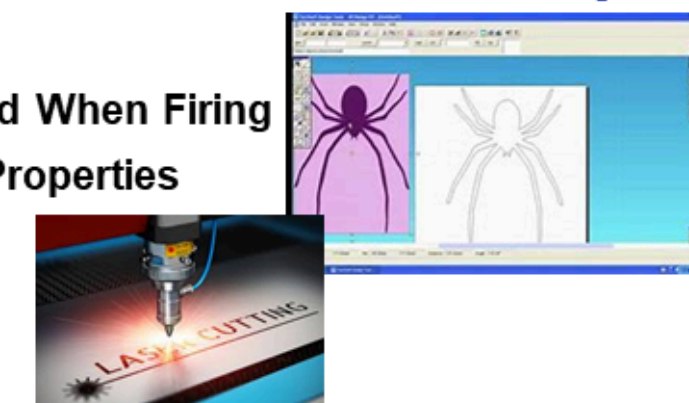


### A GUIDE TO PAPER WEIGHTS - GSM



**CAD/CAM** (computer-aided design and computer-aided manufacturing) refers to computer software that is used to both design and manufacture products. **CAD** is the use of computer technology for design. We use 2D design. **CAD/CAM** applications are used to both design a product and program manufacturing processes. We use a Laser Cutter as a manufacturing machine.

1. Never Leave Your Laser Unattended When Firing
2. Never Cut Material with Unknown Properties
3. Always Keep A Clean Workshop
4. Be Informed
5. Be Alert



Computer Numerical Control

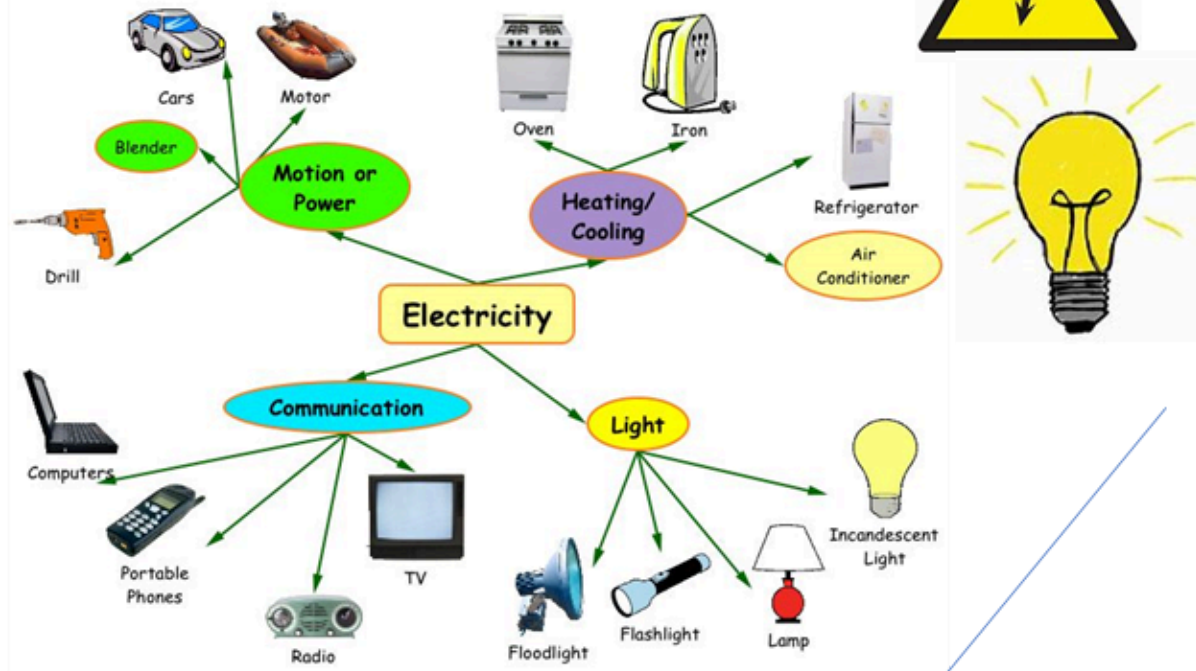
CNC means **Computer Numerical Control**. This means a computer converts the design produced by Computer Aided Design software (CAD), into numbers. The numbers can be considered to be the coordinates of a graph and they control the movement of the cutter.



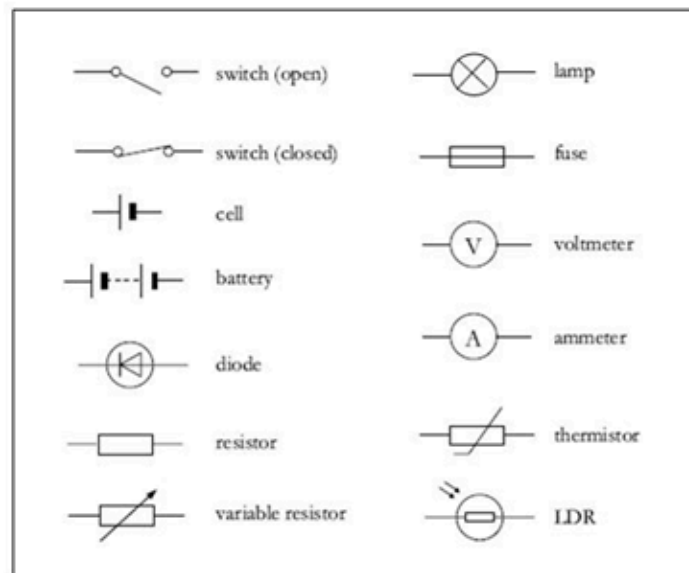
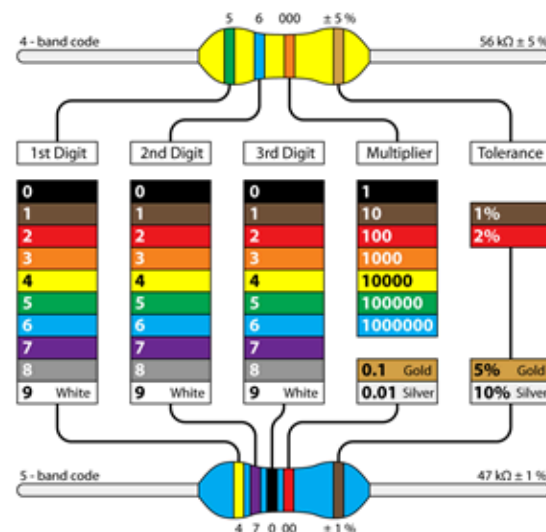


E

## Uses Of Electricity In Our Daily Life



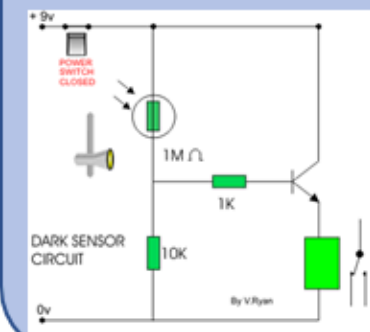
Resistor colour code



**Soldering** is a process in which two or more items (usually metal) are joined together by melting and putting a filler metal-solder into the joint. The filler metal having a lower melting point than the joining metal.



CAD is not only used to design and manufacture products. It is also used to create circuits for use in electronics.



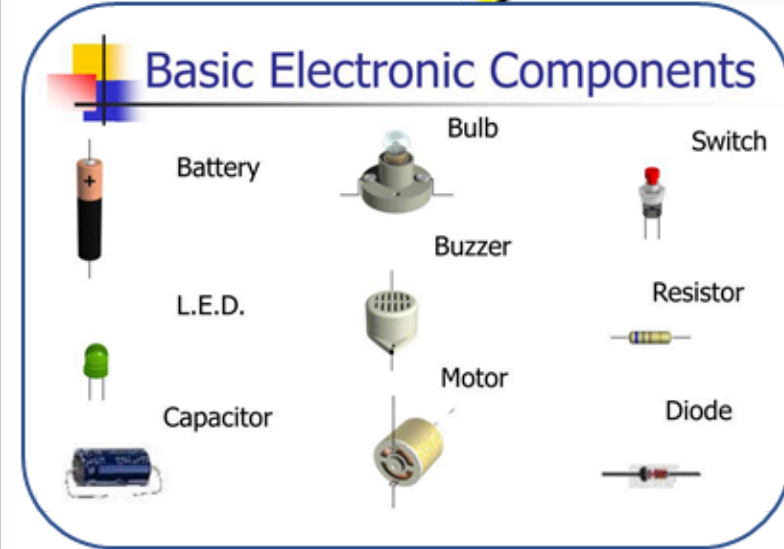
Electronics is the technology concerned with the design of circuits using transistors and microchips, and with the behaviour and movement of electrons.



There are many different types of electrical and electronic components, including resistors, capacitors and diodes. Each of these has a specific use in a circuit.

### Discrete electronic components

Discrete (meaning separate) electronic components can be selected individually and put together to make a circuit. Examples of discrete components include resistors, capacitors, diodes and transistors.



There are many different types of electrical and electronic components, including resistors, capacitors and diodes. Each of these has a specific use in a circuit. **Components**

Electronic components can be divided into two groups: discrete electronic components and integrated circuits (ICs).

### Discrete electronic components

Discrete (meaning separate) electronic components can be selected individually and put together to make a circuit. Examples of discrete components include resistors, capacitors, diodes and transistors. Discrete components can also be used as components in circuits that include an integrated circuit.

### Integrated circuits

The circuits inside integrated circuits are arranged in different configurations depending upon the type of chip and its function. The most common type of configuration is called the dual-in-line or DIL package, which has two rows of connecting 'legs', one on each side. You don't need to understand how the circuit inside a silicon chip works. It's best to think of ICs simply in terms of their function: eg as timers, counters, logic gates or operational amplifiers (op-amps).

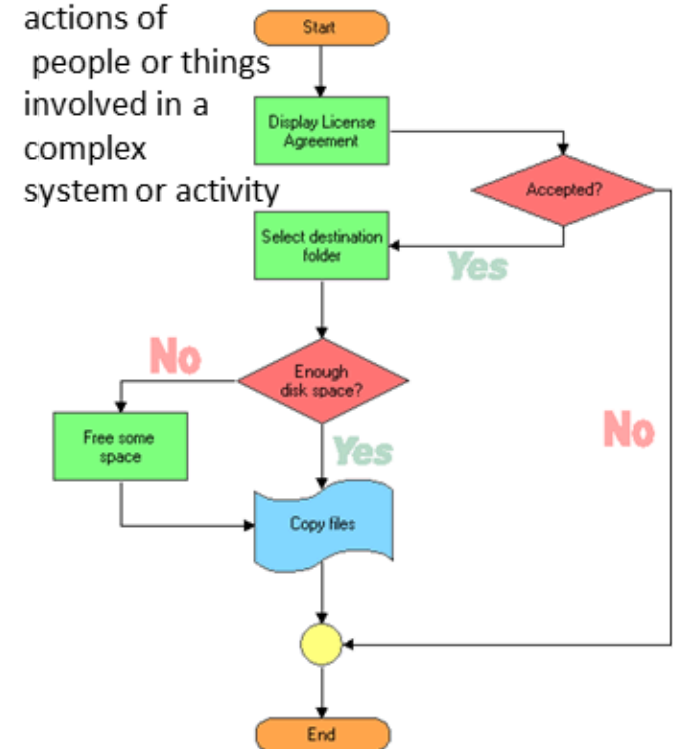
When using ICs you need to know:

- which pins have to be connected
- the function of each pin
- how the IC is connected to the power supply

### flow chart

noun

a diagram of the sequence of movements or actions of people or things involved in a complex system or activity







# THS

TIVERTON HIGH SCHOOL

## **Year 9**

## **English**

**Work hard. Be kind. Belong.**

---

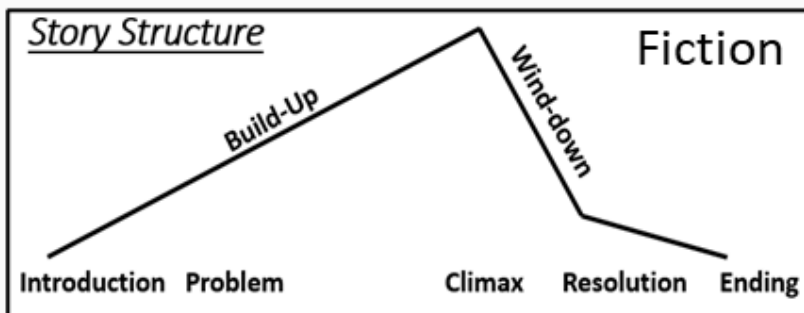


# English Year 9 Writing

## 1. Key Terms

1. **Ethos:** to make yourself appear trustworthy, unbiased and credible, to your reader.
2. **Logic:** convince your audience through reason, facts and statistics.
3. **Pathos:** persuade your audience by appealing to their emotions
4. **Antithesis:** something that is the direct opposite of something else, eg. love is the antithesis of selfishness.
5. **Rhetoric:** effective use of persuasion
6. **Anaphora:** repetition of a word or phrase at the beginning of successive clauses.
7. **Anadiplosis:** repeating the final word or phrase from one clause at the beginning of the next, eg, when I give, I give myself.
8. **Nuance:** subtle or slight difference
9. **Perspective:** a way of looking at something, a viewpoint.
10. **Metaphor:** directly refers to one thing by describing something else
11. **Hyperbole:** extreme exaggeration to make a point

## 2. Planning writing



Purpose  
Audience  
Language  
Layout

Non-fiction

## 5. Super Spellings

1. Abhorrent
2. Anticipatory
3. Vehement
4. Serendipity
5. Nonchalant
6. Imperative
7. Modicum
8. Jubilant
9. Repudiate
10. Myriad
11. Salient
12. Discombobulating
13. Obsequious
14. Plethora
15. Panacea
16. Taciturn
17. Superfluous
18. Umbrage
19. Energetic
20. Truculent



## 3. Ways to make your writing more persuasive and engaging

Anecdote  
Alliteration  
Pronouns  
Facts  
Opinions.  
Rhetorical Questions  
Repetition  
Emotive Language  
Exaggeration  
Statistics.



Threes  
**Varied** sentence lengths and structures such as multi-clausal sentences, fragment sentences.  
**Sensory** language  
**Show don't tell**  
**Figurative language:** metaphor, simile, personification  
**Punctuation** used to alter pace and tone

## 6. SPaG: complete these

**Parentheses** are....and can be used to...  
**Ellipsis** is used to...  
An **exclamation mark** shows ...  
**Commas** are used to...  
A **dash** is used to ...  
**Brackets** can ...

## 4. Useful rhetorical structures

1. **Not only, but also** E.g. Not only are holidays too infrequent, but they are also too short.
2. **So, so** E.g. Holidays are so infrequent, so short, that they feel as if they are over before they begin
3. **Brackets although** E.g. School holidays are too infrequent (although some killjoys will love to tell you otherwise) and the impact of this has been seen on students in the high anxiety rates among teenagers.
4. **Triple abstract noun colon** E.g. Fury, anger, dismay: the feelings felt by both staff and students at the end of the holidays are intense.
5. **Simile start** E.g. Like a child's first steps, holidays are something to be treasured.
6. **Verb beginnings** E.g. Considering the amount of time families spend apart, holidays are clearly too infrequent.
7. **More more more** E.g. The more time children have to relax, the more energised and engaged they will be in their studies, and ultimately the more they will achieve.
8. **Less less less** E.g. The less time spent with the family means the less time that is spent establishing family values, which means the less time a child is able to connect with their parents
9. **Fortunately/unfortunately** E.g. Fortunately, the holiday companies are aware of the holiday dates and can adjust the capacity for those dates; unfortunately, this comes at a significant financial premium.
10. **Adverb beginnings** E.g. Typically, no one consults children on how they feel about holiday dates and the frequency of their breaks.



| 1.Key Terms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | English Year 9 Reading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  | 4. Structuring your essay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div>1. <b>Rising action:</b> the part of the story where the plot becomes increasingly complicated.</div> <div>2. <b>Climax:</b> the most dramatic, exciting part of a story.</div> <div>3. <b>Falling action:</b> diminishing tension, leading towards a resolution.</div> <div>4. <b>Foreshadowing:</b> hints at events to come.</div> <div>5. <b>Allusion:</b> brief and indirect reference to a person, place, thing or idea of historical, cultural, literary or political significance. It does not describe in detail the person or thing to which it refers.</div> <div>6. <b>Pun:</b> a play on words – a joke - often when a word has more than one possible meaning,</div> <div>7. <b>Juxtaposition:</b> two contrasting ideas put next to each to make the difference clear.</div> <div>8. <b>Alternative:</b> different</div> <div>9. <b>Sustained:</b> continues without interruption.</div> <div>10. <b>Perceptive:</b> sensitive – noticing things that aren't obvious.</div> <div>11. <b>Critical:</b> analyzing faults and issues.</div> | 2. Super Spellings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3. Big questions | <div>Introduction</div> <div>What is the novel about? ' _____ ' by _____ is about...</div> <div>What is the aim of the author? _____ wanted to highlight/explore/expose...</div> <div>Developing an argument</div> <div>What is the question asking you? What is your answer? Which moments of the text will support your argument?</div> <div>At the start of the chapter/novel, the character/mood is...</div> <div>When we first meet _____, we are struck by.../Initially,</div> <div>In the middle of the chapter/novel, the character/mood changes...</div> <div>As the novel progresses, the character...</div> <div>However,</div> <div>Furthermore,</div> <div>By the end of the chapter/novel, the character/mood is...</div> <div>Finally,</div> <div>Conclusion</div> <div>What are your overall thoughts? How successful was the writer?</div> <div>Ultimately, I was left with a feeling of...</div> <div>_____ main message was....</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5. Contextual Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6. Ambiguity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <div>Can you link context to a specific moment in a text and help you understand the writer's intentions at this point?</div> <div>Author information: What do they usually write about, what influenced them, what was their life experience?</div> <div>Era: When was it written? What did people at the time believe about the world that was different to what we believe today?</div> <div>Historical Events: Were there any big events that will have affected the characters in the story?</div> <div>Location: Where was the book written or set? How does this affect what we can expect from the characters in terms of how they act the they way they do and why?</div> <div>Genre Are there any techniques that are used in the story that are common in this particular style of novel?</div> <div>Audience How would an audience in this time/location react differently to us?</div> |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 7. Further reading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <div>Explore alternative interpretations</div> <div><ul style="list-style-type: none"><li>• Could</li><li>• May</li><li>• Might</li><li>• Perhaps</li><li>• Possibly</li><li>• Seems to</li><li>• Probably</li></ul></div> <div><div><div>The Astonishing Colour of After - Emily X.R. Pan</div><div>After the Fire - Will Hill</div><div>George - Alex Gino</div><div>Code Name Verity – E. Wein</div><div>THUG - Angie Thomas</div><div>Gone Series - Michael Grant</div><div>Orphan Monster Spy - Matt Killeen</div><div>The Children of Blood and Bone - T Adey mei</div><div>The Handmaids Tale - Margaret Atwood</div></div><div><div>The Big Lie - Julie Mayhew</div><div>The Hobbit and The Lord of the Rings - JRR Tolkien</div><div>The Kite Runner - Khalid Housseni</div><div>Noughts and Crosses series - Malorie Blackman</div><div>Lies We Tell Ourselves – R. Talley</div><div>Pride and Prejudice - Jane Austin</div><div>Oliver Twist - Charles Dickens</div><div>The Help - Kathryn Stockett</div><div>The Book Thief - Markus Zusak</div></div></div> |  |



# English Year 9 Speaking and Listening

## 1. Key Terminology:

**Sophisticated:** having and expressed a developed knowledge on a particular topic.

**Repertoire:** a wide collection of items/terms/vocabulary.

**Strategies:** Methods and plan of action to achieve an overall aim.

**Perceptive:** Having or showing a sensitive insight into a key topic.

**Elaborate:** To develop further and in more detail.

**Debate:** A formal discussion on a particular matter or topic in which opposing arguments are put forward.

**Biased:** Unfairly prejudiced for or against someone/something.

**Logical:** Straight forward and making sense.

**Reasoned:** Based on logic or good sense.

## 4. PALL of Speaking and Listening Speech:

**Purpose:** To persuade and inform.

**Audience:** Year 9 students in your class.

**Language:** Formal but relevant to year 9s, engaging, persuasive and informative.

**Layout:** 6 paragraphs including an introduction, counter argument and conclusion.

## 2. Super Spellings

1. Dominant
2. Decline
- Facilitate
3. Sustainable
4. Logic
5. Presumption
6. Enhanced
7. Explicit
8. Underlying
9. Implicit
10. Intervention
11. Hierarchical
12. Eliminate
13. Prohibited
14. Exploitation
15. Integrity

## 3. Success Criteria

- You can express sophisticated ideas/information/feelings using a sophisticated repertoire of vocabulary.
- You organise and structure your presentation using an effective range of strategies to engage the audience.
- You achieve the purpose of your presentation.
- You listen to questions and feedback responding perceptively and if appropriate elaborate with further ideas and information.

## 5. Key Topic Ideas

- Climate change and recycling
- Is Barbie a good role model?
- Is war ever justified?
- Should 16 year olds be allowed to vote?
- Video games cause violence
- Students from farming families should be given time off school to help with harvesting and silaging.
- Are beauty contests harmful?
- Is the death penalty ethical?
- Should we ban keeping animals in zoos?
- Should governments be allowed to sensor information on the internet?
- Mobile phones should be monitored and installed with tracking devices for under 16s.
- Police should be armed with guns.
- Should PE in school be compulsory?

## 6. Persuasive Techniques

**Alliteration:** starting 2 or more words with the same letter.

**Anecdote:** a short story to support your idea

**Pronouns:** I, you, he, she, we

**Facts:** something proven to be true

**Opinion:** a personal view.

**Repetition:** using the same word/phrase more than once.

**Rhetorical Questions:** a question that doesn't require an answer but encourages deeper thought.

**Exaggeration:** making an over the top statement.

**Emotive Language:** language that is designed to evoke an emotional response.

**Statistics:** numerical fractions and percentages.

**Threes:** using three words/phrases to support or describe.





# THS

TIVERTON HIGH SCHOOL

**Year 9**

**French**

**Work hard. Be kind. Belong.**

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## Grammar

## G1: Infinitive verbs

Regular verbs (follow patterns)

|           |           |
|-----------|-----------|
| Écouter   | to listen |
| Regarder  | to watch  |
| Bavarder  | to chat   |
| Visiter   | to visit  |
| Étudier   | to study  |
| Nager     | to swim   |
| Manger    | to eat    |
| Commencer | to start  |
| Enseigner | to teach  |
| Porter    | to wear   |
| Finir     | to finish |
| Apprendre | to learn  |

Irregular verbs (break pattern rules)

|       |         |
|-------|---------|
| Aller | to go   |
| Faire | to do   |
| Avoir | to have |
| Être  | to be   |
| Lire  | to read |
| Voir  | to see  |

Modal verbs (use these verbs with an infinitive)

|         |               |
|---------|---------------|
| Pouvoir | to be able to |
| Devoir  | to have to    |

## Vocabulary

## G2: Articles and genders

| M  | F     | Pl  | meaning |
|----|-------|-----|---------|
| Le | La    | Les | The     |
| Un | Une   |     | A       |
| Du | De la | des | some    |

An adjective modifies a noun.

## G3: Adjectives

| M        | MPL      | F         | Fpl        | Meaning  |
|----------|----------|-----------|------------|----------|
| bavard   | bavards  | bavarde   | bavarde    | chatty   |
| sympa    | sympa    | sympa     | sympa      | Nice     |
| créatif  | créatifs | créative  | créatives  | Creative |
| ennuyeux | ennuyeux | ennuyeuse | ennuyeuses | Boring   |
| gentil   | gentils  | gentille  | gentille   | Kind     |
| ancien   | anciens  | ancienne  | anciennes  | old      |

## Pronunciation

## Pronunciation (you see/say) P1

|   |      |    |        |     |         |
|---|------|----|--------|-----|---------|
|   |      |    |        |     |         |
| a | "ah" | r  | "ruh"  | th  | "tuh"   |
| à | "ah" | rr | "rrrr" | gn  | "nuh"   |
| y | "ee" | ç  | "ss"   | ien | "eeahn" |

## V1: Connectives

|           |             |
|-----------|-------------|
| et and    | car because |
| mais but  | ou or       |
| parce que | because     |
| cependant | however     |

## V2 Intensifiers

|              |              |
|--------------|--------------|
| Vraiment     | truly/really |
| Vachement    | really       |
| Absolument   | absolutely   |
| Complètement | completely   |
| Totalement   | totally      |
| Tellement    | so/rather    |
| Très         | very         |
| Assez        | quite        |
| Un peu       | a bit        |



# Y9 French KO2: The essentials: Tenses: The present tense (for actions happening **at the moment**)

## Grammar

## Vocabulary

jouer

visiter

écouter

bavarder

regarder

finir

manger

vendre

### G1: The present tense of **regular verbs**

These are verbs that follow a pattern

| ER verbs<br>Jouer (to play)                                                                                         | Ir verbs<br>Finir (to finish) | RE verbs<br>Vendre (to sell) |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------|
| Remove last 2 letters from each infinitive to make the verb <b>stem</b> and then add the following <b>endings</b> . |                               |                              |
| Je _____e                                                                                                           | Je _____is                    | Je _____s                    |
| Tu _____es                                                                                                          | Tu _____is                    | Tu _____s                    |
| Il/elle/on _____e                                                                                                   | Il/elle/on _____it            | Il/elle/on _____             |
| Nous _____ons                                                                                                       | Nous _____issons              | Nous _____ons                |
| Vous _____ez                                                                                                        | Vous _____issez               | Vous _____ez                 |
| Ils/elles _____ent                                                                                                  | Ils/elles _____issent         | Ils/elles _____ent           |

#### Example sentence

Normalement **je joue** au tennis.  
*Normally I play tennis.*

### V1: adverbs of time

|             |           |
|-------------|-----------|
| Aujourd'hui | Today     |
| Normalement | Normally  |
| D'habitude  | Typically |

avoir

### G2: The present tense of **irregular verbs**

These are verbs that **DO NOT** follow a pattern

être

| Avoir<br>To have     | Être<br>To be         | Faire<br>To do/make     | Aller<br>To go |
|----------------------|-----------------------|-------------------------|----------------|
| J'ai                 | Je <b>suis</b>        | Je <b>fais</b>          | Je vais        |
| Tu as                | Tu <b>es</b>          | Tu <b>fais</b>          | Tu vas         |
| Il/elle/on a         | Il/elle/on <b>est</b> | Il/elle/ on <b>fait</b> | Il/elle va     |
| Nous <b>avons</b>    | Nous <b>sommes</b>    | Nous <b>faisons</b>     | Nous allons    |
| Vous <b>avez</b>     | Vous <b>êtes</b>      | Vous <b>faites</b>      | Vous allez     |
| Ils/elles <b>ont</b> | Ils/elles <b>sont</b> | Ils/elles <b>font</b>   | Ils/ells vont  |

#### Example sentence

**J'ai** une soeur elle **est** grande.  
*I have a sister and she is tall*

pouvoir

devoir

### G3: The present tense of **modal verbs**

| Pouvoir<br>To be able to                                              | Devoir<br>To have to     |
|-----------------------------------------------------------------------|--------------------------|
| These verbs are <b>always followed</b> by an <b>infinitive verb</b> . |                          |
| Je <b>peux</b>                                                        | Je <b>dois</b>           |
| Tu <b>peux</b>                                                        | Tu <b>dois</b>           |
| Il/elle/on <b>peut</b>                                                | Il/elle/on <b>doit</b>   |
| Nous <b>pouvons</b>                                                   | Nous <b>devons</b>       |
| Vous <b>pouvez</b>                                                    | Vous <b>devez</b>        |
| Ils/elles <b>peuvent</b>                                              | Ils/elles <b>doivent</b> |

faire

aller

#### Example sentence

Normalement on peut aller en ville  
*Normally we can go into town*



# Y9 French KO3: The essentials: Tenses: The perfect, near future and conditional tenses

## Grammar

## Vocabulary

### V2: past adverbs of time

|                     |              |
|---------------------|--------------|
| Hier                | Yesterday    |
| Le weekend dernier  | Last weekend |
| La semaine dernière | Last week    |

### V3: future adverbs of time

|                      |              |
|----------------------|--------------|
| Demain               | Tomorrow     |
| Le weekend prochain  | Next weekend |
| La semaine prochaine | Next weekend |

### V4: In an ideal world

|                            |                          |
|----------------------------|--------------------------|
| Dans un monde idéale       | In an ideal world        |
| Dans la ville de mes rêves | In the town of my dreams |
| Si c'était possible        | If it were possible      |

### G4: The perfect tense

Describes an action that is **finished or completed**.

### G5: The near future tense

Describes an action that **is going to happen in the near future**

### G6: The conditional tense

Describes an action that **would happen in an ideal situation**

| Take a bit of <b>avoir</b> | Add a <b>past participle</b> | Take a bit of <b>être</b> | Add a <b>past participle</b>                                                                                                       |
|----------------------------|------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| J'ai                       | joué (played)                | Je suis                   | Allé (e) (s) (went)                                                                                                                |
| Tu as                      | Visité (visited)             | Tu es                     |                                                                                                                                    |
| Il/elle/on a               | Bavardé (chatted)            | Il/elle/on est            | Sorti (e) (s) went out                                                                                                             |
| Nous avons                 | Regardé (watched)            | Nous sommes               |  <b>These past participles need agreements</b> |
|                            | Écouté (listened)            |                           |                                                                                                                                    |
|                            | Mangé (ate)                  |                           |                                                                                                                                    |
|                            | Fait (did/made)              |                           |                                                                                                                                    |
|                            | Lu (read)                    |                           |                                                                                                                                    |
|                            | Vu (saw)                     |                           |                                                                                                                                    |
|                            | Bu (drank)                   |                           |                                                                                                                                    |

| Take a bit of <b>aller</b> | Add an <b>infinitive</b> |
|----------------------------|--------------------------|
| Je vais                    | Jouer (to play)          |
| Tu vas                     | Visitier (to visit)      |
| Il/elle/on va              | Bavarder (to chat)       |
| Nous allons                | Regarder (to watch)      |
|                            | Écouter (to listen)      |
|                            | Manger (to eat)          |
|                            | Faire (to do/make)       |
|                            | Lire (to read)           |
|                            | Voir (to see)            |
|                            | Boire (to drink)         |
|                            | Aller (to go)            |
|                            | Sortir (to go out)       |

| Add the <b>infinitive</b> to the pronoun<br>E.g: jouer | Add an <b>these conditional tense endings</b>                                                                                                                                                                               |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Je jouer                                               | Je.....ais                                                                                                                                                                                                                  |
| Tu jouer                                               | Tu.....ais                                                                                                                                                                                                                  |
| Il/elle/on jouer                                       | Il/elle/on.....ait                                                                                                                                                                                                          |
| Nous jouer                                             | Nous.....ions                                                                                                                                                                                                               |
|                                                        | Vous.....iez                                                                                                                                                                                                                |
|                                                        | Ils/elles.....aient                                                                                                                                                                                                         |
|                                                        |  These verbs have irregular stems. Use the stem then add the ending above:<br>Aller-----ir être-----ser<br>Faire-----fer avoir-----aur |
|                                                        |                                                                                                                                                                                                                             |
|                                                        |                                                                                                                                                                                                                             |

#### Example sentence

Hier **je suis allée** en ville and **j'ai visité** le musée.  
*Yesterday I went into town and I visited the museum.*

#### Example sentence

Demain **je vais regarder** un film  
*Tomorrow I am going to watch a film.*

#### Example sentence

Si c'était possible, je jouerais au tennis.  
*If it were possible, I would play tennis..*



# Y9 French KO4: Que fais-tu pendant ton temps libre? (What do you do in your free time ?)

## Grammar

### Grammar G1: key verbs Jouer & faire with prepositions

|                                                         |                                                     |
|---------------------------------------------------------|-----------------------------------------------------|
| <u>Jouer + au + ball sport</u><br>Jouer au rugby        | <u>Faire du + sport</u><br>Faire du canoe-Kayak     |
| <u>Jouer + à la + ball sport</u><br>Jouer à la pétanque | <u>Faire de la + sport</u><br>Faire de la natation  |
| <u>Jouer + aux</u><br>Jouer aux boules                  | <u>Faire de l' + sport</u><br>Faire de l'équitation |
|                                                         | <u>Faire des + sport</u><br>Faire des randonnées    |

### Book genres V2

|              |            |
|--------------|------------|
| Un roman     | A novel    |
| Un livre     | A book     |
| Un BD        | A comic    |
| Une magazine | A magazine |
| Une article  | An article |

### Pronunciation (you see, you say) P1

|                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| gn                                                                                  | "nuh"                                                                               |
| th                                                                                  | "tuh"                                                                               |
| r                                                                                   | "ruh"                                                                               |
| Silent final s/t                                                                    | nothing                                                                             |

## Vocabulary

### TV programmes V1



### G3: adjectives

|                        |                                |                        |                           |                       |
|------------------------|--------------------------------|------------------------|---------------------------|-----------------------|
| Rigolo<br><i>funny</i> | Passionnant<br><i>exciting</i> | Génial<br><i>great</i> | Ennuyeux<br><i>boring</i> | Nul<br><i>rubbish</i> |
|------------------------|--------------------------------|------------------------|---------------------------|-----------------------|

### Adverbs of frequency V3

#### Tous les jours

Toujours  
Souvent  
Quelquefois/parfois  
De temps en temps  
Une fois par semaine  
Rarement  
Jamais

every day  
always  
often  
sometimes  
from time to time  
once a week  
rarely  
never



## Pronunciation

### G2 Places (at the / in/ on/ at the house of)

|                                                      |                                                                  |
|------------------------------------------------------|------------------------------------------------------------------|
| <u>Au</u><br>Au terrain de foot<br>Au centre sportif | <u>À la</u><br>À la piscine<br>À la bibliothèque                 |
| <u>En</u><br>En ville<br>En ligne                    | <u>Sur</u><br>Sur l'internet<br>Sur mon portable<br>Sur WhatsApp |
| <u>Dans</u><br>Dans ma chambre<br>Dans un café       | <u>Chez</u><br>Chez moi / nous<br>Chez elle / lui                |

### Sequencers V4

|                    |                               |                    |                               |
|--------------------|-------------------------------|--------------------|-------------------------------|
| D'abord<br>Ensuite | <i>firstly</i><br><i>next</i> | puis<br>finalement | <i>then</i><br><i>finally</i> |
|--------------------|-------------------------------|--------------------|-------------------------------|

### Opinions V5



Je pense que  
Je trouve que  
J'ai horreur de  
Je crois que  
A mon avis  
Je le/la/les trouve...

I think that  
I find that  
I cannot stand  
I believe that  
In my opinion  
I find it/them





# Y9 French KO5: Comment est la vie au collège? (what is school life like?)

## Grammar

### V1: school subjects

|                     |                        |
|---------------------|------------------------|
| Les matières        | <i>School subjects</i> |
| L'anglais           | <i>English</i>         |
| L'espagnol          | <i>Spanish</i>         |
| L'allemande         | <i>German</i>          |
| La technologie      | <i>DT</i>              |
| L'informatique      | <i>ICT</i>             |
| Les sciences        | <i>science</i>         |
| Le français         | <i>French</i>          |
| Le dessin           | <i>art</i>             |
| Les arts plastiques | <i>art</i>             |
| L'emploi du temps   | <i>timetable</i>       |
| La récréation       | <i>breaktime</i>       |

La musique *music*  
 La cuisine *Food tech*  
 Les maths *maths*  
 Le théâtre *drama*  
 L'EPS *PE*



## Vocabulary

### V4 : Opinions

Je pense que  
 Je trouve que  
 J'ai horreur de  
 Je crois que  
 A mon avis  
 Je le/la/les trouve...  
 Ma matière préférée

I think that  
 I find that  
 I cannot stand  
 I believe that  
 In my opinion  
 I find it/them  
 My favourite subject

G3: Key verbs  
 étudier *to study*  
 apprendre *to learn*  
 enseigner *to teach*

### G1: Modal verbs (can, must, it is necessary to)

| Modal verb                                         | Infinitive phrase                                                                                 |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------|
| On peut<br>On doit<br>Il faut                      | porter un uniforme scolaire<br>arriver à l'heure<br>utiliser les portables<br>harcéler les autres |
| On ne peut pas<br>On ne doit pas<br>Il ne faut pas | porter des bijoux<br>avoir du maquillage<br>avoir son équipement                                  |

### G2: Adjectives

|                   |                      |             |                    |
|-------------------|----------------------|-------------|--------------------|
| Compréhensif (ve) | <i>understanding</i> | Barbant     | <i>boring</i>      |
| Rigolo            | <i>funny</i>         | Sévère      | <i>strict</i>      |
| Sympa             | <i>nice</i>          | Stressé (e) | <i>stressed</i>    |
| Utile             | <i>useful</i>        | Agaçant (e) | <i>annoying</i>    |
| Facile            | <i>easy</i>          | Inutile     | <i>useless</i>     |
| Stimulant (e)     | <i>stimulating</i>   | Compiqué(e) | <i>complicated</i> |
| Pratique          | <i>practical</i>     |             |                    |

### V3: telling the time

#### Mon horloge française



### V2: numbers

|    |           |
|----|-----------|
| 10 | Dix       |
| 20 | Vingt     |
| 30 | Trente    |
| 40 | Quarante  |
| 50 | cinquante |



# Y9 French KO6 Comment est ta ville? (what is your town like?)

## Grammar

### V1: places in town

|                             |                               |
|-----------------------------|-------------------------------|
| Un château                  | <i>a castle</i>               |
| Un musée                    | <i>a museum</i>               |
| Un théâtre                  | <i>a theatre</i>              |
| Un jardin publique          | <i>a public garden</i>        |
| Un collège                  | <i>a high school</i>          |
| Une église                  | <i>a church</i>               |
| Une stade                   | <i>a stadium</i>              |
| Une cathédrale              | <i>a cathedral</i>            |
| Une centre commerciale      | <i>a business centre</i>      |
| Une grande surface          | <i>a shopping mall</i>        |
| Une piscine                 | <i>a swimming pool</i>        |
| Des magasins                | <i>some shops</i>             |
| Des bâtiments               | <i>some buildings</i>         |
| Des installations sportives | <i>some sports facilities</i> |

## Vocabulary

### G1: Key verbs

|             |                      |
|-------------|----------------------|
| Il y a      | <i>there is/are</i>  |
| avoir       | <i>to have</i>       |
| être        | <i>to be</i>         |
| voir        | <i>to see</i>        |
| visiter     | <i>to visit</i>      |
| pouvoir     | <i>to be able to</i> |
| se relaxer  | <i>to relax</i>      |
| se promener | <i>to walk</i>       |

### G2: Adjectives

|                 |                     |                |                   |
|-----------------|---------------------|----------------|-------------------|
| animé(e)        | <i>lively</i>       | bruyant(e)     | <i>noisy</i>      |
| agréable        | <i>pleasant</i>     | désagréable    | <i>unpleasant</i> |
| divertissant(e) | <i>entertaining</i> | déprimant(e)   | <i>depressing</i> |
| tranquille      | <i>peaceful</i>     | affreux (euse) | <i>awful</i>      |
| passionnant(e)  | <i>exciting</i>     | laid(e)        | <i>ugly</i>       |
| pittoresque     | <i>picturesque</i>  | ancien(ne)     | <i>old</i>        |
| beau (belle)    | <i>beautiful</i>    |                |                   |

### V2 Opinions

|                        |                 |
|------------------------|-----------------|
| Je pense que           | I think that    |
| Je trouve que          | I find that     |
| J'ai horreur de        | I cannot stand  |
| Je crois que           | I believe that  |
| A mon avis             | In my opinion   |
| Je le/la/les trouve... | I find it/ them |
| Une perte de temps     | A waste of time |

### G3 Comparative adjectives

|                 |             |
|-----------------|-------------|
| Plus...que      | More...than |
| Moins...que     | Less...than |
| Aussi ...que    | as...as     |
| Meilleur(e) que | better than |
| Pire que        | worse than  |

### V2: Connectives

|          |              |
|----------|--------------|
| Pourtant | <i>yet</i>   |
| Ou       | <i>or</i>    |
| Où       | <i>where</i> |
| Quand    | <i>when</i>  |
| Si/ s'   | <i>if</i>    |

### V3: Weather

|                                                                                     |                   |                                                                                       |                 |
|-------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------|-----------------|
|  | Il y a du soleil  |  | Il fait du vent |
|  | Il y a des nuages |  | Il neige        |
|  | Il y a des orages |  | Il pleut        |
|  | Il fait chaud     |                                                                                       |                 |
|  | Il fait froid     |                                                                                       |                 |

### P1 Pronunciation

|                                                                                       |                                                                                       |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |
| Y                                                                                     | "ee"                                                                                  |
| ien                                                                                   | "eeahn"                                                                               |
| th                                                                                    | "tuh"                                                                                 |
| Silent final<br>s, t, d, x                                                            | nothing                                                                               |

### G4: Negatives

|                 |              |
|-----------------|--------------|
| Ne...pas        | Not          |
| Ne ...rien      | nothing      |
| Ne...ni         | neither, nor |
| Ne....jamais    | never        |
| Ne...plus       | no longer    |
| Ne ... aucun(e) | not a single |
| Ne...que        | only         |



# Y9 French KO7: Quel film as-tu vu récemment? (what film have you seen recently?)

## Grammar

## Vocabulary

## Pronunciation

### V1: Film genres

|                            |                          |
|----------------------------|--------------------------|
| Un film policier           | <i>a thriller</i>        |
| Un film comique            | <i>a comedy</i>          |
| Un film d'horreur          | <i>a horror film</i>     |
| Un film d'action           | <i>an action film</i>    |
| Un film de science-fiction | <i>a sci-fi film</i>     |
| Un film de guerre          | <i>a war film</i>        |
| Un film d'animation        | <i>an animated film</i>  |
| Un film d'amour            | <i>a romantic film</i>   |
| Un film fantastique        | <i>a fantasy film</i>    |
| Un film d'aventure         | <i>an adventure film</i> |

### G1: Adjectives

|                          |                     |                           |                      |
|--------------------------|---------------------|---------------------------|----------------------|
| <i>divertissant(e)</i>   | <i>entertaining</i> | <i>effrayant(e)</i>       | <i>scary</i>         |
| <i>exceptionnel (le)</i> | <i>exceptional</i>  | <i>Choquant (e)</i>       | <i>shocking</i>      |
| <i>passionnant(e)</i>    | <i>exciting</i>     | <i>Terrible</i>           | <i>terrible</i>      |
| <i>Incroyable</i>        | <i>incredible</i>   | <i>Imprévisible</i>       | <i>unpredictable</i> |
| <i>prenant(e)</i>        | <i>gripping</i>     | <i>agaçant(e)</i>         | <i>annoying</i>      |
| <i>fascinant(e)</i>      | <i>fascinating</i>  | <i>peu convaincant(e)</i> | <i>unconvincing</i>  |
| <i>prévisible</i>        | <i>predictable</i>  | <i>ennuyeux (euse)</i>    | <i>boring</i>        |
| <i>Sensationnel (le)</i> | <i>sensational</i>  |                           |                      |
| <i>drôle</i>             | <i>funny</i>        |                           |                      |

### P1 Pronunciation

|                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| a                                                                                   | "ah"                                                                                |
| rr                                                                                  | "rrr"                                                                               |
| ç                                                                                   | "ss"                                                                                |
| y                                                                                   | "ee"                                                                                |
| Silent final s, t, x                                                                | nothing                                                                             |

### V1: The specifics of a film

|             |                     |                     |                            |
|-------------|---------------------|---------------------|----------------------------|
| Le conflit  | <i>conflict</i>     | la violence         | <i>the violence</i>        |
| L'amour     | <i>love</i>         | la politique        | <i>the politics</i>        |
| Le début    | <i>the start</i>    | la romance          | <i>the romance</i>         |
| L'histoire  | <i>the story</i>    | La bande sonore     | <i>the sound track</i>     |
| La lutte    | <i>the fight</i>    | les effets spéciaux | <i>the special effects</i> |
| L'amitié    | <i>friendship</i>   | les blagues         | <i>the jokes</i>           |
| L'histoire  | <i>the story</i>    | les vedettes        | <i>the stars</i>           |
| La suspense | <i>the suspense</i> | les acteurs         | <i>the actors</i>          |
| La fin      | <i>the ending</i>   | les extras          | <i>the extras</i>          |

### V2 Opinions

|                        |                     |
|------------------------|---------------------|
| Je pense que           | I think that        |
| Je trouve que          | I find that         |
| J'ai horreur de        | I cannot stand      |
| Selon moi              | according to me     |
| A mon avis             | In my opinion       |
| Je le/la/les trouve... | I find it/ them     |
| Il me semble que       | it seems to me that |

### G2: Key verbs

|             |                      |
|-------------|----------------------|
| voir        | <i>to see</i>        |
| regarder    | <i>to watch</i>      |
| jouer       | <i>to play</i>       |
| se dérouler | <i>to take place</i> |
| conseiller  | <i>to advise</i>     |
| recommander | <i>to recommend</i>  |





# THS

TIVERTON HIGH SCHOOL

## **Year 9**

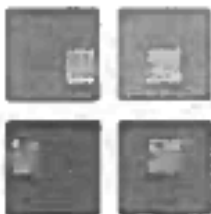
## **German**

**Work hard. Be kind. Belong.**

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# Year 9 German



## SentenceBuilders

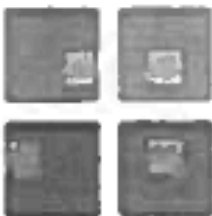
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## 1. Beschreib dein Handy

|                                                                                                                                                               |                                                                                                                                                 |                                                                                               |                                                                                                                                                                                                                                                                             |                                                                     |                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <p>Mein Handy ist (My phone is)</p> <p>Ich habe (I have)</p> <p>Mein Freund hat (My [male] friend has)</p> <p>Meine Freundin hat (My [female] friend has)</p> | <p>ein graues (a grey)</p> <p>ein schwarzes (a black)</p> <p>ein blaues (a blue)</p> <p>ein weißes (a white)</p> <p>ein silberes (a silver)</p> | <p>iPhone (iPhone)</p> <p>Samsung (Samsung)</p> <p>OnePlus (OnePlus)</p> <p>Nokia (Nokia)</p> | <p>und es ist (and it is)</p> <p>und ich denke es ist (and I think it is)</p> <p>und meiner Meinung nach ist es (and in my opinion it is)</p> <p>und laut meinen Freunden ist es (and as far as my friends are concerned it is)</p> <p>und ich finde es (and I find it)</p> | <p>ziemlich (quite)</p> <p>sehr (very)</p> <p>wirklich (really)</p> | <p>modern. (modern.)</p> <p>altmodisch. (old-fashioned.)</p> <p>nützlich. (useful.)</p> <p>nutzlos. (useless.)</p> <p>cool. (cool.)</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|



# Year 9 German



**SentenceBuilders**

Powered by  **THE LANGUAGE GYM**

## 4. Was hast du neulich mit deinem Handy gemacht?

|                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Letztes Wochenende,</b><br/>(Last weekend,)</p> <p><b>Gestern,</b><br/>(Yesterday,)</p> <p><b>Letzte Woche,</b><br/>(Last week,)</p> <p><b>Gestern Abend,</b><br/>(Yesterday evening,)</p> <p><b>Vor zwei Tagen,</b><br/>(Two days ago,)</p> | <p><b>nachdem ich mein Abendessen gegessen hatte,</b><br/>(after I had eaten my dinner,)</p> <p><b>nachdem ich meine Hausaufgaben gemacht hatte,</b><br/>(after I had done my homework,)</p> <p><b>nachdem ich meine Großeltern besucht hatte,</b><br/>(after I had visited my grandparents,)</p> <p><b>nachdem ich Zuhause geholfen hatte,</b><br/>(after I had helped at home,)</p> <p><b>nachdem ich nach Hause gekommen war,</b><br/>(after I had returned home,)</p> | <p><b>habe ich getwittert.</b><br/>(I tweeted.)</p> <p><b>habe ich ein Video auf TikTok hochgeladen.</b><br/>(I uploaded a video to TikTok.)</p> <p><b>habe ich mit meinen Freunden geplaudert.</b><br/>(I chatted with my friends.)</p> <p><b>habe ich Musik per Spotify gehört.</b><br/>(I listened to music on Spotify.)</p> <p><b>habe ich gewhatsappt.</b><br/>(I sent some messages via Whatsapp.)</p> <p><b>habe ich Fotos per Instagram geteilt.</b><br/>(I shared photos on Instagram.)</p> <p><b>habe ich einen Film durch Amazon Prime gesehen.</b><br/>(I watched a film on Amazon Prime.)</p> <p><b>habe ich Clash Royale online gespielt.</b><br/>(I played Clash Royale online.)</p> <p><b>habe ich ein Video auf YouTube gesehen.</b><br/>(I saw a video on YouTube.)</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# Year 9 German



## 3. Wie wirst du das Internet benutzen?

|                                                                                                                                                                                           |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Heute Abend, (This evening,)</p> <p>Später, (Later on,)</p> <p>Nach der Schule, (After school,)</p> <p>Nachdem ich meine Hausaufgaben gemacht habe, (After I've done my homework,)</p> | <p>werde ich (I'm going)</p> <p>will ich (I want)</p> <p>möchte ich (I would like)</p> | <p>bloggen (to blog)</p> <p>mit meinen Freunden chatten (to chat with my friends)</p> <p>Musik hören (to listen to music)</p> <p>Fotos und Videos teilen (to share photos and videos)</p> <p>Filme sehen (to watch films)</p> <p>Lieder herunterladen (to download songs)</p> <p>Fotos machen (to take photos)</p> <p>FIFA 22 online spielen (play FIFA 22 online)</p>                        |
|                                                                                                                                                                                           | <p>habe ich vor, (I intend)</p> <p>hoffe ich, (I hope)</p>                             | <p>zu bloggen (to blog)</p> <p>mit meinen Freunden zu chatten (to chat with my friends)</p> <p>Musik zu hören (to listen to music)</p> <p>Fotos und Videos zu teilen (to share photos and videos)</p> <p>Filme zu sehen (to watch films)</p> <p>Lieder herunterzuladen (to download songs)</p> <p>Fotos zu machen (to take photos)</p> <p>FIFA 22 online zu spielen (play FIFA 22 online)</p> |





*2. Was sind die Vorteile von sozialen Netzwerken?*

|                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Laut mir, (According to me,)</p> <p>Meiner Meinung nach, (In my opinion,)</p> <p>Soweit ich weiss, (As far as I know,)</p> <p>Um ehrlich zu sein, (To be honest,)</p> <p>Ehrlich gesagt, (Honestly,)</p> | <p>sind die Vorteile, dass (the advantages are that)</p> <p>sind die Vorteile von soziale Medien, dass (the advantages of social media are that)</p> <p>sind die Vorteile, soziale Medien zu benutzen, dass (the advantages of using social media are that)</p> | <p>man sich entspannen kann (you can relax)</p> <p>man chatten kann (you can chat)</p> <p>man neue Freunde kennenlernen kann (you can find new friends)</p> <p>man seine Meinungen teilen kann (you can share your opinions)</p> <p>man Rat geben und bekommen kann (you can give and receive advice)</p> <p>man Fotos teilen kann (one can share photos)</p> <p>man Videos hochladen kann (one can upload videos)</p> <p>man Podcasts hören und Blogs lesen kann (you can listen to podcasts and read blogs)</p> <p>man Leute treffen kann, die die gleichen Interessen wie du haben (you can meet people who are interested in the same things as you)</p> <p>man einfach mit Freunden in Kontakt bleiben kann (one can stay in contact with friends easily)</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

*2. Was sind die Nachteile von sozialen Medien?*

|                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Nichtsdestotrotz,</b><br/>(Nevertheless,)</p> <p><b>Im Gegenteil,</b> (On the contrary,)</p> <p><b>Andererseits,</b> (On the other hand,)</p> <p><b>Jedoch,</b> (However,)</p> | <p><b>sind die Nachteile, dass</b> (the disadvantages are that)</p> <p><b>sind die Nachteile von soziale Medien, dass</b> (the disadvantages of social media are that)</p> <p><b>sind die Nachteile, soziale Medien zu benutzen, dass</b> (the disadvantages of using social media are that)</p> | <p><b>es das Problem von Trolling gibt</b> (there is the problem of trolling)</p> <p><b>man süchtig werden kann</b> (you can become addicted)</p> <p><b>Teenager abhängig von ihren Handys werden könnten</b><br/>(teenagers could become dependent on their phones)</p> <p><b>Jugendliche Opfer von Cyber-Bullying werden könnten</b> (young people could become a victim of cyber-bullying)</p> <p><b>man Opfer von Internetkriminalität sein könnte</b> (you could be a victim of internet crime)</p> <p><b>man keine Privatsphäre mehr hat</b> (you don't have privacy any more)</p> <p><b>man den Inhalt von Webseiten nicht kontrollieren kann</b> (you cannot control the content of websites)</p> <p><b>man Opfer von Cybergrooming sein könnte</b> (you could be a victim of online grooming)</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|





# THS

TIVERTON HIGH SCHOOL

## **Year 9**

## **Geography**

**Work hard. Be kind. Belong.**

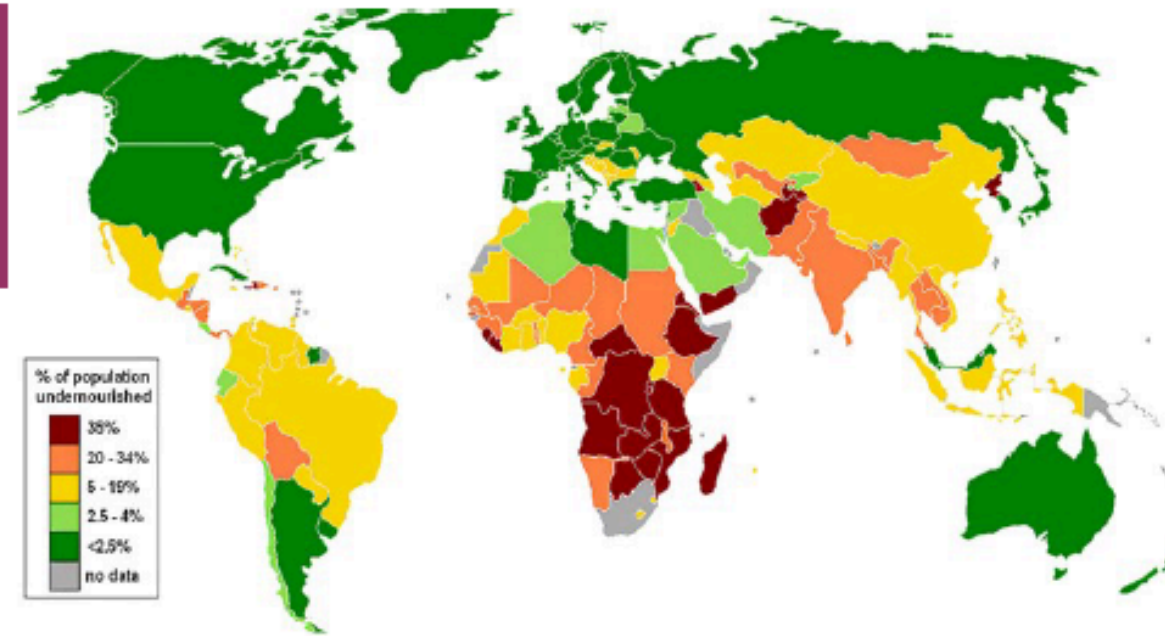
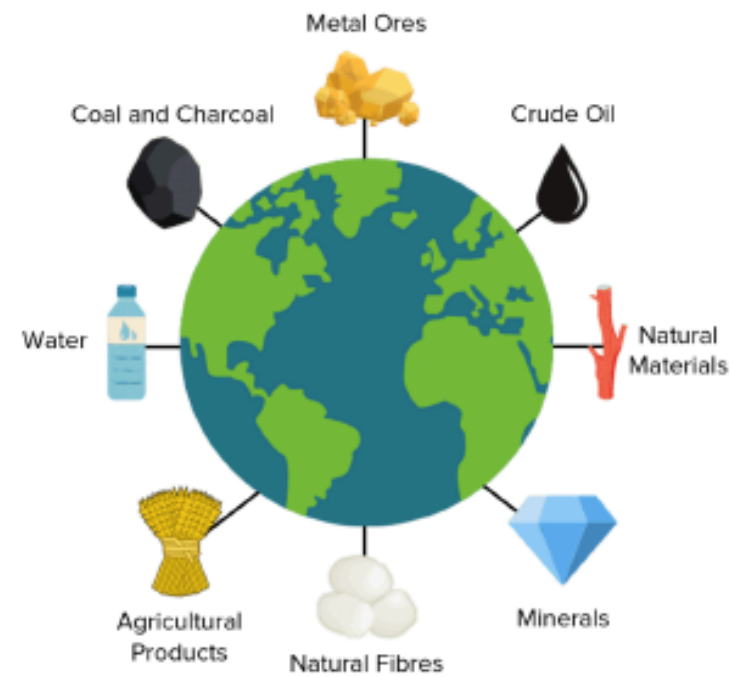
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# GEOGRAPHY 9.3 Resources & Issues

## 1. Resources are anything that we use to meet our wants and needs

We all consume resources on a constant basis as we go about our daily lives. Some are essential—such as food, water and energy, whilst others are important for economic reasons as they are valuable. Resources are useful for a massive variety of reasons depending on what they are.

Water, for example, is used for drinking, washing, sanitation, energy production, clothes manufacturing, cement and concrete making, agriculture, leisure, fishing, heating, transport... and so on!



## 2. Uneven global access to resources

The distribution of resources is very uneven across the world. For example, some countries have huge reserves of energy resources such as coal and oil, whilst others rely on importing it from others. The choropleth map above shows the % of country's population who are undernourished; this means the amount of people who have an insufficient amount and/or quality of food to be healthy. You will notice that the wealthier countries (see North America or western Europe) have no issues with undernourishment, whilst the poorest countries of the world (see sub-Saharan Africa) clearly do not have the wealth to access the basic resources—such as food in this case.

The distribution of resources is very uneven across the world. For example,

## 3. 4. & 5. Environmental impacts

### Air Pollution (CLIMATE CHANGE)

Deforestation for human use of land clearance, is changing the natural balance of life on Earth. The removal of vast forested areas changes biodiversity, changes the composition of the atmosphere, and changes the local and global climates of Earth.



### Water Pollution (OCEAN HEALTH)

Industrial areas in many LICs and NEEs can create major river pollution when chemicals used in factories is dumped into the rivers. In other cases, rivers after often treated by people as places to dispose of their waste. Ultimately, pollution ends up in the sea. 6% of the world's plastic waste ends up in the oceans. In addition, climate change is causing stress to the fragile marine environment—especially coral reefs.



### Land degradation (DESERTIFICATION)

Desertification means to make an area of land (usually on the fringes of existing deserts) become a desert. Desertification is not a natural process, but as a result of human activity; degrading the soil to the point of ecological failure by over grazing, poor land management, over cultivation and deforestation for fuel wood.



## 8. Mitigation or Adaptation?

The concept: Why do we put a seatbelt on in a car? Well, it won't prevent a crash, but it will reduce the impact of one. This is how **mitigation** works; it is the act of reducing the (negative) impacts of an event. **Adaptation** is knowing an event is happening (or going to happen) and adjusting what we do to prevent the event or, change the way we operate because it is having an impact.

Take climate change for example; it is happening in the present, and will continue to do so into the future. Therefore we need to **mitigate** against the causes of climate change by switching energy sources away from fossil fuels to renewable sources, and go about a global afforestation scheme. Meanwhile, countries particularly at risk to sea level rise (as a result of climate change) have to **adapt** their landscapes to cope with higher future sea levels by defending the coastline.

### The Enhanced Greenhouse Effect

The thin atmosphere around Earth acts like the glass on a greenhouse. Incoming UV radiation passes through the glass and outgoing IR radiation (heat) does not. The outcome is heat gets trapped inside the greenhouse. This process happens naturally thanks to the greenhouse gases such as CO<sub>2</sub> (Carbon Dioxide) and CH<sub>4</sub> (Methane) being in the atmosphere absorbing heat (like the glass prevents heat from leaving the greenhouse). The process is becoming more enhanced due to human activity changing the balance of these gases; the consequence is climate change.

### Sources of greenhouse gases from Human Activity (Economic Sector):

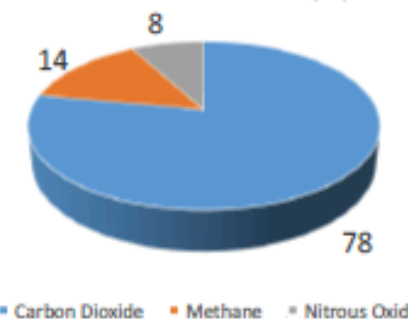


Our demand for fossil fuels for energy, transport and industry lead to vast amounts of CO and NOx being released into the atmosphere. At the same time, our use of the land through agriculture, water use and forestry create huge amounts of emissions in CH—as well as the other two key greenhouse gases. It is our resource use that is changing the concentration of these gases in the atmosphere; thus changing the climate in the shortest time ever recorded.

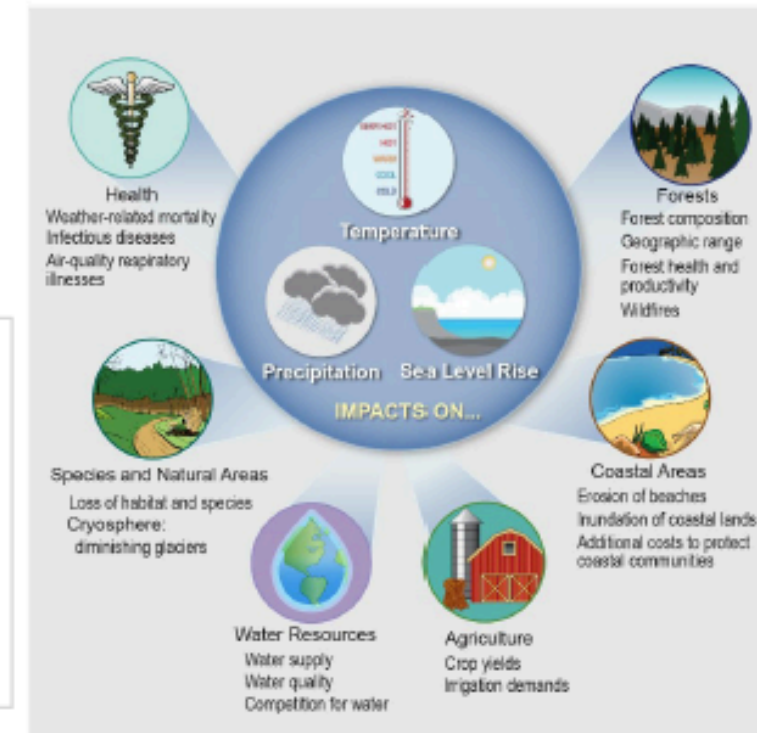
## 6. Human Activity is creating climate change



### Greenhouse Gas Pollutants (%)



## 7. Impacts of climate change





# GEOGRAPHY 9.4. Urbanisation

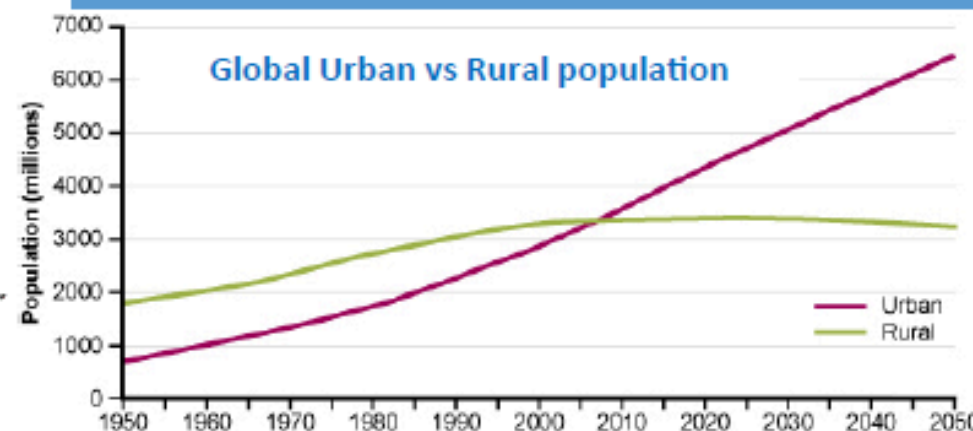
## Topic-relevant countries



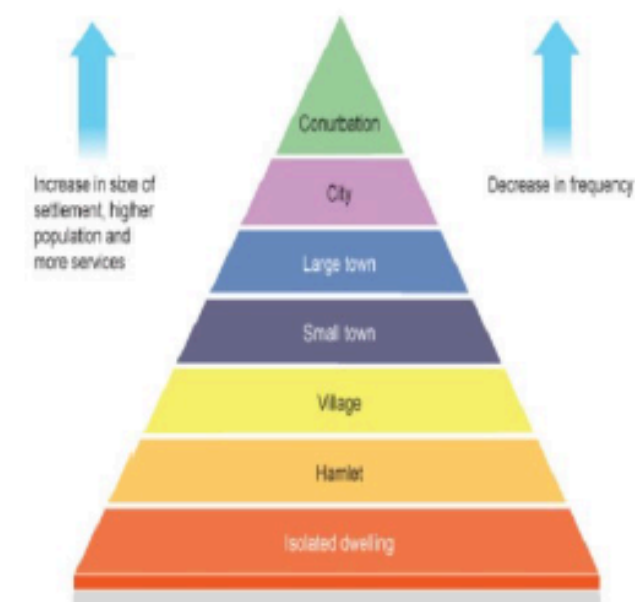
Key:  
1. UK  
2. India  
3. Kenya  
4. Nigeria

## 1. Global trends of urbanisation

Urbanisation is the proportion of population that live in cities. Cities then predominantly grow horizontally or vertically. In 2007 a critical change happened; more people now live in urban areas compared to those that remain in the countryside. Urban living is the future for most humans.



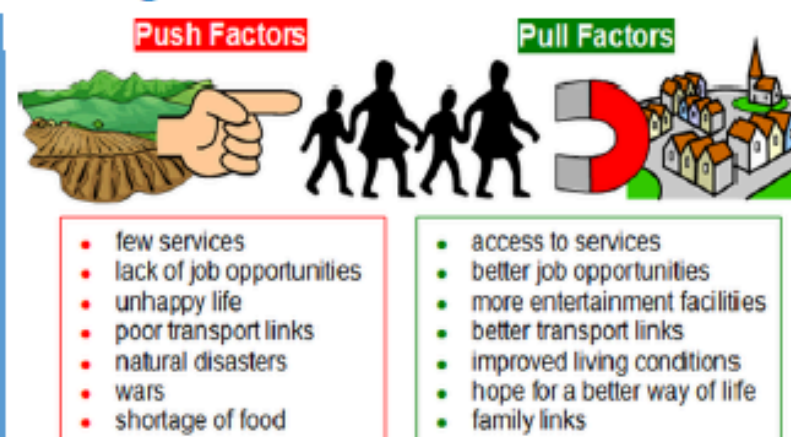
## 3. Settlement hierarchy



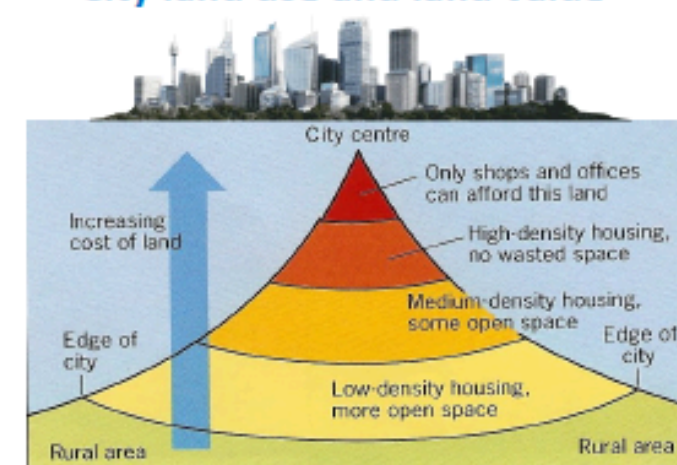
## 4. Settlement Interdependence

Settlements rely on each other; this relationship is called interdependence. For example, cities draw in huge amounts of workers—who live in neighbouring towns and villages—who commute to work daily in the city. However, a village may well be in a National Park for example, and attract city residents as tourists who want to get away from the city.

## 2. Migration: Causes of urbanisation



## City land use and land value



## Urbanisation key terms

urban rural population urbanisation  
hierarchy urban sprawl expansion density  
urban fringe suburbs hamlet village  
town city conurbation megacity com-  
muter redevelopment regeneration gentri-  
fication slum NEE (Newly Emerging Economy)

## 7. Tiverton's EUE

### Eastern Urban Expansion

With the completion of the new junction near Gornhay Cross off of the A361, the Tiverton Eastern Urban Expansion (EUE) will begin in the Autumn 2019.

- Over 2000 new homes
- Community Centre
- Local shops
- Primary School (420 places)
- New employment land

|                |                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------|
| Regeneration   | Economic revival of a city centre                                                                 |
| Redevelopment  | The demolition and rebuilding of brownfield sites (sometimes combined with gentrification)        |
| Gentrification | Modernising a building/area to meet expectations                                                  |
| Mixed Use      | Combining urban retail with hospitality and entertainment                                         |
| Urban Sprawl   | The outward expansion of urban areas from new developments being built on the rural-urban fringe. |
| CBD            | The Central Business District                                                                     |

## 5. Urban Redevelopment—Exeter City Centre's Princesshay

|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exeter | Buildings and Land use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Transport                                                                                                                                                                                                         |
| Before | The Princesshay area of Exeter was originally redeveloped in 1950 after bomb damage during WW2. Shops were small and over time, the buildings began to suffer 'concrete cancer' and fall apart. By 2005, most shops were empty and the area was economically dead.                                                                                                                                                                                                                                                      | 1950s Princesshay was the first pedestrianised shopping area in the UK— a revolution at the time. However, the High Street was still heavily used by buses.                                                       |
| 2007   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                   |
| Exeter | The hugely successful regeneration of Princesshay was opened in 2007 containing new buildings (redeveloped) with larger shops combined with restaurants, cafes and accommodation to broaden the appeal to meet modern expectations of retail, leisure and urban living. Some buildings were 'gentrified' (given a make-over) to bring them up to standard and blend the older with the new. Most however, were flattened and rebuilt. John Lewis gentrified the former Debenhams tower and moved into the city in 2012. | Transport                                                                                                                                                                                                         |
| In     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Pedestrian shopping is still key to modern Princesshay and the High Street remains a bus route—although much restricted. Exeter's bus station is the latest phase of urban change currently underway in the city. |
| 2019   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                   |



# THS

TIVERTON HIGH SCHOOL

## **Year 9 History**

**Work hard. Be kind. Belong.**

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# History Year 9 Knowledge Organiser Autumn Term

## 1) The Rise of the Nazi Party

**Weimar:** The name of the government set up after WW1

**Article 48:** Emergency powers for the president in a crisis

**28<sup>TH</sup> June 1919** - The signing of the treaty of Versailles

**1923** - Hyperinflation (Money becomes worthless)

**8<sup>th</sup> November 1923** - Munich Putsch (Hitler tries to seize power=Failure=Prison)

**1924** - The Dawes Plan (USA lends Germany money=good times return)

**October 1929** - The Wall Street Crash=The Great Depression (There is NO Money)

**July 1932** - Nazis are most popular Party in Germany

**30<sup>th</sup> January 1933** - Hitler made Chancellor of Germany (2<sup>nd</sup> in command)

**27<sup>th</sup> February 1933** - The Reichstag Fire (Communists blamed)

**23<sup>rd</sup> March 1933** - The Enabling Act/Article 48 gives Hitler complete control

## 2) 1929: Wall Street Crash causes Depression in Germany

|            |                                                              |
|------------|--------------------------------------------------------------|
| 1928       | Nazis have 12 seats in The Reichstag                         |
| 1930       | 107 (rises due to The Depression)                            |
| July 1932  | 230 (even more popular. Hitler promises them Work and Bread) |
| Nov 1932   | 196 (many feel they are too violent)                         |
| March 1933 | 288 (after the Communists are blamed for the Reichstag Fire) |

## 3) Steps to World War II after Hitler takes control

|            |                                        |
|------------|----------------------------------------|
| 1936       | Invasion of the Rhineland              |
| 1938       | Anschluss with Austria                 |
| Sep 1938   | Invasion of Sudetenland                |
| March 1939 | Invasion of the rest of Czechoslovakia |
| Sep 1939   | Invasion of Poland                     |

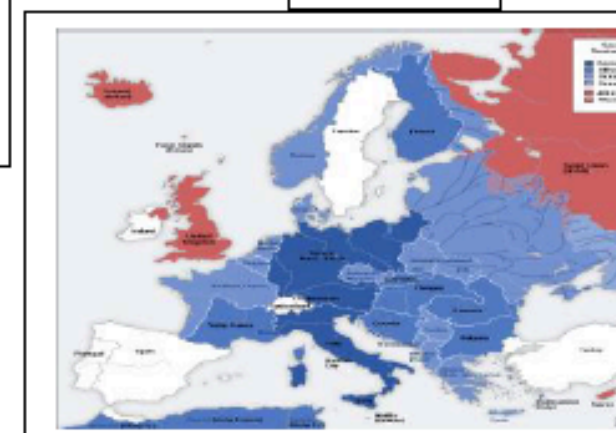
## 4) Key Turning Points of World War Two

|                        |                                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Home Front             | Men were conscripted into the army. Food was rationed. Air raid shelters were built so that people could take shelter from bombs dropped in the Blitz. The Battle of Britain was fought in the skies between the RAF and Luftwaffe. Britain managed to avoid defeat which prevented a full-scale German invasion. | Rationing – Limiting the food that people can eat. Conscription – forcing men to join the military.                       |
| Operation Barbarossa   | Hitler attacked Russia to take land and resources. This was called Operation Barbarossa. It started in 1941. Hitler expected a quick victory. Instead, the Germans lost. Many soldiers died in the Russian winter as they were not equipped properly. The Germans lost 800,000 men at the Battle of Stalingrad.   | Turning point – an event that changes the course of History.                                                              |
| Pearl Harbour          | In 1941, the Japanese attacked Pearl Harbour in Hawaii. This was an American naval base. 2,400 people died including 68 civilians. 1,178 were wounded. America declared war on Japan. America had joined WWII.                                                                                                    | Ambush – surprise attack. Civilians – people not part of the military                                                     |
| Dropping of the A bomb | America dropped two atomic bombs on Japanese cities, Hiroshima and Nagasaki, in August 1945. Japan surrendered, ending WWII. People were killed instantly. Some died afterwards for diseases caused by the radiation. 140,000 people are estimated to have been killed by the bomb dropped on Hiroshima.          | A-bomb – a powerful bomb that uses nuclear power to explode. It releases harmful radiation. Inevitable – bound to happen. |

Europe in 1919



Europe in 1941



Europe in 1946



# History Year 9 Knowledge Organiser Spring Term

## 1) War of two halves: the first half is a disaster for the Allies

3<sup>rd</sup> September  
1939. Britain  
declares war

May 1940.  
Dukirk

Summer of  
1940. Battle of  
Britain.

1941. Invasion  
of USSR  
(Operation  
Barbarossa)

## War of two halves: the second half is a disaster for Germany

1942-43. Siege  
of Stalingrad.

1943. Total War  
declared in  
Germany.

6<sup>th</sup> June 1944.  
D-Day.

30<sup>th</sup> April 1945.  
Hitler ends his  
own life.



### Split of interests:

Allies want to  
rebuild. Soviets  
want revenge

## 2) After World War II Germany is divided

## 3) Key events after World War II

1947: The Marshall Plan (US Loans) Help West Germany rebuild and revitalise.

24<sup>th</sup> June 1948: Stalin blockades Berlin which causes the Berlin Airlift.

12<sup>th</sup> May 1949: Stalin calls off the Berlin Blockade but **Cold War** begins.

1955: West Germany Joins NATO and East Germany joins Soviet Pact.





# History Year 9 Knowledge Organiser Summer Term

1)

- **Capitalism: USA**
  - Individuals own business
  - Opportunity for all
  - Democracy: Different parties compete for political office
  - Higher standard of living= Wealth, health, goods and services

- **Communism: USSR**
  - Government owns business
  - Equality for all
  - Only 1 political party
    - No need for any more
  - Lower standard of living but all are equal



2) A Cold War of Two Halves: The first half is full of tension

1945: USA drops atomic bombs on Japan

1949: USSR tests first nuclear weapon

1950: USA tests first hydrogen bomb

1962: Cuban Missile Crisis

In the second half tensions continue and finally ease

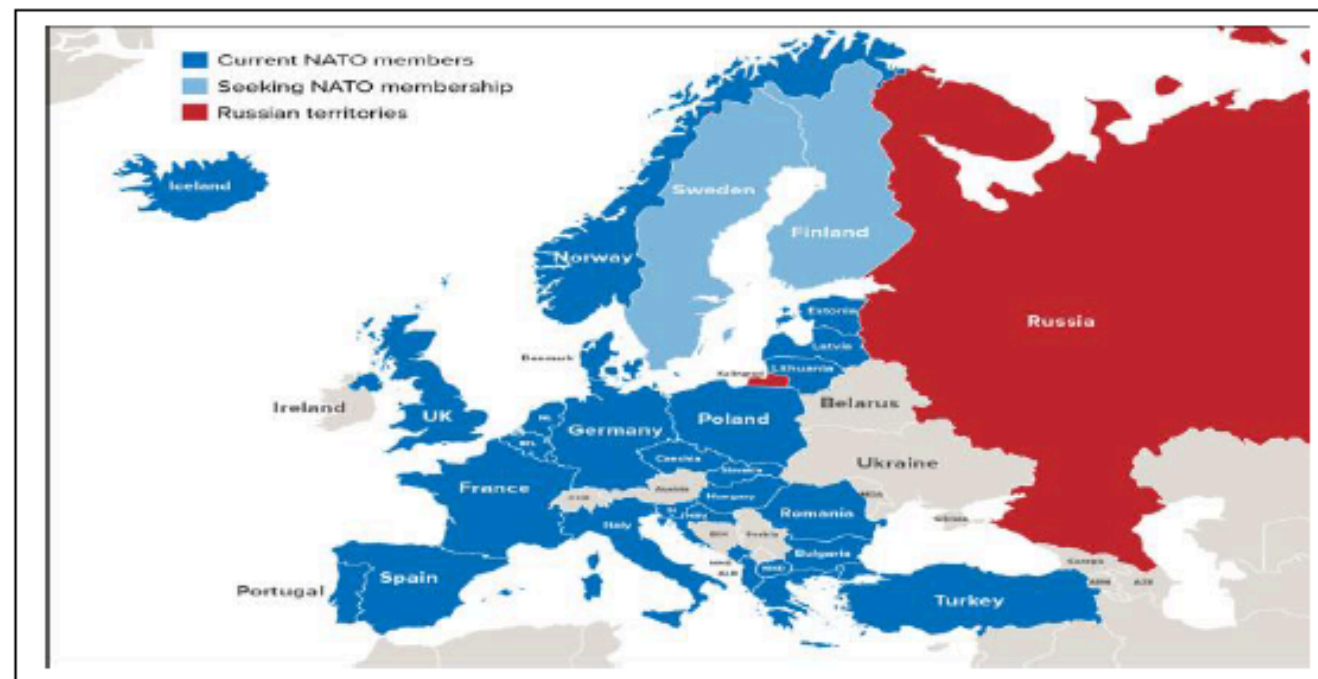
1963: Hot Line between USA and USSR

1965- 1973: USA involved in Vietnam War

1989: Berlin Wall comes down

1991: Collapse of the Soviet Union

3) Current world issues. NATO and Russia in 2024



4) Key Constructs in our learning this year

|                                                                 |                                                                                     |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Political actions have created positive and negative change     | Hitler's political aims to create a Greater Germany caused WW2                      |
| Certain events in history are turning points                    | Dunkirk, The Battle of Britain, Invasion of USSR and D-Day                          |
| Across history there have been periods of continuity and change | Everything we have learnt about in history has shaped our world                     |
| Societies have changed and this has impacted people's lives     | The Twentieth Century was dominated by war                                          |
| Over time authority has been accepted, challenged and altered   | Many people now live in free, democratic societies. Unfortunately many still do not |
| Religion has been a driving force throughout history            | Far less in the modern era with some big events still linked                        |



# THS

TIVERTON HIGH SCHOOL

**Year 9**

**Maths**

**Work hard. Be kind. Belong.**

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# YEAR 9 - DEVELOPING NUMBER...

## Standard Form

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

- By the end of this unit you should be able to:
- Write numbers in standard form and as ordinary numbers
  - Order numbers in standard form
  - Add/ Subtract with standard form
  - Multiply/ Divide with standard form
  - Use a calculator with standard form

### Keywords

**Standard (index) Form:** A system of writing very big or very small numbers  
**Commutative:** an operation is commutative if changing the order does not change the result.  
**Base:** The number that gets multiplied by a power  
**Power:** The exponent – or the number that tells you how many times to use the number in multiplication  
**Exponent:** The power – or the number that tells you how many times to use the number in multiplication  
**Indices:** The power or the exponent  
**Negative:** A value below zero.

### Positive powers of 10

1 billion – 1 000 000 000  
 $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9$

Addition rule for indices  $10^a \times 10^b = 10^{a+b}$

Subtraction rule for indices  $10^a \div 10^b = 10^{a-b}$

### Standard form with numbers > 1

Any number between 1 and less than 10  $\rightarrow A \times 10^n$  ← Any integer

#### Example

$3.2 \times 10^4$   
 $= 3.2 \times 10 \times 10 \times 10 \times 10$   
 $= 32000$

#### Non-example

$(0.8) \times 10^4$   
 $5.3 \times 10^{07}$

### Negative powers of 10

|                           |           |           |           |           |           |
|---------------------------|-----------|-----------|-----------|-----------|-----------|
| 0.001                     | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ |
| $1 \times \frac{1}{1000}$ | $10^0$    | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ |
| $1 \times 10^{-3}$        | 0         | 0         | 0         | 0         | 1         |

Any value to the power 0 always = 1  
 Negative powers do not indicate negative solutions

### Numbers between 0 and 1

|                        |        |           |           |           |
|------------------------|--------|-----------|-----------|-----------|
| 0.054                  | $10^0$ | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ |
| $= 5.4 \times 10^{-2}$ | 0      | 0         | 5         | 4         |

A negative power does not mean a negative answer – it means a number closer to 0

### Order numbers in standard form

|                      |                   |                   |                      |
|----------------------|-------------------|-------------------|----------------------|
| $6.4 \times 10^{-2}$ | $2.4 \times 10^2$ | $3.3 \times 10^0$ | $1.3 \times 10^{-1}$ |
| 0.064                | 240               | 1                 | 0.13                 |

Look at the power first will the number be  $>$  or  $<$  than 1  
 Use a place value grid to compare the numbers for ordering

### Mental calculations

$6.4 \times 10^2 \times 1000$  Not in Standard Form  
 $= 6.4 \times 10^2 \times 10^3$  Use addition for indices rule  
 $= 6.4 \times 10^5$   
 $(2 \times 10^3) \div 4$  Divide the values  
 $= (2 \div 4) \times 10^3$   
 $= 0.5 \times 10^3$

Remember the layout for standard form

Any number between 1 and less than 10  $\rightarrow A \times 10^n$  ← Any integer

### Addition and Subtraction

Tip: Convert into ordinary numbers first and back to standard form at the end

$6 \times 10^5 + 8 \times 10^5$   
**Method 1**  
 $= 600000 + 800000$   
 $= 1400000$   
 $= 1.4 \times 10^6$   
**Method 2**  
 $= (6 + 8) \times 10^5$   
 $= 14 \times 10^5$   
 $= 1.4 \times 10^5 \times 10^2$   
 $= 1.4 \times 10^7$   
 This is not the final answer  
 More robust method  
 Less room for misconceptions  
 Easier to do calculations with negative indices  
 Can use for different powers  
 Only works if the powers are the same

### Multiplication and division

For multiplication and division you can look at the values for A and the powers of 10 as two separate calculations  
 $\frac{1.5 \times 10^5}{0.3 \times 10^3}$   
 $(1.5 \div 0.3) \times (10^5 \div 10^3)$   
 $(15 \div 0.3) \times 10^5 \div 10^3$   
 $= 5 \times 10^2$   
 Revisit addition and subtraction laws for indices – they are needed for the calculations  
 Multiplication law for indices  $a^m \times a^n = a^{m+n}$   
 Division law for indices  $a^m \div a^n = a^{m-n}$

### Using a calculator

Input 14 and press  $\times 10^5$  Then press 5 (for the power)  
 Press  $\times$   
 Input 3.9 and press  $\times 10^3$  Then press 3 (for the power)  
 Press  $=$   
 This gives you the solution  
 Use a calculator to work out this question to a suitable degree of accuracy  
 Click calculator for video tutorial  
 To put into standard form and a suitable degree of accuracy  
 Press  $\text{SHIFT}$   $\text{SETUP}$  and then press 7 for sci mode  
 Choose a degree of accuracy so in most cases press 2  
 Answer:  $5.5 \times 10^4$

# YEAR 9 - REASONING WITH NUMBER...

## Numbers

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

- By the end of this unit you should be able to:
- Identify integers, real and rational numbers
  - Work with directed number
  - Solve problems with number
  - Find HCF/ LCM
  - Add/ Subtract fractions
  - Multiply/ Divide fractions
  - Write numbers in standard form

### Keywords

**Integer:** a whole number that is positive or negative  
**Rational:** a number that can be made by dividing two integers  
**Irrational:** a number that cannot be made by dividing two integers  
**Inverse operation:** the operation that reverses the action  
**Quotient:** the result of a division  
**Product:** the result of a multiplication  
**Multiples:** found by multiplying any number by positive integers  
**Factor:** integers that multiply together to get another number

### Integers, real and rational numbers

**Rational – root word: ratio**  
 Real numbers:  $\frac{2}{3}$  stems from 2 (the whole)  
 Irrational numbers:  $\sqrt{2}$  the solution is a decimal that never ends and does not repeat  
 The square root of a negative is not a real number and cannot be found

### Directed number

**Addition**  
 $2 + 4 = 6$   
 Generalisation:  $+$   $-$   $-$   
 Zero pair  $(-1 + 1 = 0)$   
 Two  $-$   $-$   $1$  left  $= -2$   
**Multiplication**  
 $-2 \times -3 = 6$   
 The act of making counters into their negative is turning them over  
 Divisions are the inverse operations  
 $a = 5$   $b = -4$   
 Brackets around negative substitutions helps remove calculation errors  
 $2a - b = 2 \times 5 - (-4) = 10 + 4 = 14$   
**Subtraction**  
 $2 - 1 = 1$   
 Generalisation:  $-$   $+$   $+$   
 "Subtract" – means take away or remove  
 Representation for calculation  
 Start with the representation of 2  
 Take away one  
 $2 - 1 = 1$   
 $2 - -1 = 3$   
 "Subtract" – means take away or remove

### HCF/LCM

Common factors are factors two or more numbers share  
**HCF – Highest common factor**  
 HCF of 18 and 30  
 18: 1, 2, 3, 6, 9, 18  
 30: 1, 2, 3, 5, 6, 10, 15, 30  
 HCF = 6  
**LCM – Lowest common multiple**  
 LCM of 9 and 12  
 9: 9, 18, 27, 36, 45, 54  
 12: 12, 24, 36, 48, 60  
 LCM = 36  
 The first time their multiples match

### Addition/ Subtraction of fractions

$\frac{4}{5} - \frac{2}{3}$   
 $\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$   
 Use equivalent fractions to find a common multiple for both denominators

### Multiplication/ Division of fractions

Shade in 3 parts  
 $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$   
 Repeat it on this many rows  
 Modelled: 3 rows, 4 columns  
 Parts shaded  
 Total number of parts in the diagram  
 Remember to use reciprocals  
 $2 \div \frac{3}{4} = 2 \times \frac{4}{3} = \frac{8}{3}$   
 Multiplying by a reciprocal gives the same outcome  
 Represented: 8 parts shaded out of 12

### Standard form

Any number between 1 and less than 10  $\rightarrow A \times 10^n$  ← Any integer  
 $6 \times 10^5 + 8 \times 10^5$   
 $= 600000 + 800000$   
 $= 1400000$   
 $= 1.4 \times 10^6$   
 $(1.5 \times 10^2) \div (0.3 \times 10^3)$   
 $15 \div 0.3 \times 10^2 \div 10^3$   
 $= 5 \times 10^{-2}$



# YEAR 9 - REASONING WITH NUMBER...

## Using Percentages

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

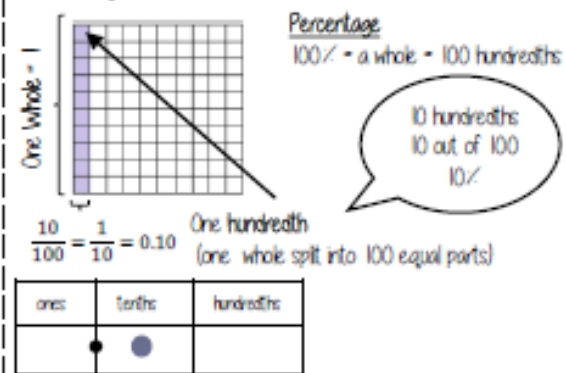
By the end of this unit you should be able to:

- Use FDP equivalence
- Calculate percentage increase and decrease
- Express percentage change
- Solve reverse percentage problems
- Solve percentage problems (calculator and non calculator problems)

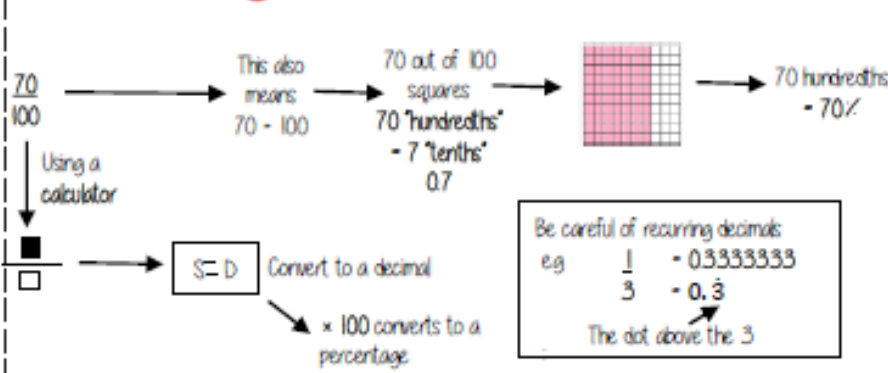
### Keywords

Percent: parts per 100 — written using the % symbol  
 Decimal: a number in our base 10 number system. Numbers to the right of the decimal place are called decimals  
 Fraction: a fraction represents how many parts of a whole value you have.  
 Equivalent: of equal value.  
 Reduce: to make smaller in value.  
 Growth: to increase/ to grow.  
 Integer: whole number, can be positive, negative or zero.  
 Invest: use money with the goal of it increasing in value over time (usually in a bank).  
 Multiplier: the number you are multiplying by.  
 Profit: the income take away any expenses/ costs.

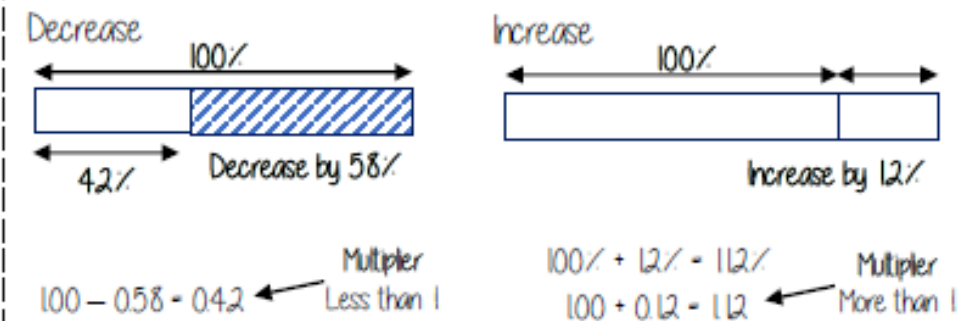
### FDP Equivalence



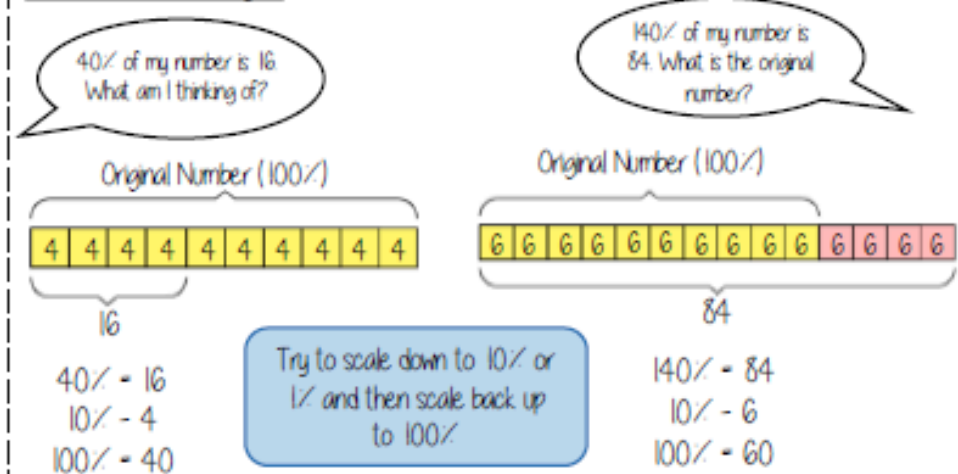
### Converting FDP



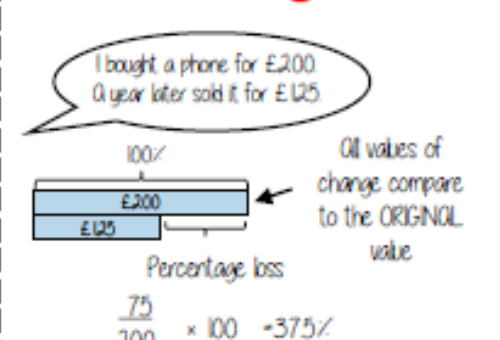
### Percentage Increase/ Decrease



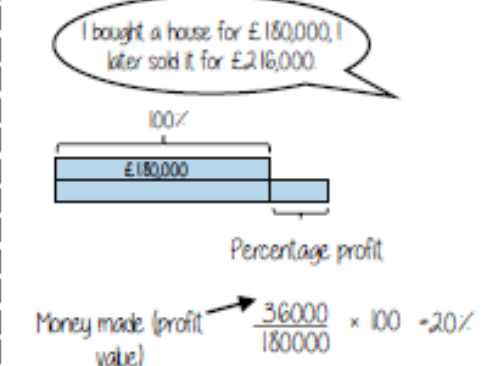
### Reverse Percentages



### Percentage change



$$\frac{\text{Difference in values}}{\text{Original value}} \times 100$$



# YEAR 9 - REASONING WITH NUMBER...

## Maths & Money

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

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

- Solve problems with bills and bank statements
- Calculate simple interest
- Calculate compound interest
- Calculate wages and taxes
- Solve problems with exchange rates
- Solve unit pricing problems

### Keywords

Credit: money being placed into a bank account.  
 Debit: money that leaves a bank account.  
 Balance: the amount of money in a bank account.  
 Expense: a cost/ outgoing.  
 Deposit: an initial payment (often a way of securing an item you will later pay for).  
 Multiplier: a number you are multiplying by (Multiplier more than 1 = increasing, less than 1 = decreasing).  
 Per Annum: each year.  
 Currency: the type of money a country uses.  
 Unitary: one — the cost of one.

### Bills and Bank Statements

Bills — tell you the amount items cost and can show how much money you need to pay.

| Menu | Price |
|------|-------|
| Milk | 89p   |
| Tea  | £1.50 |

### Bank Statements

Bank statement can have negative balances if the money spent is higher than the money coming into the account.

| Date      | Description | Credit | Debit | Balance |
|-----------|-------------|--------|-------|---------|
| 1st Sept  | Salary      | £1500  |       | £1500   |
| 1st Sept  | Mortgage    |        | £600  | £900    |
| 25th Sept | Bday Money  | £15    |       | £915    |

### Simple Interest

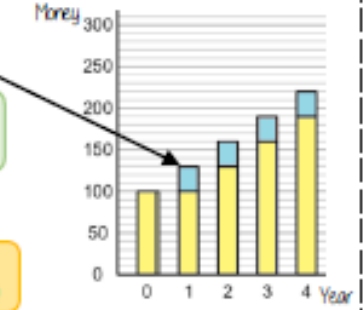
For each year of investment the interest remains the same.

$$\frac{\text{Principal amount} \times \text{Interest Rate} \times \text{Years}}{100}$$

Principal amount is the amount invested in the account.  
 e.g. Invest £100 at 30% simple interest for 4 years

$$\frac{100 \times 30 \times 4}{100} = £120$$

This account earned £120 interest.  
 At the end of year 4 they have £220



### Compound Interest

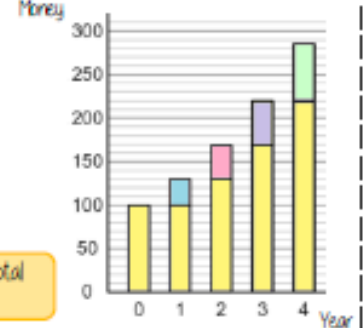
Interest is added to the current value of investment at the end of each year so the next year's interest is greater.

$$\text{Principal amount} \times \text{Multiplier}^{\text{Years}}$$

e.g. Invest £100 at 30% compound interest for 4 years

$$100 \times 1.3^4 = £285.61$$

This account has £285.61 in total at the end of the 4 years.



### Value Added Tax (VAT)

VAT is payable to the government by a business. In the UK VAT is 20% and added to items that are bought.

Essential items such as food do not include VAT.

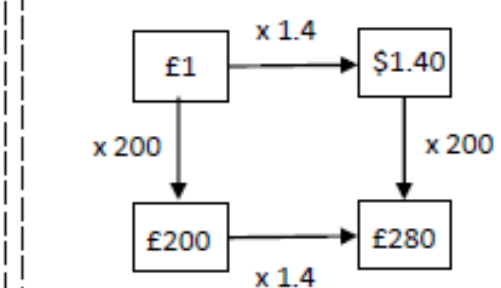
### Wages and Taxes

Salaries fall into tax brackets — which means they pay this much each month from their salary.

| Taxable Income      | Tax Rate |
|---------------------|----------|
| £12,501 to £50,000  | 20%      |
| £50,001 to £150,000 | 40%      |
| over £150,000       | 45%      |

Over time:  
 Time and a half — means 1.5 times their hourly rate.  
 Double — 2 times their hourly rate.

### Exchange Rates



When making estimates it is also useful to use estimates to check if our solution is reasonable.

Use inverse operations to reverse the exchange process.

### Common Currencies

|                          | £  | Pounds  |
|--------------------------|----|---------|
| United Kingdom           |    |         |
| United States of America | \$ | Dollars |
| Europe                   | €  | Euros   |

### Unit Pricing

|                                     |                        |
|-------------------------------------|------------------------|
| 4 Oranges<br>£1                     | 5 cupcakes<br>£1.20    |
| 4 = £1.00<br>2 = £0.50<br>1 = £0.25 | 5 = £1.20<br>1 = £0.20 |
| Cost per Unit                       |                        |

To calculate unit per cost you divide by the cost.

Cupcakes are the best value as one item has the cheapest value.

There is a directly proportional relationship between the cost and number of units.



# YEAR 9 - DEVELOPING NUMBER...

## Number Sense

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

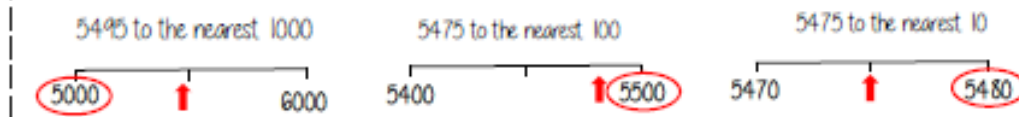
- By the end of this unit you should be able to:
- Round numbers to powers of 10 and 1 sf
  - Round numbers to any dp
  - Estimate solutions
  - Calculate using order of operations
  - Calculate with money, units of measurement, and time

### Keywords

**Significant:** Place value of importance  
**Round:** Making a number simpler but keeping its value close to what it was  
**Decimal Place:** holders after the decimal point  
**Overestimate:** Rounding up – gives a solution higher than the actual value  
**Underestimate:** Rounding down – gives a solution lower than the actual value  
**Metric:** A system of measurement  
**Balance:** The amount of money in a bank account  
**Deposit:** Putting money into a bank account

### Round to powers of 10 and 1 sig figure

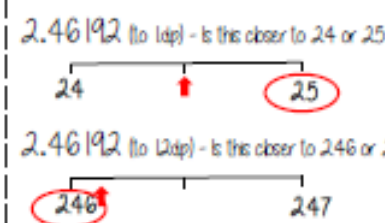
**R** If the number is halfway between we "round up"



370 to 1 significant figure is 400  
 37 to 1 significant figure is 40  
 3.7 to 1 significant figure is 4  
 0.37 to 1 significant figure is 0.4  
 0.00037 to 1 significant figure is 0.0004  
 Round to the first non-zero number

### Round to decimal places

To 1dp – to one number after the decimal  
 To 2dp – to two numbers after the decimal



### Estimate the calculation

Focus on the numbers after the decimal point  
 This shows the number is closer to 2.5  
 This shows the number is closer to 2.46

### Estimate the calculation

Round to 1 significant figure to estimate  
 $4.2 + 6.7 \approx 4 + 7 \approx 11$  This is an overestimate because the 6.7 was rounded up more.  
 $214 \times 3.1 \approx 20 \times 3 \approx 60$  This is an underestimate because both values were rounded down.  
 It is good to check all calculations with an estimate in all aspects of maths – it helps you identify calculation errors.

### Order of operations

**Brackets:** Operations in brackets are calculated first  
**Other:** operations e.g. powers, roots  
**Multiplication/ Division:** They are carried out in the order from left to right in the question  
**Addition/ Subtraction:** They are carried out in the order from left to right in the question

### Calculations with money

**Debit:** – You have £0 or more in an account  
**Credit:** – You have less than £0 in an account

Using a calculator – ensure you are working in the correct units  
 $£1.30 + 50p = 130 + 50$  (in pence)  
 $= 130 + 0.50$  (in pounds)  
 $£1 = 100p$

### Units are important: Useful Conversions



### Metric measures of length

Kilo = 1000 x meter  
 Centi =  $\frac{1}{100}$  x meter  
 Milli =  $\frac{1}{1000}$  x meter

### Units of weight/ capacity

Weight = g, kg, t  
 Capacity (volume of liquid) = ml, L

### Time and the calendar

**12 Months:** – one year = 52 weeks  
 31 days – Jan, March, May, July, Aug, Oct, Dec  
 30 days – April, June, Sept, Nov  
 28 days – Feb (29 leap year)  
**1 Year:** – the amount of time it takes Earth to go around the sun 365 (and a quarter) days  
**Leap Year:** – 366 days (every 4 years)  
**1 Week:** – 7 days  
 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday  
**1 day:** – 24 hours  
**1 hour:** – 60 minutes  
**1 minute:** – 60 seconds  
 Use a number line for time calculations!  
**Analogous Clock:** 12-hour clock: Use am (morning) and pm (afternoon). Only use hour times up to 12.  
**Digital Clock (24-hour times):** 24-hour clock: 0-11 (morning hours), 12-23 (afternoon hours).

# YEAR 9 - REASONING WITH GEOMETRY...

## Solving ratio & proportion problems

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

- By the end of this unit you should be able to:
- Solve problems with direct proportion
  - Use conversion graphs
  - Solve problems with inverse proportion
  - Solve ratio problems
  - Solve 'best buy' problems

### Keywords

**Proportion:** a comparison between two numbers  
**Ratio:** a ratio shows the relative size of two variables  
**Direct proportion:** as one variable is multiplied by a scale factor the other variable is multiplied by the same scale factor.  
**Inverse proportion:** as one variable is multiplied by a scale factor the other is divided by the same scale factor.

### Direct Proportion

As one variable changes the other changes at the same rate.  
 This is a multiplicative change.  
 4 cans of pop = £2.40  
 $\times 0.5$  2 cans of pop = £1.20  
 $\times 2$  8 cans of pop = £4.80  
 $\times 0.5$  2 cans of pop = £1.20  
 $\times 2$  4 cans of pop = £2.40  
 Sometimes this is easiest if you work out how much one unit is worth first e.g. 1 can of pop = £0.60

### Conversion Graphs

Compare two variables.  
 This is always a straight line because as one variable increases so does the other at the same rate.  
 To make conversions between units you need to find the point to compare – then find the associated point by using your graph.  
 Using a ruler helps for accuracy.  
 Showing your conversion lines help as a "check" for solutions.

### Inverse Proportion

As one variable is multiplied by a scale factor the other is divided by the same scale factor.  
 Examples of inversely proportional relationships:  
 Time taken to fill a pool and the number of taps running.  
 Time taken to paint a room and the number of workers.  
 T is inversely proportional to G. When T=2 then G=20  

|   |    |    |   |
|---|----|----|---|
| T | 1  | 2  | 8 |
| G | 40 | 20 | 5 |

 Operations:  $\div 2$ ,  $\times 4$ ,  $\times 2$ ,  $\div 4$

### Best Buys

Have a directly proportional relationship.  
 To calculate best buys you need to be able to compare the cost of one unit or units of equal amounts.

**Shop A:** 4 cans for £1.20  
 $\downarrow$   $£1.20 \div 4$   
 1 can is £0.30 Or 30p  
**Shop B:** 3 cans for 93p  
 $\downarrow$   $£0.93 \div 3$   
 1 can is £0.31 Or 31p

Shop A is the best value as it is 1p cheaper per can of pop

**Shop A:** 4 cans for £1.20  
 $\downarrow$   $4 \div £1.20$   
 £1 buys 3.333 cans of pop  
**Shop B:** 3 cans for 93p  
 $\downarrow$   $3 \div £0.93$   
 £1 buys 3.23 cans of pop

Shop A is still shown as being the best value but pay attention to the unit you are calculating per item or per pound

Best value is the most product for the lowest price per unit

### Sharing a whole into a given 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  
 $\frac{£350}{7} = £50$   
 James = 3 x £50 = £150  
 Lucy = 4 x £50 = £200  
**Find the value of one part:** Whole: £350  
 7 parts to share between (3 James, 4 Lucy)  
**Put back into the question:** James = 3 x £50 = £150  
 Lucy = 4 x £50 = £200

### Finding a value given In (or n:1)

Inside a box are blue and red pens in the ratio 5:1  
 If there are 10 red pens how many blue pens are there?

**Model the Question:** Blue: Red 5:1  
 One unit = 10 pens  
 Blue pens = 5 x 10 = 50 pens  
 Red pens = 1 x 10 = 10 pens  
**Put back into the question:** Blue: Red 5:1  
 50:10  
 There are 50 Blue Pens



# YEAR 9 - REASONING WITH GEOMETRY...

## Rates

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

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

- Solve speed, distance, time questions
- Use distance time graphs
- Solve density, mass, volume problems
- Solve flow problems
- Use flow graphs
- Interpret rates of change and their units

### Keywords

Convert: change

Mass: a measure of how much matter is in an object. Commonly measured by weight

Origin: the coordinate (0, 0)

Volume: the amount of 3D space a shape takes up

Substitute: putting numbers where letters are – replacing numbers into a formula

### Speed, Distance, Time

'per' for every  
e.g. 80 miles per hour (mph)  
Travel 80 miles every hour

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

You can use a double number line to help you calculate distance



e.g. A boat travels at a constant speed for 2.5 hours  
It travels 300 miles.



Bar models can help to calculate mph

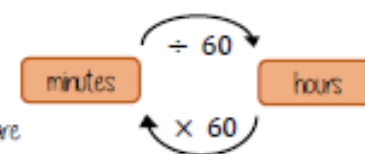
Each part is half an hour  
Each part is 60 miles

### Speed, Distance, Time

Before calculations – make sure you are working in the same units as the speed

Learn or learn how to rearrange the formula for speed, distance and time

Substitute in the variables given



$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

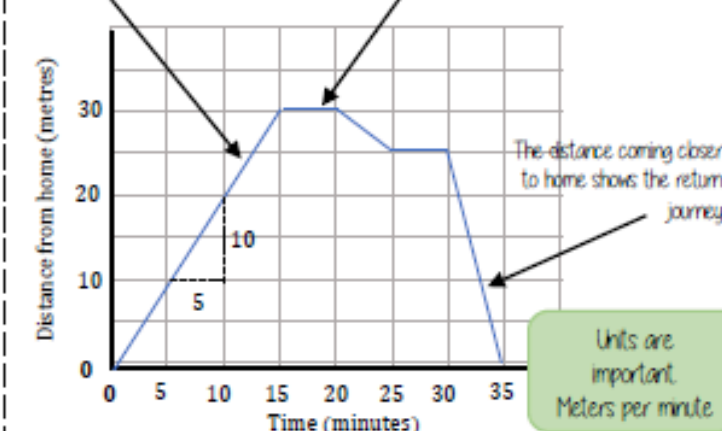
$$\text{distance} = \text{speed} \times \text{time}$$

### Distance – Time graphs

The steeper a gradient the faster the speed  
 $\frac{10}{5} = 2$  metres per min

Gradient = speed

Horizontal lines represent staying still

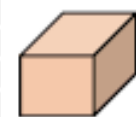


### Density, Mass, Volume

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{volume} = \frac{\text{mass}}{\text{density}}$$

$$\text{mass} = \text{volume} \times \text{density}$$



$$\text{volume of prism} = \text{Area of cross section} \times \text{Depth}$$

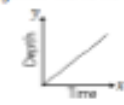
### Flow problems & graphs



This will fill at a constant rate, then as the space decreases it will speed up and the neck of the bottle fill at a faster constant speed



The cylinder will fill at a constant speed



Units are important.  
Ensure any volume calculations are the same unit as the rate of flow

### Rates of change & units

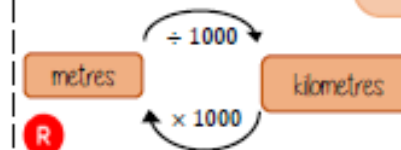
Common rates of change relationships

Revisit your conversions between units of length and capacity

Speed: miles per hour

Exchange rates: euros per pounds

Density: mass per volume



# YEAR 9 - REASONING WITH ALGEBRA...

## Forming and Solving Equations

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

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

- Solve inequalities with negative numbers
- Solve equations with unknowns on both sides
- Solve inequalities with unknowns on both sides
- Substitute into formulae and equations
- Rearrange formulae

### Keywords

Inequality: an inequality compares two values showing if one is greater than, less than or equal to another

Variable: a quantity that may change within the context of the problem

Rearrange: Change the order

Inverse operation: the operation that reverses the action

Substitute: replace a variable with a numerical value

Solve: find a numerical value that satisfies an equation

### Solve equations with brackets

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

Expand the brackets

$$6x + 12 = 30$$

$$-12 \quad -12$$

$$6x = 18$$

$$\div 6 \quad \div 6$$

$$x = 3$$

### Form and solve inequalities

Two more than treble my number is greater than 11

Find the possible range of values

$$3x + 2 > 11$$

Solve

$$x > 3$$

### Inequalities with negatives

Method 1: Make x positive first

$$2 - 3x > 17$$

$$+ 3x \quad + 3x$$

$$2 > 17 + 3x$$

$$-17 \quad -17$$

$$-15 > 3x$$

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

$$-5 > x$$

x is true for any value smaller than -5

CHECK IT!  
 $2 - 3(-6) = 20$   
TRUE/ CORRECT

### Equations with unknown on both sides

$$4x + 5 = 3x + 24$$

$$-3x \quad -3x$$

$$x + 5 = 24$$

$$-5 \quad -5$$

$$x = 19$$

### Inequalities with unknown on both sides

Solving inequalities has the same method as equations

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

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

$$2x + 20 < 6$$

$$2x < -14$$

$$x < -7$$

Check it!  
 $5(-8 + 4) < 3(-8 + 2)$   
 $5(-4) < 3(-6)$   
 $-20 < -18$   
✓ -20 is smaller than -18

### Formulae and Equations

Formulae – all expressed in symbols

Substitute in values

Equations – include numbers and can be solved

### Rearranging Formulae (one step)

$$x = y + z$$

Rearrange to make y the subject

$$y = x - z$$

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

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

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

Rearranging can also be checked by substitution

Language of rearranging...

Make XXX the subject

Change the subject

Rearrange

### Rearranging Formulae (two step)

In an equation (find x)

$$4x - 3 = 9$$

$$+3 \quad +3$$

$$4x = 12$$

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

$$x = 3$$

In a formula (make x the subject)

$$xy - s = a$$

$$+s \quad +s$$

$$xy = a + s$$

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

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

The steps are the same for solving and rearranging

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

e.g. Find the gradient of the line  $2y - 4x = 9$

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

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



# YEAR 9 - REASONING WITH ALGEBRA...

## Straight Line Graphs

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

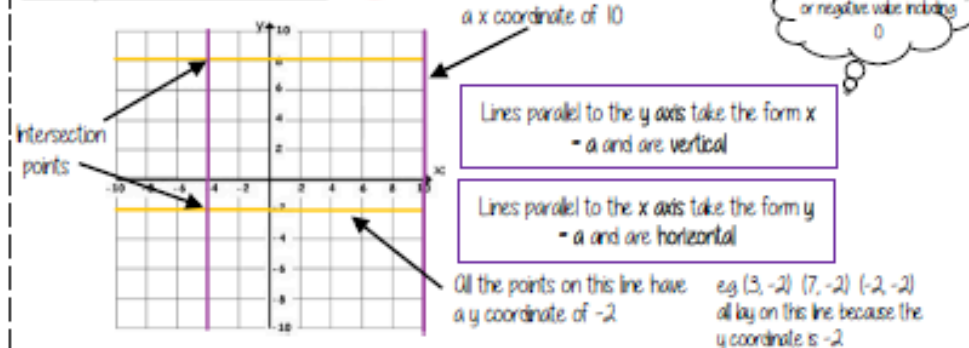
By the end of this unit you should be able to:

- Compare gradients
- Compare intercepts
- Understand and use  $y = mx + c$
- Find the equation of a line from a graph
- Interpret gradient and intercepts of real-life graphs

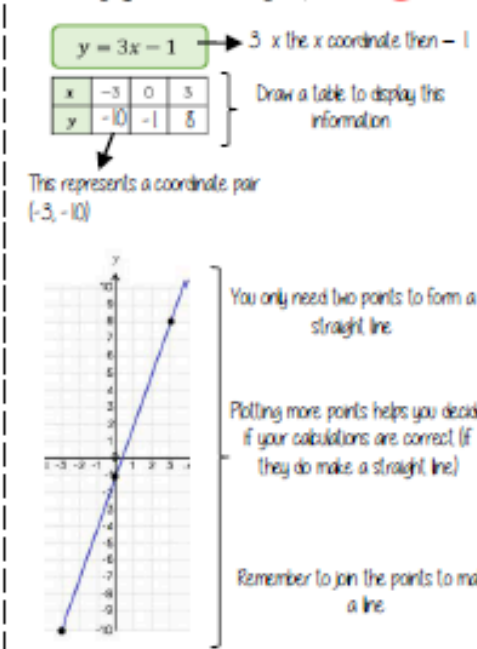
### Keywords

**Gradient:** the steepness of a line  
**Intercept:** where two lines cross. The y-intercept: where the line meets the y-axis  
**Parallel:** two lines that never meet with the same gradient  
**Co-ordinate:** a set of values that show an exact position on a graph  
**Linear:** linear graphs (straight line) – linear common difference by addition/ subtraction  
**Asymptote:** a straight line that a graph will never meet  
**Reciprocal:** a pair of numbers that multiply together to give 1  
**Perpendicular:** two lines that meet at a right angle

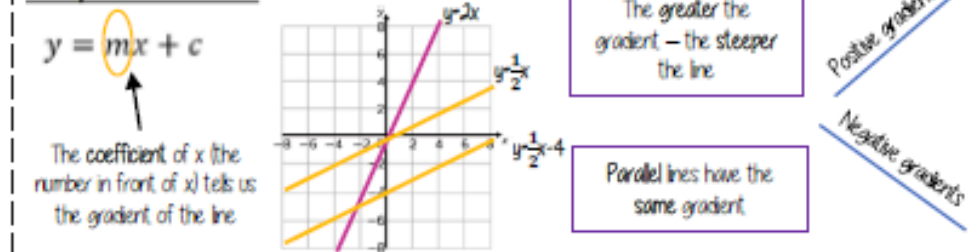
### Lines parallel to the axes



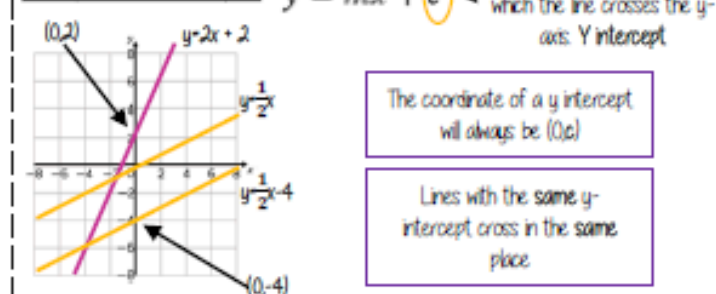
### Plotting $y = mx + c$ graphs



### Compare Gradients



### Compare Intercepts



### $y = mx + c$

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

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

$y = mx + c$

y and x are coordinates

The equation of a line can be rearranged. Eg

$y = c + mx$   
 $c = y - mx$

Identify which coefficient you are identifying or comparing

### Real life graphs

A plumber charges a £25 callout fee, and then £12.50 for every hour. Complete the table of values to show the cost of hiring the plumber.

|          |     |   |   |   |      |
|----------|-----|---|---|---|------|
| Time (h) | 0   | 1 | 2 | 3 | 8    |
| Cost (£) | £25 |   |   |   | £125 |

In real life graphs like this values will always be positive because they measure distances or objects which cannot be negative.

The y-intercept shows the minimum charge. The gradient represents the price per mile.

### Direct Proportion graphs

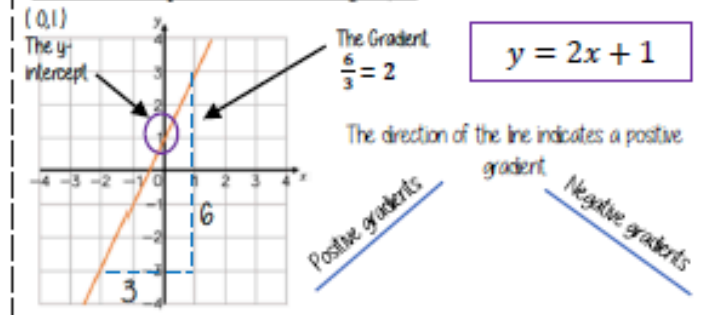
To represent direct proportion the graph must start at the origin

A box of pens costs £2.30. Complete the table of values to show the cost of buying boxes of pens.

|          |   |       |   |   |   |
|----------|---|-------|---|---|---|
| Boxes    | 0 | 1     | 2 | 3 | 8 |
| Cost (£) |   | £2.30 |   |   |   |

When you have 0 pens this has 0 cost. The gradient shows the price per pen

### Find the equation from a graph



# YEAR 9 - REPRESENTATIONS...

## Algebraic Representation

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

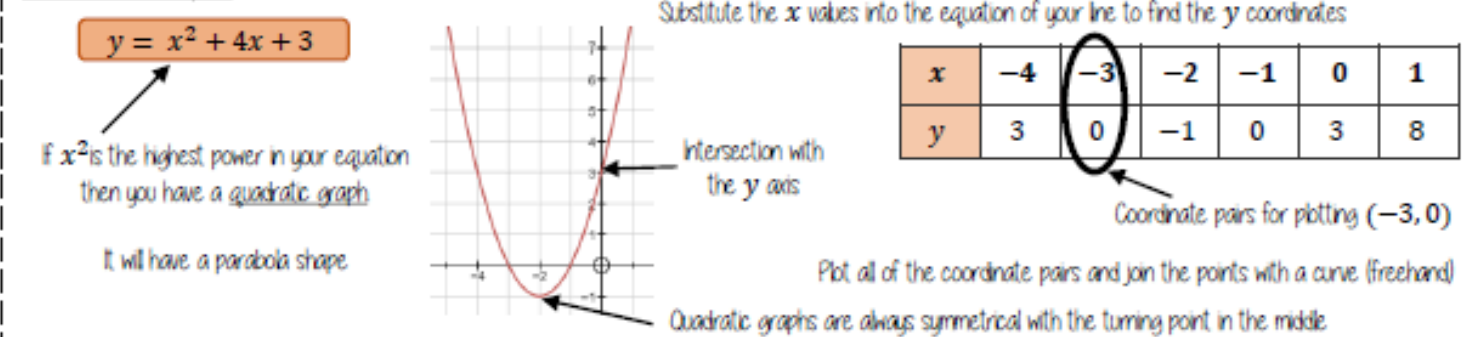
By the end of this unit you should be able to:

- Draw quadratic graphs
- Interpret quadratic graphs
- Interpret other graphs including reciprocals
- Represent inequalities

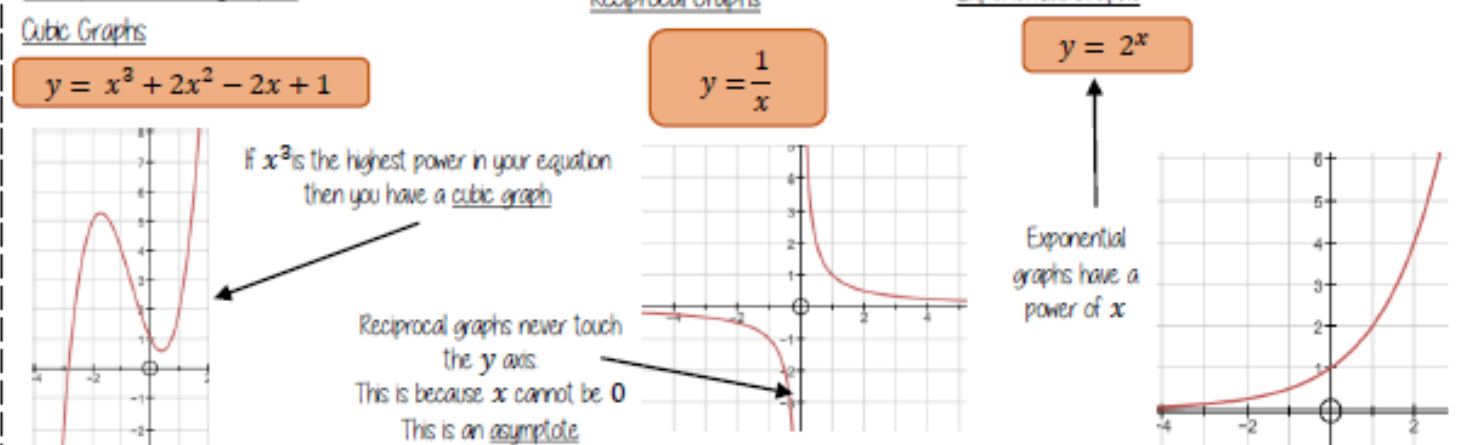
### Keywords

**Quadratic:** a curved graph with the highest power being 2. Square power.  
**Inequality:** makes a non equal comparison between two numbers  
**Reciprocal:** a reciprocal is 1 divided by the number  
**Cubic:** a curved graph with the highest power being 3. Cubic power.  
**Origin:** the coordinate (0, 0)  
**Parabola:** a 'u' shaped curve that has mirror symmetry

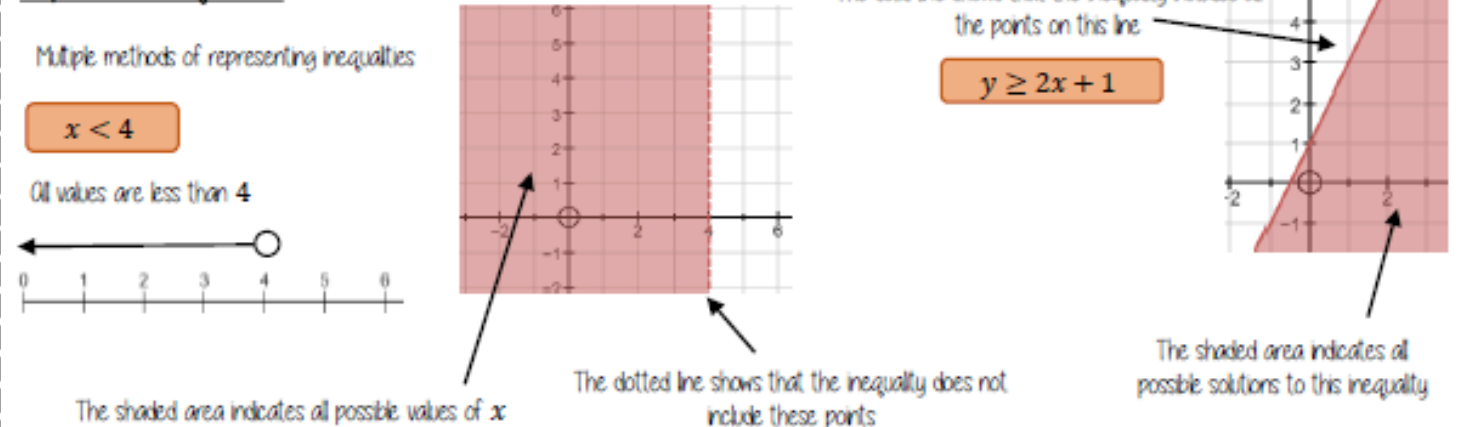
### Quadratic Graphs



### Interpret other graphs



### Represent Inequalities





# YEAR 9 - DEVELOPING GEOMETRY...

## Line symmetry and reflection

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

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

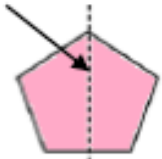
- Recognise line symmetry
- Reflect in a horizontal line
- Reflect in a vertical line
- Reflect in a diagonal line

### Keywords

**Mirror line:** a line that passes through the center of a shape with a mirror image on either side of the line  
**Line of symmetry:** same definition as the mirror line  
**Reflect:** mapping of one object from one position to another of equal distance from a given line  
**Vertex:** a point where two or more line segments meet  
**Perpendicular:** lines that cross at  $90^\circ$   
**Horizontal:** a straight line from left to right (parallel to the x axis)  
**Vertical:** a straight line from top to bottom (parallel to the y axis)

### Lines of symmetry

Mirror line (line of reflection)



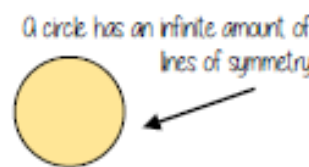
Shapes can have more than one line of symmetry...  
 This regular polygon (a regular pentagon has 5 lines of symmetry)



Rhombus  
Two lines of symmetry

Parallelogram

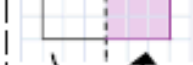
No lines of symmetry



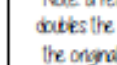
A circle has an infinite amount of lines of symmetry

### Reflect horizontally/ vertically (1)

Reflection in a vertical line



Reflection in a horizontal line



Note: a reflection doubles the area of the original shape

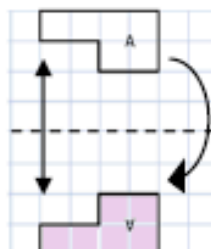
Reflection on an axis grid



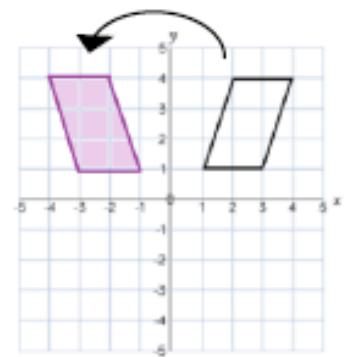
Reflection in the line  $x=2$

### Reflect horizontally/ vertically (2)

All points need to be the same distance away from the line of reflection



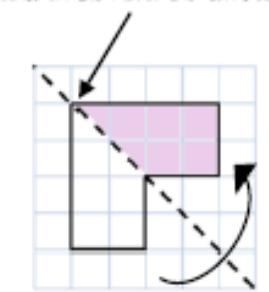
Reflection in the line y axis - this is also a reflection in the line  $x=0$



**Lines parallel to the x and y axis**  
**REMEMBER**  
 Lines parallel to the x-axis are  $y = \dots$   
 Lines parallel to the y-axis are  $x = \dots$

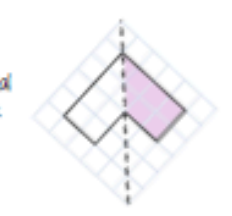
### Reflect Diagonally (1)

Points on the mirror line don't change position



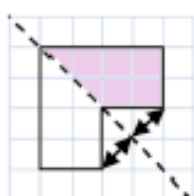
Fold along the line of symmetry to check the direction of the reflection

**Turn your image**  
 If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)



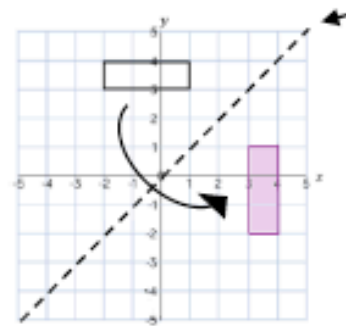
**Drawing perpendicular lines**

Perpendicular lines to and from the mirror line can help you to plot diagonal reflections

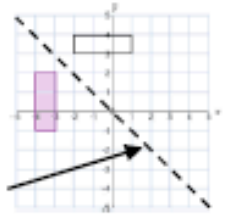


### Reflect Diagonally (2)

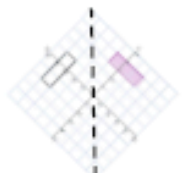
This is the line  $y = x$  (every y coordinate is the same as the x coordinate along this line)



This is the line  $y = -x$   
 The x and y coordinate have the same value but opposite sign



**Turn your image**  
 If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)



# YEAR 9 - REASONING WITH GEOMETRY...

## Rotation & Translation

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

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

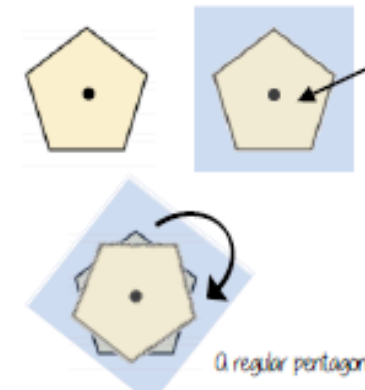
- Identify the order of rotational symmetry
- Rotate a shape about a point on the shape
- Rotate a shape about a point not on a shape
- Translate by a given vector
- Compare rotations and reflections

### Keywords

**Rotate:** a rotation is a circular movement  
**Symmetry:** when two or more parts are identical after a transformation  
**Regular:** a regular shape has angles and sides of equal lengths  
**Invariant:** a point that does not move after a transformation  
**Vertex:** a point two edges meet  
**Horizontal:** from side to side  
**Vertical:** from up to down

### Rotational Symmetry

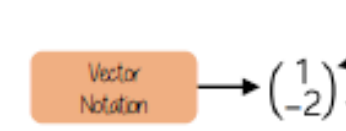
Tracing paper helps check rotational symmetry



- 1 Trace your shape (mark the centre point)
- 2 Rotate your tracing paper on top of the original through  $360^\circ$
- 3 Count the times it fits back into itself

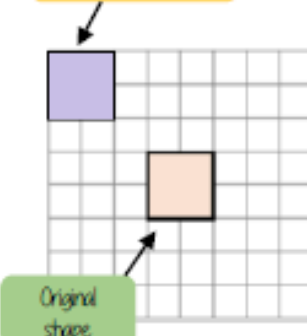
A regular pentagon has rotational symmetry of order 5

### Translation and vector notation



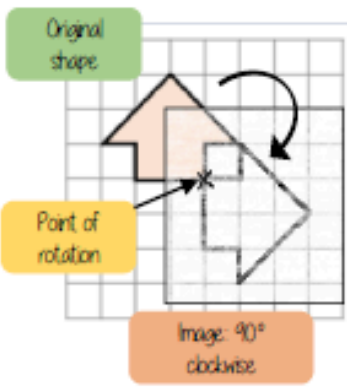
How far left or right to move  
 Negative value (left)  
 Positive value (right)  
 How far up or down to move  
 Negative value (down)  
 Positive value (up)

Translation  $\begin{pmatrix} -3 \\ 3 \end{pmatrix}$



Every vertex has been translated by the same amount

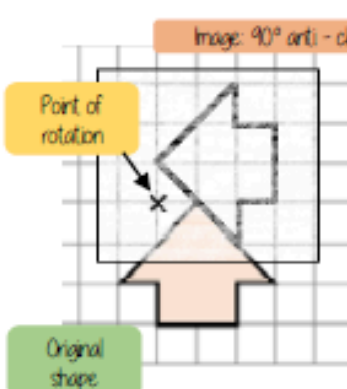
### Rotate from a point (in a shape)



- 1 Trace the original shape (mark the point of rotation)
- 2 Keep the point in the same place and turn the tracing paper
- 3 Draw the new shape

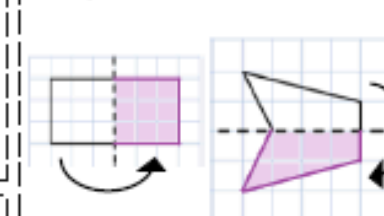


### Rotate from a point (outside a shape)



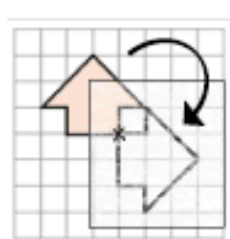
- 1 Trace the original shape (mark the point of rotation)
- 2 Keep the point in the same place and turn the tracing paper
- 3 Draw the new shape

### Compare rotations and reflections



**R** Reflections are a mirror image of the original shape.

Information needed to perform a reflection  
 - Line of reflection (Mirror line)



Rotations are the movement of a shape in a circular motion

Information needed to perform a rotation  
 - Point of rotation  
 - Direction of rotation  
 - Degrees of rotation



# YEAR 9 - REASONING WITH GEOMETRY...

## Enlargement & Similarity

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

- By the end of this unit you should be able to:
- Recognise enlargement and similarity
  - Enlarge a shape by a positive SF
  - Enlarge a shape from a point
  - Enlarge a shape by a fractional SF
  - Work out missing sides and angles in a pair of similar shapes.

### Keywords

**Similar Shapes:** shapes of different sizes that have corresponding sides in equal proportion and identical corresponding angles.

**Scale Factor:** the multiple describing how much a shape has been enlarged

**Enlarge:** to change the size of a shape (enlargement is not always making a shape bigger)

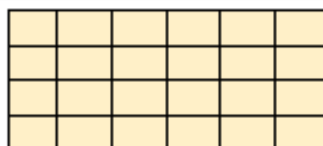
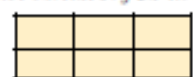
**Corresponding:** objects (or sides) that appear in the same place in two similar situations.

**Image:** the picture or visual representation of the shape.

### Recognise enlargement & similarity

Shapes are similar if all pairs of corresponding sides are in the same ratio

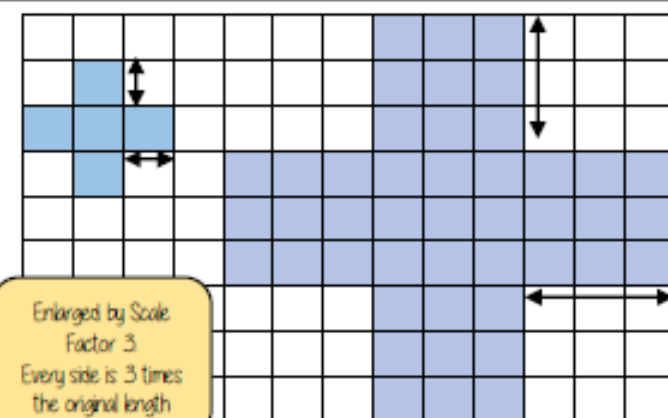
These shapes are similar because all sides are increased by the same ratio



Enlargements are similar shapes with a ratio other than 1

### Enlarge by a positive scale factor

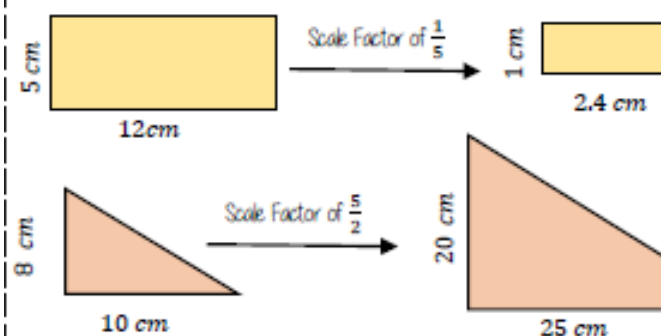
With a scale factor larger than 1 it makes the shape bigger



Enlarged by Scale Factor 3  
Every side is 3 times the original length

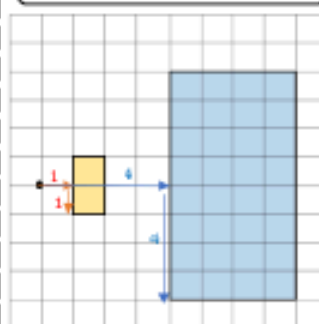
### Positive fractional scale factor

With a scale factor between 0 and 1 it makes the shape smaller



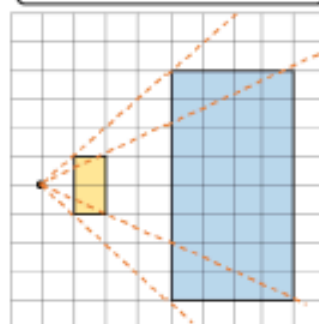
### Enlarge a shape from a point

Scaled distances method



Scale the distance between the point of enlargement and each corresponding vertices

Rays method

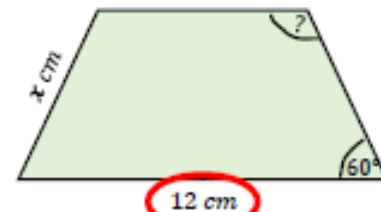


Multiply the distance from the centre of corresponding vertices by the scale factor along the ray

### Calculations in similar shapes

Don't forget that properties of shapes don't change with enlargements or in similar shapes

The two trapezium are similar find the missing side and angle



Corresponding sides identify the scale factor

$$\frac{12}{6} = 2 \quad \text{Scale Factor} = 2$$

Calculate the missing side

$$\text{Length (corresponding side)} \times \text{scale factor}$$

$$2\text{ cm} \times 2$$

$$x = 4\text{ cm}$$

Enlargement does not change angle size

Calculate the missing angle

Corresponding angles remain the same

$$130^\circ$$

# YEAR 9 - CONSTRUCTING IN 2D/3D...

## 3D Shapes

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

- By the end of this unit you should be able to:
- Name 2D & 3D shapes
  - Recognise Prisms
  - Sketch and recognise nets
  - Draw plans and elevations
  - Find areas of 2D shapes
  - Find Surface area for cubes, cuboids, triangular prisms and cylinders
  - Find the volume of 3D shapes

### Keywords

**2D:** two dimensions to the shape e.g. length and width

**3D:** three dimensions to the shape e.g. length, width and height

**Vertex:** a point where two or more line segments meet

**Edge:** a line on the boundary joining two vertex

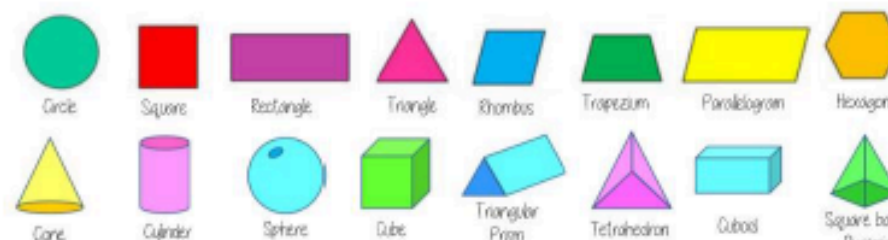
**Face:** a flat surface on a solid object

**Cross-section:** a view inside a solid shape made by cutting through it

**Plan:** a drawing of something when drawn from above (sometimes birds eye view)

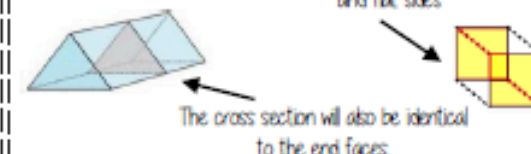
**Perspective:** a way to give illustration of a 3D shape when drawn on a flat surface.

### Name 2D & 3D shapes



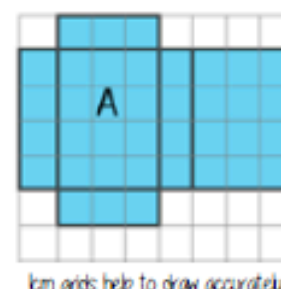
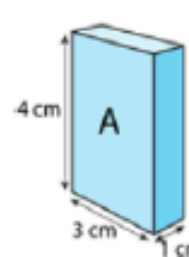
### Recognise prisms

A solid object with two identical ends and flat sides



A cylinder although with very similar properties does not have flat faces so is not categorised as a prism

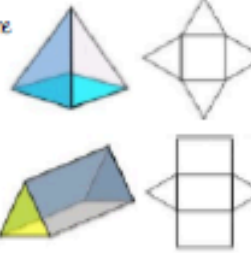
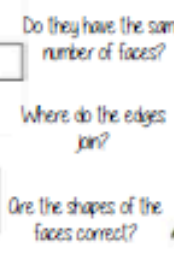
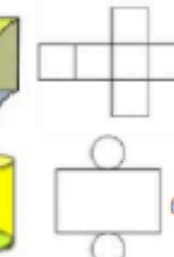
### Nets of cuboids



Visualise the folding of the net. Will it make the cuboid with all sides touching

1cm grids help to draw accurately

### Sketch and recognise nets

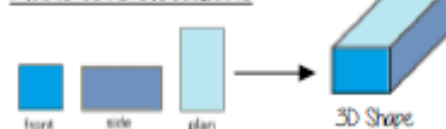


Do they have the same number of faces?

Where do the edges join?

Are the shapes of the faces correct?

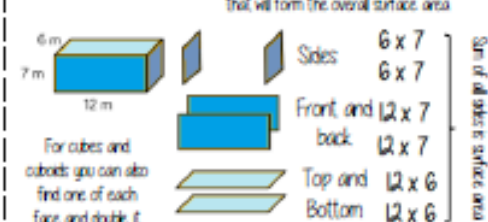
### Plans and elevations



The direction you are considering the shape from determines the front and side views

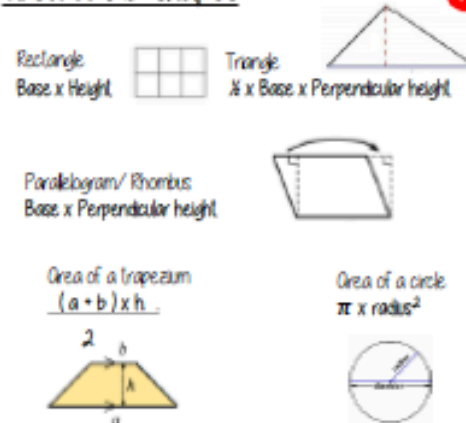
### Surface area

Sketching nets first helps you visualise all the sides that will form the overall surface area

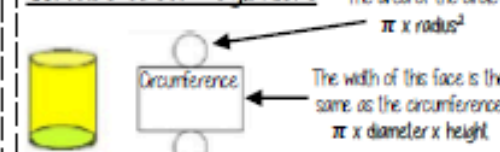


For other shapes not all the sides are the same, so calculate the individually

### Area of 2D shapes



### Surface area - cylinders



$$2 \times \pi \times \text{radius}^2 + \pi \times \text{diameter} \times \text{height}$$

### Volumes

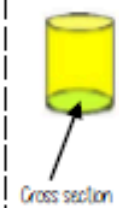
Volume is the 3D space it takes up - also known as capacity if using liquids to fill the space



**Counting cubes**  
Some 3D shape volumes can be calculated by counting the number of cubes that fill inside the shape.

$$\text{Cubes/Cuboids} = \text{base} \times \text{width} \times \text{height}$$

Remember multiplication is commutative



**Prisms and cylinders**  
= area cross section x height  
Height can also be described as depth

Areas - square units  
Volumes - cube units

Areas and volumes can be left in terms of pi



# YEAR 9 - CONSTRUCTING IN 2D/3D...

## Constructions & congruency

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

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

- Draw and measure angles
- Construct scale drawings
- Find locus of distance from points, lines, two lines
- Construct perpendiculars from points, lines, angles
- Identify congruence
- Identify congruent triangles

### Keywords

**Protractor:** piece of equipment used to measure and draw angles

**Locus:** set of points with a common property

**Equidistant:** the same distance

**Discorectangle:** (a stadium) — a rectangle with semi circles at either end

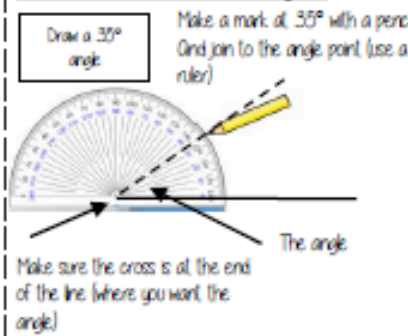
**Perpendicular:** lines that meet at  $90^\circ$

**Orc:** part of a curve

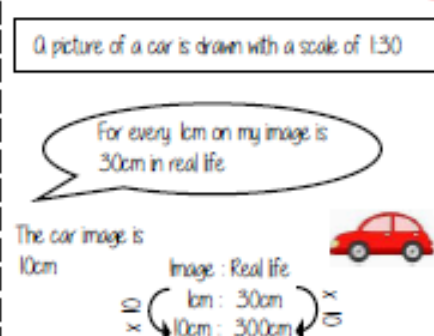
**Bisector:** a line that divides something into two equal parts

**Congruent:** the same shape and size

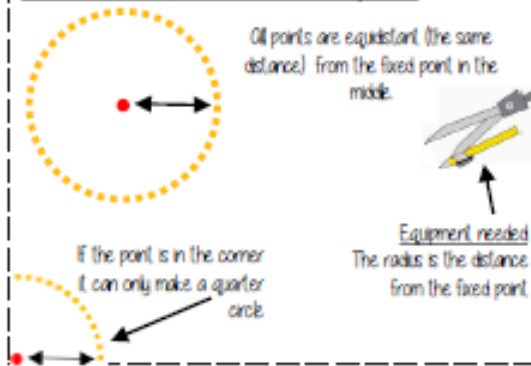
### Draw and measure angles



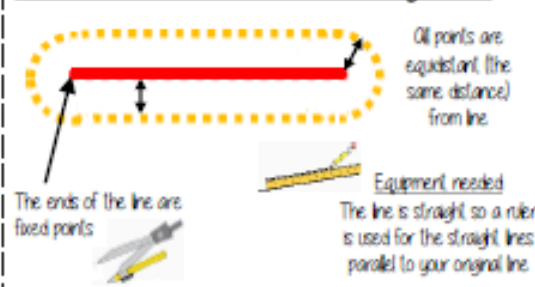
### Scale drawings



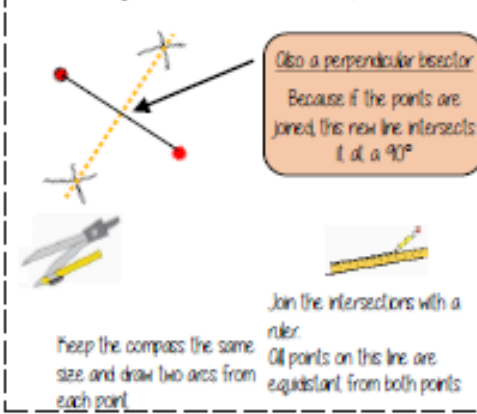
### Locus of a distance from a point



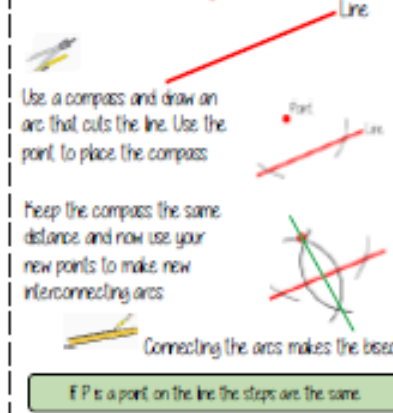
### Locus of a distance from a straight line



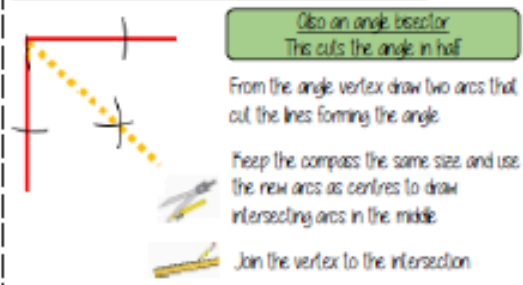
### Locus equidistant from two points



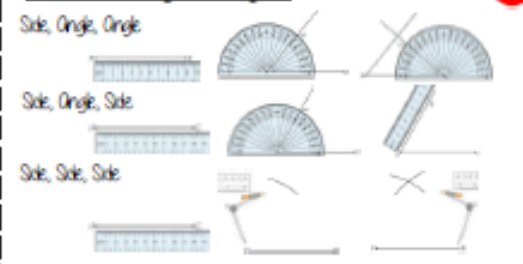
### Construct a perpendicular from a point



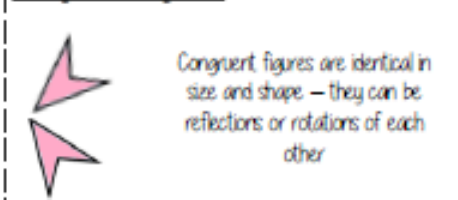
### Locus of a distance from two lines



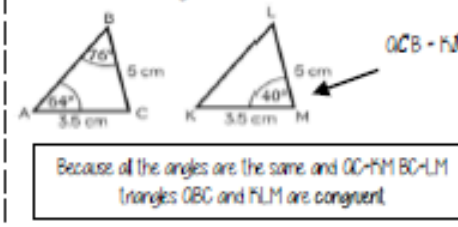
### Constructing Triangles



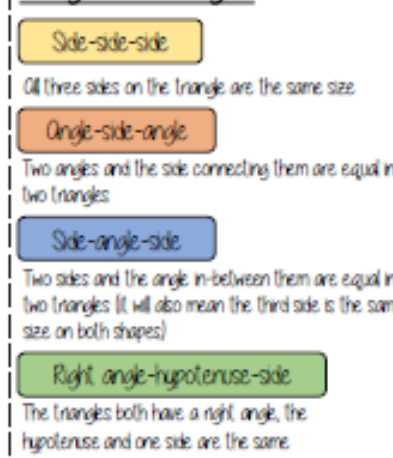
### Congruent figures



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



### Congruent triangles



# YEAR 9 — Trigonometry

## Using sine to find sides and angles

### Key point

The side opposite the chosen angle (angle  $\theta$  in this diagram) is called the **opposite** side. The side next to  $\theta$  is called the **adjacent** side.



### Key point

The ratio of the opposite side to the hypotenuse is called the **sine** of the angle. The sine of angle  $\theta$  is written as  $\sin \theta$ .

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

### Key point

You can use **inverse** trigonometric functions to work out unknown angles.

$$\sin \theta = x, \text{ so } \theta = \sin^{-1} x$$

### Worked example

Use the sine ratio to find the missing angle in this right-angled triangle.



Using the sine ratio

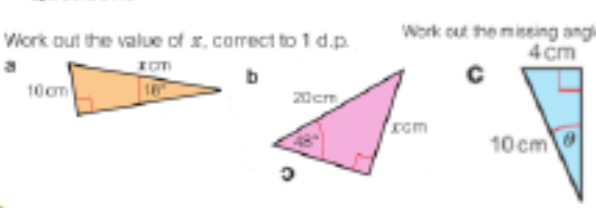
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin \theta = \frac{5}{13}$$

$$\theta = 22.6^\circ$$



### Questions



Corbett Maths  
Videos 329, 330 and 331

Answers: a 32.4 b 14.9 c 23.6

## Using cosine to find sides and angles

### Key point

The side opposite the chosen angle (angle  $\theta$  in this diagram) is called the **opposite** side. The side next to  $\theta$  is called the **adjacent** side.



### Key point

The ratio of the adjacent side to the hypotenuse is called the **cosine** of the angle. The cosine of angle  $\theta$  is written as  $\cos \theta$ .

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

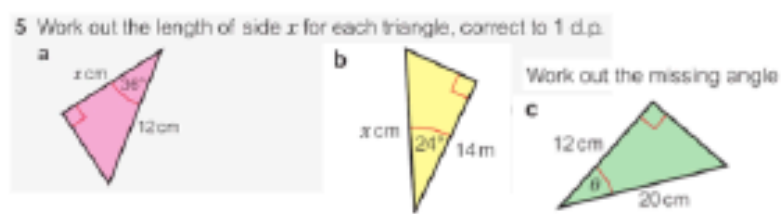
### Key point

You can use **inverse** trigonometric functions to work out unknown angles.

$$\cos \theta = x, \text{ so } \theta = \cos^{-1} x$$

For examples look at 9.1 'using tan' and 9.2 'using sine'

### Questions:



Answers:

a 9.7 b 15.3 c 53.1

Corbett Maths  
Videos 329, 330 and 331

## Using tangent to find sides and angles

### Key point

The side opposite the chosen angle (angle  $\theta$  in this diagram) is called the **opposite** side. The side next to  $\theta$  is called the **adjacent** side.



### Key point

The ratio of the opposite side to the adjacent side is called the **tangent** of the angle. The tangent of angle  $\theta$  is written as  $\tan \theta$ .

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

### Key point

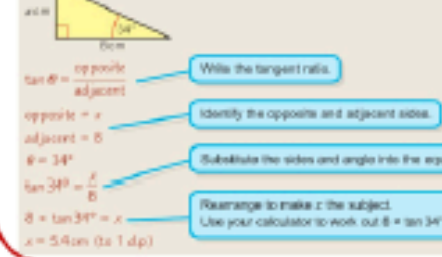
You can use **inverse** trigonometric functions to work out unknown angles.  $\tan \theta = x$ , so  $\theta = \tan^{-1} x$

For a worked example to find a missing angle in a right-angle triangle, look at 9.2 'using sine'

Hint for Qb:  
 $\tan 53 = \frac{5}{x}$   
Rearrange to  
 $x = \frac{5}{\tan 53}$

### Worked example

Use the tangent ratio to work out the value of  $x$ , correct to 1 d.p.

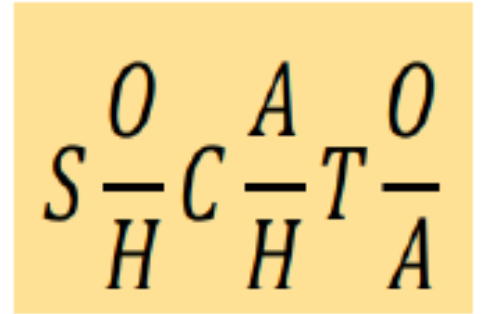


### Questions



Corbett Maths  
Videos 329, 330 and 331

Answers: a 3.8 b 3.3 c 45



| Angle ( $\theta$ ) | $\sin(\theta)$       | $\cos(\theta)$       | $\tan(\theta)$       |
|--------------------|----------------------|----------------------|----------------------|
| $0^\circ$          | 0                    | 1                    | 0                    |
| $30^\circ$         | $\frac{1}{2}$        | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{3}}$ |
| $45^\circ$         | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{2}}{2}$ | 1                    |
| $60^\circ$         | $\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$        | $\sqrt{3}$           |
| $90^\circ$         | 1                    | 0                    | undefined            |



# YEAR 9 - REPRESENTATIONS...

## Probability

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

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

- Find single event probability
- Find relative frequency
- Find expected outcomes
- Find independent events
- Use diagrams to work out probabilities

### Keywords

**Probability:** the chance that something will happen

**Relative Frequency:** how often something happens divided by the outcomes

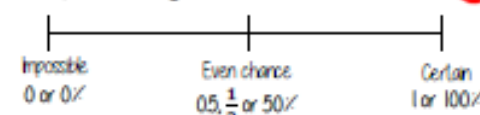
**Independent:** an event that is not effected by any other events

**Chance:** the likelihood of a particular outcome

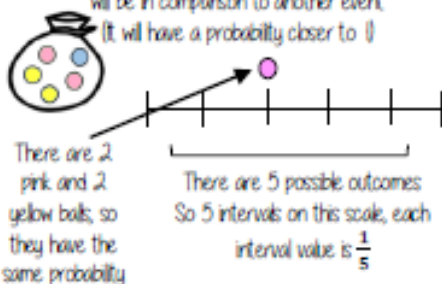
**Event:** the outcome of a probability – a set of possible outcomes

**Biased:** a built in error that makes all values wrong by a certain amount

### The probability scale



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)



### Single event probability

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

The table shows the probability of selecting a type of chocolate

| Dark | Milk | White |
|------|------|-------|
| 0.15 | 0.35 |       |

$$P(\text{White chocolate}) = 1 - 0.15 - 0.35 = 0.5$$



### Relative Frequency

$$\frac{\text{Frequency of event}}{\text{Total number of outcomes}}$$

Remember to calculate or identify the overall number of outcomes!

| Colour | Frequency | Relative Frequency |
|--------|-----------|--------------------|
| Green  | 6         | 0.3                |
| Yellow | 12        | 0.6                |
| Blue   | 2         | 0.1                |
|        | 20        |                    |

Relative frequency can be used to find expected outcomes

e.g. Use the relative probability to find the expected outcome for green if there are 100 selections

$$\text{Relative frequency} \times \text{Number of times} \\ 0.3 \times 100 = 30$$

### Expected outcomes

Expected outcomes are estimations. It is a long term average rather than a prediction.

| Dark | Milk | White |
|------|------|-------|
| 0.15 | 0.35 | 0.5   |

The sum of the probabilities is 1

An experiment is carried out 400 times

Show that dark chocolate is expected to be selected 60 times

$$0.15 \times 400 = 60$$

### Independent events



The rolling of one die has no impact on the rolling of the other. The individual probabilities should be calculated separately.

Probability of event 1  $\times$  Probability of event 2



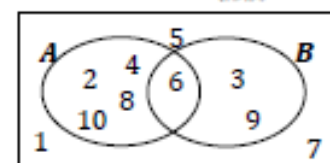
$$P(5) = \frac{1}{6} \quad P(R) = \frac{1}{4}$$

Find the probability of getting a 5 and a red

$$P(5 \text{ and } R) = \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$$

### Using diagrams

Recap Venn diagrams, Sample space diagrams and Two-way tables



|       | Car | Bus | Walk | Total |
|-------|-----|-----|------|-------|
| Boys  | 15  | 24  | 14   | 53    |
| Girls | 6   | 20  | 21   | 47    |
| Total | 21  | 44  | 35   | 100   |

The possible outcomes from tossing a coin

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 |



# THS

TIVERTON HIGH SCHOOL

**Year 9**

**Music**

**Work hard. Be kind. Belong.**

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# Dance Music

## Exploring Rhythm, Chords and Metre in Music for Dance

The **RHYTHMS** of dance music always match the **STEPS** of the dance: the two are inter-related. Dance music is based on **CHORD PATTERNS**: mainly **PRIMARY CHORDS (I, IV & V(7))** and has a clear **MELODY** with an **ACCOMPANIMENT** (**HOMOPHONIC TEXTURE**). Different dances and their music use different **METRES/TIME SIGNATURES**.



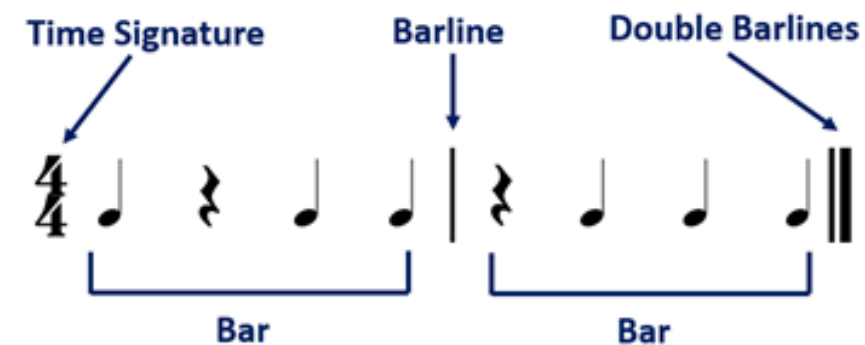
### A. Pulse, Time and Metre in Dance Music

The **BEAT** or **PULSE** of dance music is always **REGULAR**. Here is a regular crotchet pulse of 12 beats:



A single **BEAT** is a basic unit of musical time. In dance music, beats are grouped together to make a repeating pattern – normally made up of either twos, threes or fours.

The repeating pattern of beats gives us the **METRE** or the **TIME** of the music, shown by the **TIME SIGNATURE** at the start of a piece of music. Each repetition of the beat-pattern is called a **BAR** and bars are separated by vertical lines called **BARLINES**. A **DOUBLE BARLINE** always comes at the end of a piece of music or section of music.



The **TOP NUMBER** of a time signature tells you how many beats there are in each bar. The **BOTTOM NUMBER** tells you what types or note values these beats are (as divisions of a semibreve = 1):

**1 = Semibreve**

**2 = Minim**

**4 = Crotchet**

**8 = Quaver**

**16 = Semiquaver**

4/4 can also be shown by a "C" meaning

COMMON TIME



### B. Simple Time in Dance Music

**SIMPLE DUPLÉ METRE: Two beats to a bar**



Dance music such as **MARCHES**, the **TANGO** and **IRISH REEL** often use simple duple metre.

**SIMPLE TRIPLE METRE: Three beats to a bar**



Dance music such as **WALTZES** and the **MINUET**, **COURANTE** and **SARABANDE** from the Baroque Dance Suite often use simple triple metre.

**SIMPLE QUADRUPLE METRE: Four beats to a bar**



Dance music such as the **TANGO**, the **IRISH REEL**, the **ALLEMANDE** from The Baroque Dance Suite, **AMERICAN LINE DANCE MUSIC** (Country and Western), **DISCO** and **CLUB DANCE** often use simple quadruple metre.

### C. Simple and Compound Time

|                 | Simple Time Signatures |               |               | Compound Time Signatures |                |                 |
|-----------------|------------------------|---------------|---------------|--------------------------|----------------|-----------------|
| Duple Metre     | $\frac{2}{4}$          | $\frac{2}{2}$ | $\frac{2}{8}$ | $\frac{6}{8}$            | $\frac{6}{4}$  | $\frac{6}{16}$  |
| Triple Metre    | $\frac{3}{4}$          | $\frac{3}{2}$ | $\frac{3}{8}$ | $\frac{9}{8}$            | $\frac{9}{4}$  | $\frac{9}{16}$  |
| Quadruple Metre | $\frac{4}{4}$          | $\frac{4}{2}$ | $\frac{4}{8}$ | $\frac{12}{8}$           | $\frac{12}{4}$ | $\frac{12}{16}$ |

Dance music such as the **IRISH JIG** and the **GIGUE** from the Baroque Dance Suite often use compound duple metre (6/8) with a "ONE and a TWO and a" feel to the music.

### D. Chords in Dance Music

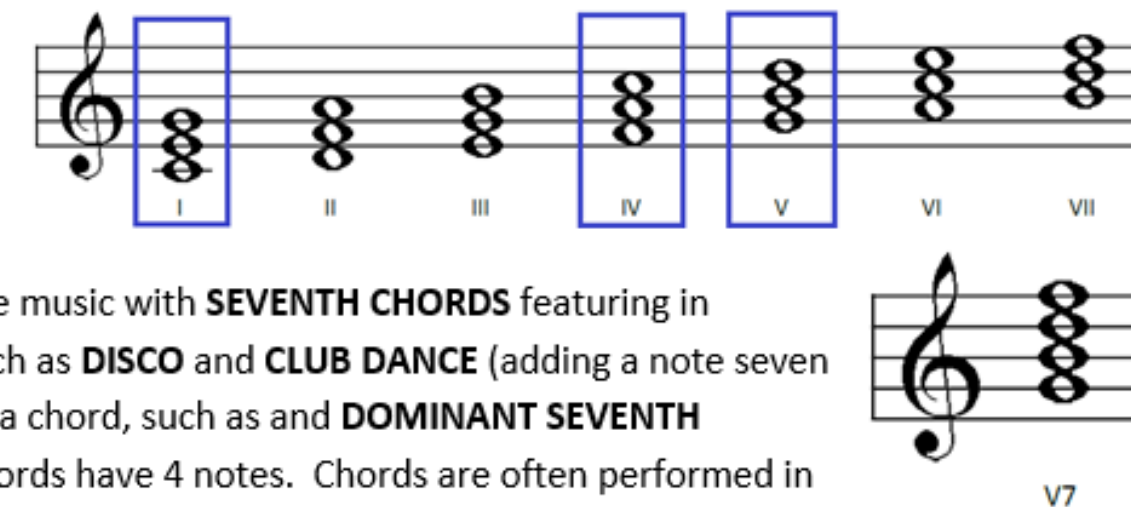
Dance music is based on **CHORD PATTERNS**.

**PRIMARY CHORDS:**

**CHORD I**, **CHORD IV**

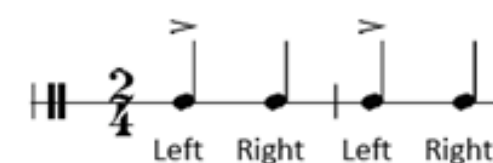
and **CHORD V** are most

commonly used in dance music with **SEVENTH CHORDS** featuring in popular dance music such as **DISCO** and **CLUB DANCE** (adding a note seven notes above the root of a chord, such as and **DOMINANT SEVENTH CHORD**). All seventh chords have 4 notes. Chords are often performed in different ways as an **ACCOMPANIMENT** in dance music.

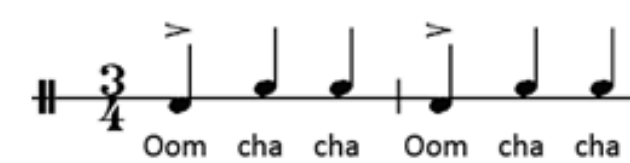


### E. Characteristic Rhythms in Dance Music

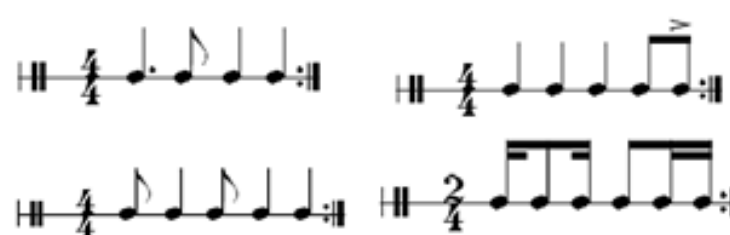
The **MARCH** has a strong **LEFT**, right, **LEFT**, right rhythm:



The **WALTZ** has a strong **OOM**-cha-cha, **OOM**-cha-cha rhythm:



The **TANGO** has several rhythms:



**FOUR-ON-THE-FLOOR** is a common rhythm in **DISCO** and more modern dance music:

| Count                    | 1 | and a | 2 | and a | 3 | and a | 4 | and a |
|--------------------------|---|-------|---|-------|---|-------|---|-------|
| Bass Drum                | ● |       | ● |       | ● |       | ● |       |
| Snare Drum or Hand Claps |   |       | ● |       |   |       | ● |       |
| Hi-Hat                   |   | ●     |   | ●     |   | ●     |   | ●     |
| Cymbal                   |   |       |   |       |   |       |   |       |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>F. Marches</b></p>  <p>Often with military connections or performed at ceremonies by large groups together.</p> <p><b>SIMPLE DUPE METRE</b> (<u>2/4 time</u> signature), although some marches can be in 4/4). Strong emphasis on the first beat of the bar (<b>LEFT</b>, right, <b>LEFT</b>, right). Clear <b>MELODY</b> and <b>ACCOMPANIMENT</b> (<b>HOMOPHONIC TEXTURE</b>). Uses mainly <b>PRIMARY CHORDS (I, IV &amp; V)</b>. Often performed by <b>MARCHING BANDS</b> featuring <b>BRASS, DRUMS</b> and <b>PERCUSSION</b>.</p> | <p><b>G. The Waltz</b></p>  <p>A <b>PAIRED DANCE</b> with couples close, arms around and facing each other. Popular in Vienna and became a fashionable</p> <p><b>BALLROOM DANCE.</b></p> <p><b>SIMPLE TRIPLE METRE</b> (<u>3/4 time</u> signature). Emphasis on first beat of the bar. Clear <b>OOM</b>-cha-cha, <b>OOM</b>-cha-cha rhythm. Clear <b>MELODY</b> and <b>ACCOMPANIMENT</b> (<b>HOMOPHONIC TEXTURE</b>). <b>REGULAR 4-BAR PHRASES</b>. Slow <b>HARMONIC RHYTHM</b> using <b>PRIMARY CHORDS (I, IV &amp; V)</b>. Performed by <b>ORCHESTRAS</b>. <b>STRINGS</b> (occasionally <b>WOODWIND</b>) normally have the <b>MELODY LINE</b>.</p> | <p><b>H. Latin Dance: The Tango</b></p>  <p>Originated in Argentina and became a popular <b>LATIN BALLROOM DANCE</b>. A dramatic and sensual <b>PAIRED DANCE</b> with close contact, serious expressions, and quick, jerky movements. Characteristic crisp "<b>TANGO RHYTHMS</b>" (see E.) often <b>DOTTED/SYNCOPATED RHYTHMS</b>. <b>SIMPLE DUPE METRE</b> (2/4) or <b>SIMPLE QUADRUPLE METRE</b> (4/4). Often <b>MINOR TONALITY</b> (sometimes <b>MAJOR</b> for contrast). Clear <b>MELODY</b> and <b>ACCOMPANIMENT</b> (<b>HOMOPHONIC TEXTURE</b>). Uses mainly <b>PRIMARY CHORDS (I, IV &amp; V)</b>. Instruments such as <b>BANDONEON, VIOLIN, CELLO, DOUBLE BASS</b> (often plucked – <b>PIZZICATO</b>), <b>SPANISH/ACOUSTIC GUITAR, PIANO</b>.</p> | <p><b>I. The Baroque Dance Suite</b></p>  <p>Popular between 1600-1750, a collection of shorter dances (<b>MOVEMENTS</b>) grouped together to form a <b>SUITE</b>. Dances included:</p> <ul style="list-style-type: none"> <li>• <b>ALLEMANDE</b> (German, 4/4, Stately)</li> <li>• <b>COURANGE</b> (French, 3/4, Lively, Dotted Rhythms and Disjunct melody)</li> <li>• <b>SARABANDE</b> (Spanish, 3/2, Slow and Stately, emphasis on 2<sup>nd</sup> beat of bar)</li> <li>• <b>MINUET</b> (3/4, Elegant, Stately)</li> <li>• <b>GIGUE</b> (6/8, Fast, Lively, Triplet Rhythms)</li> </ul> <p>All dances in <b>BINARY FORM (AB)</b> with each section repeated (<b>AABB</b>). Performed by a group of instruments such as <b>HARPSICHORD, LUTE, VIOLIN, CELLO, OBOE, RECORDER, FLUTE</b>.</p> |
| <p><b>J. American Line Dance</b></p> <p><b>GROUP SYNCHRONISED DANCE.</b> All dancers face same way standing in lines performing steps at the same time without touching. Accompanied by <b>COUNTRY AND WESTERN MUSIC</b>: <b>CATCHY MELODY, CROTCHET BASS LINE, SIMPLE HARMONY (CHORDS I &amp; V)</b> in crotchets. <b>SIMPLE QUADRUPLE METRE</b> (4/4) <b>POPULAR SONG FORM</b> <b>MAJOR TONALITY</b> Instruments such as <b>GUITARS (Electric and Acoustic), STEEL GUITAR, DRUMS, BANJO, FIDDLE, HARMONICA, ACCORDION</b>.</p>        | <p><b>K. Irish Jig and Reel</b></p>  <p>Traditional <b>FOLK DANCES</b> from Ireland with intricate footwork and arms by sides. <b>REEL: COMPOUND TIME</b> (6/8); <b>JIG: SIMPLE TIME</b> (2/4 or 4/4) both with "two in a bar" feel, continuous bouncy quaver or semiquaver rhythms, fast tempo and <b>DECORATED</b> melodies. <b>BINARY FORM. MAJOR/MINOR</b> or <b>MODAL</b>. Folk Instruments include: <b>FIDDLE, FLUTE, TIN WHISTLE, ACCORDION, BODHRAN, UILLEANN PIPES, HARP</b>.</p>                                                                                                                                                         | <p><b>L. Disco</b></p>  <p>Appeared in 1970's as an individual, <b>IMPROVISED DANCE</b> in clubs from a mix of jazz, funk and soul.</p> <p><b>SIMPLE QUADRUPLE METRE</b> (4/4) <b>FAST TEMPO</b> (around 120 BPM) <b>FOUR-ON-THE-FLOOR RHYTHM</b> (see E.) <b>SYNCOPATED</b> bass line parts. Simple <b>CHORD PATTERNS</b> using <b>CHORDS I</b> and <b>V</b> and <b>SEVENTH CHORDS</b>. <b>POPULAR SONG FORM</b> with a strong <b>GROOVE</b> (long repeated rhythm section) and fade out endings, and catchy <b>HOOKS/RIFFS</b>. <b>GUITARS, VOCALS, DRUMS, STRING/BRASS SOUNDS, SYNTHESISERS, SAMPLES</b>.</p>                                                                                                                                        | <p><b>M. Club Dance</b></p>  <p>Influenced by <b>MUSIC TECHNOLOGY</b>: samplers, synthesisers, sequencers and drum machines. Various genres: House, Techno, Drum and Bass, Garage, Trance, Ambient. Dancing in individual and <b>IMPROVISED</b> on one spot. <b>SIMPLE QUADRUPLE METRE</b> (4/4). Use of <b>ELECTRONIC SOUNDS</b>. A <b>STRONG BEAT</b> emphasised by the <b>DRUM</b> and <b>STRONG BASS LINES</b>. <b>SHORT PHRASES</b> and <b>REPETITIVE SECTIONS</b>. <b>FAST TEMPO</b> (Ambient is slower/chilled) Complex, layered drum patterns. Inclusion of <b>SAMPLES</b>.</p>                                                                                                                                                                                                      |



## Exploring Rhythm, Chords and Metre in Music for Dance

The RHYTHMS of dance music always match the STEPS of the dance: the two are inter-related. Dance music is based on CHORD PATTERNS: mainly PRIMARY CHORDS (I, IV & V(7)) and has a clear MELODY with an ACCOMPANIMENT (HOMOPHONIC TEXTURE). Different dances and their music use different METRES/TIME SIGNATURES.

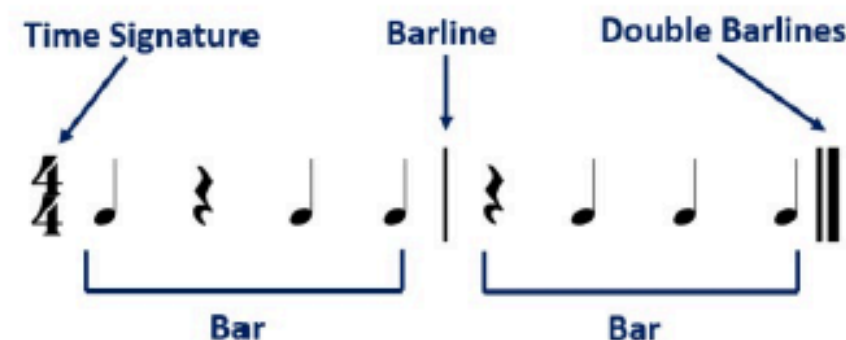
## A. Pulse, Time and Metre in Dance Music

The **BEAT** or **PULSE** of dance music is always **REGULAR**. Here is a regular crotchet pulse of 12 beats:



A single **BEAT** is a basic unit of musical time. In dance music, beats are grouped together to make a repeating pattern – normally made up of either twos, threes or fours.

The repeating pattern of beats gives us the **METRE** or the **TIME** of the music, shown by the **TIME SIGNATURE** at the start of a piece of music. Each repetition of the beat-pattern is called a **BAR** and bars are separated by vertical lines called **BARLINES**. A **DOUBLE BARLINE** always comes at the end of a piece of music or section of music.



The **TOP NUMBER** of a time signature tells you how many beats there are in each bar. The **BOTTOM NUMBER** tells you what types or note values these beats are (as divisions of a semibreve = 1):

- 1 = Semibreve
- 2 = Minim
- 4 = Crotchet
- 8 = Quaver
- 16 = Semiquaver

4/4 can also be shown by a "C" meaning COMMON TIME



## B. Simple Time in Dance Music

**SIMPLE DUPLER METRE:** Two beats to a bar



Dance music such as **MARCHES**, the **TANGO** and **IRISH REEL** often use simple duple metre.

**SIMPLE TRIPLE METRE:** Three beats to a bar



Dance music such as **WALTZES** and the **MINUET**, **COURANTE** and **SARABANDE** from the Baroque Dance Suite often use simple triple metre.

**SIMPLE QUADRUPLE METRE:** Four beats to a bar



Dance music such as the **TANGO**, the **IRISH REEL**, the **ALLEMANDE** from The Baroque Dance Suite, **AMERICAN LINE DANCE MUSIC** (Country and Western), **DISCO** and **CLUB DANCE** often use simple quadruple metre.

## C. Simple and Compound Time

|                       | Simple Time Signatures |               |                | Compound Time Signatures |                 |                 |
|-----------------------|------------------------|---------------|----------------|--------------------------|-----------------|-----------------|
| Simple duple time     |                        |               |                |                          |                 |                 |
| Simple triple time    |                        |               |                |                          |                 |                 |
| Simple quadruple time |                        |               |                |                          |                 |                 |
| Duple Metre           | $\frac{2}{4}$          | $\frac{3}{8}$ | $\frac{2}{8}$  | $\frac{6}{8}$            | $\frac{9}{8}$   | $\frac{12}{8}$  |
| Triple Metre          | $\frac{3}{4}$          | $\frac{3}{8}$ | $\frac{3}{16}$ | $\frac{9}{8}$            | $\frac{9}{16}$  | $\frac{9}{32}$  |
| Quadruple Metre       | $\frac{4}{4}$          | $\frac{4}{8}$ | $\frac{4}{16}$ | $\frac{12}{8}$           | $\frac{12}{16}$ | $\frac{12}{32}$ |

Dance music such as the **IRISH JIG** and the **GIGUE** from the Baroque Dance Suite often use compound duple metre (6/8) with a "ONE and a TWO and a" feel to the music.

## D. Chords in Dance Music

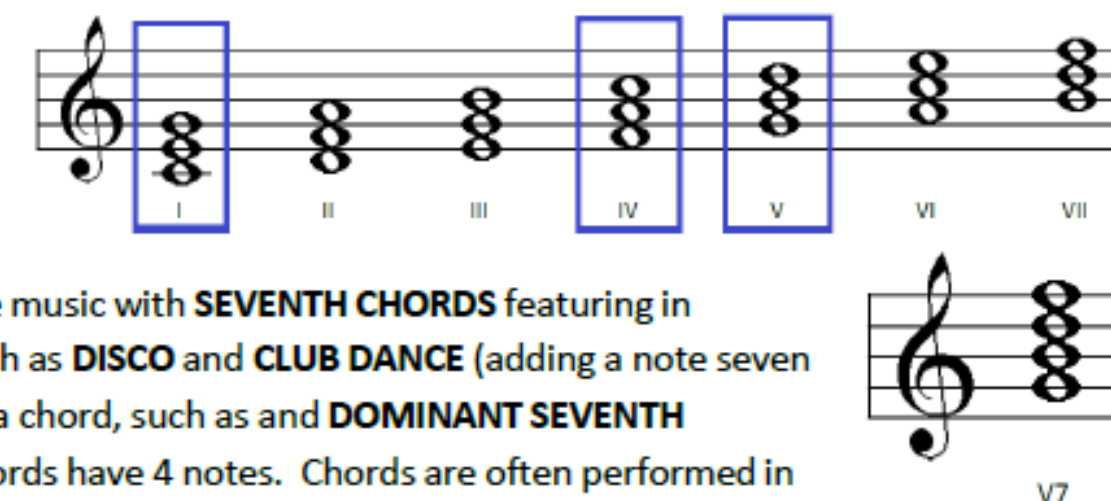
Dance music is based on **CHORD PATTERNS**.

**PRIMARY CHORDS:**

**CHORD I**, **CHORD IV**

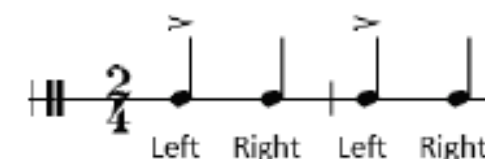
and **CHORD V** are most

commonly used in dance music with **SEVENTH CHORDS** featuring in popular dance music such as **DISCO** and **CLUB DANCE** (adding a note seven notes above the root of a chord, such as and **DOMINANT SEVENTH CHORD**). All seventh chords have 4 notes. Chords are often performed in different ways as an **ACCOMPANIMENT** in dance music.



## E. Characteristic Rhythms in Dance Music

The **MARCH** has a strong **LEFT**, right, **LEFT**, right rhythm:



The **WALTZ** has a strong **OOM**-cha-cha, **OOM**-cha-cha rhythm:



The **TANGO** has several rhythms:



**FOUR-ON-THE-FLOOR** is a common rhythm in **DISCO** and more modern dance music:

| Count                    | 1 | and a | 2 | and a | 3 | and a | 4 | and a |
|--------------------------|---|-------|---|-------|---|-------|---|-------|
| Bass Drum                | ● |       | ● |       | ● |       | ● |       |
| Snare Drum or Hand Claps |   |       | ● |       |   |       | ● |       |
| Hi-Hat Cymbal            |   | ●     | ● |       | ● | ●     |   | ●     |



# SOUNDTRACKS

## Exploring Film Music



### A. The Purpose of Music in Film

Film Music is a type of **DESCRIPTIVE MUSIC** that represents a **MOOD, STORY, SCENE** or **CHARACTER** through music, it is designed to **SUPPORT THE ACTION AND EMOTIONS OF THE FILM ON SCREEN**. Film Music can be used to:

- Create or enhance a mood (though the **ELEMENTS OF MUSIC**) ->
- Function as a **LEITMOTIF** (see D)
- To emphasise a gesture (**MICKEY-MOUSING** – when the music fits precisely with a specific part of the action in a film e.g. cartoons)
- Provide unexpected juxtaposition/irony (using music the listener wouldn't expect to hear giving a sense of uneasiness or humour!)
- Link one scene to another providing continuity
- Influence the pacing of a scene making it appear faster/slower
- Give added commercial impetus (released as a **SOUNDTRACK**) – sometimes a song, usually a pop song is used as a **THEME SONG** for a film.
- Illustrate the geographic location (using instruments associated with a particular country) or historical period (using music 'of the time').

### D. Leitmotifs

**LEITMOTIF** – A frequently recurring short melodic or harmonic idea which is associated with a character, event, concept, idea, object or situation which can be used directly or indirectly to remind us of one not actually present on screen



### E. History of Film Music

Early films had no soundtrack ("**SILENT CINEMA**") and music was provided live, usually **IMPROVISED** by a pianist or organist. The first **SOUNDTRACKS** appeared in the 1920's and used existing music (**BORROWED MUSIC** – music composed for other (non-film) purposes) from composers such as Wagner and Verdi's operas and ballets. In the 1930's and 1940's Hollywood hired composers to write huge Romantic-style soundtracks. **JAZZ** and **EXPERIMENTAL MUSIC** was sometimes used in the 1960's and 1970's. Today, film music often blends **POPULAR, ELECTRONIC** and **CLASSICAL** music together.

### B. How the Elements of Music are used in Film Music

**PITCH AND MELODY** – **RIISING MELODIES** are often used for increasing tension, **FALLING MELODIES** for defeat. Westerns often feature a **BIG THEME**. **Q&A PHRASES** can represent good versus evil. The **INTERVAL OF A FIFTH** is often used to represent outer space with its sparse sound.

**DYNAMICS** – **FORTE (LOUD)** dynamics to represent power; **PIANO (SOFT)** dynamics to represent weakness/calm/resolve. **CRESCENDOS** used for increasing threat, triumph or proximity and **DECRESCENDOS** or **DIMINUENDOS** used for things going away into the distance. Film soundtracks often use **EXTREME DYNAMICS** or **SUDDEN DYNAMIC CHANGES** to 'shock the listener'.

**HARMONY** – **MAJOR** – happy; **MINOR** – sad. **CONSONANT HARMONY OR CHORDS** for "good" and **DISSONANT HARMONY OR CHORDS** for "evil". **SEVENTH CHORDS** often used in Westerns soundtracks.

**DURATION** – **LONG** notes often used in Westerns to describe vast open spaces and in Sci-Fi soundtracks to depict outer space; **SHORT** notes often used to depict busy, chaotic or hectic scenes. **PEDAL NOTES** – long held notes in the **BASS LINE** used to create tension and suspense.

**TEXTURE** – **THIN/SPARE** textures used for bleak or lonely scenes; **THICK/FULL** textures used for active scenes or battles.

**ARTICULATION** – **LEGATO** for flowing or happy scenes, **STACCATO** for 'frozen' or 'icy' wintery scenes. **ACCENTS (>)** for violence or shock.

**RHYTHM & METRE** – 2/4 or 4/4 for Marches (battles), 3/4 for Waltzes, 4/4 for "Big Themes" in Westerns. **IRREGULAR TIME SIGNATURES** used for tension. **OSTINATO** rhythms for repeated sounds e.g. horses.

### C. Film Music Key Words

**SOUNDTRACK** – The music and sound recorded on a motion-picture film. The word can also mean a commercial recording of a collection of music and songs from a film sold individually as a CD or collection for digital download.

**MUSIC SPOTTING** – A meeting/session where the composer meets with the director and decides when and where music and sound effects are to feature in the finished film.

**STORYBOARD** – A graphic organiser in the form of illustrations and images displayed in sequence to help the composer plan their soundtrack.

**CUESHEET** – A detailed listing of **MUSICAL CUES** matching the visual action of a film so that composers can time their music accurately. **CLICK TRACKS** – An electronic **METRONOME** which helps film composers accurately time their music to on-screen action through a series of 'clicks' (often heard through headphones).

**DIEGETIC FILM MUSIC** – Music within the film for both the characters and audience to hear e.g. *a car radio, a band in a nightclub or sound effects*.

**NON-DIEGETIC FILM MUSIC** – Music which is put "over the top" of the action of a film for the audience's benefit and which the characters within a film can't hear – also known as **UNDERScore** or **INCIDENTAL MUSIC**.

### F. Film Music Composers and their Soundtracks



Jerry Goldsmith  
*Planet of the Apes*  
*Star Trek: The Motion Picture*  
*The Omen*  
*Alien*



John Williams  
*Star Wars*  
*Jaws*  
*Harry Potter*  
*Indiana Jones*  
*Superman, E.T.*



James Horner  
*Titanic*  
*Apollo 13*  
*Braveheart*  
*Star Trek II: The Wrath of Khan*



Ennio Morricone  
*The Good, The Bad and The Ugly*  
*For a Few Dollars More*  
*The Mission*



Danny Elfman  
*Mission Impossible*  
*Batman Returns*  
*Men in Black*  
*Spider-Man*



Hans Zimmer  
*The Lion King*  
*Gladiator*  
*Dunkirk*  
*Blade Runner 2049*  
*No Time to Die*



Bernard Herrmann  
*Psycho*  
*Vertigo*  
*Taxi Driver*



# Computer and Video Game Music



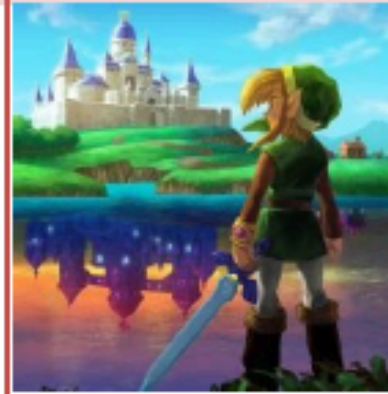
## Early Computer and Video Game Music



Early video game music consisted primarily of **SOUND EFFECTS** (an artificially created or enhanced sound used to emphasize certain actions within computer and video games), **CHIPTUNES** or **8-BIT MUSIC** (a style of electronic music which used simple melodies made for programmable sound generator (PSG) sound chips in

vintage computers, consoles and arcade machines) and early sound **SYNTHESISER** technology (an electronic musical instrument that generates audio signals that may be converted to sound). **SAMPLING** (the technique of digitally encoding music or sound and reusing it as part of a composition or recording) began in the 1980's allowing sound to be played during the game, making it more realistic and less "synthetic-sounding".

## How Computer and Video Game Music is used within a Game



Music within a computer or video game is often used for **CUES** (knowing when a significant event was about to occur).

Video game music is often heard over a game's title screen (called the **GROUND THEME**), options menu and bonus content as well as during the entire gameplay. Music can be used to **INCREASE TENSION AND SUSPENSE** *e.g. during battles and chases*, when the player must make a decision within the game (a **DECISION MOTIF**) and can change, depending on a player's actions or situation *e.g. indicating missing actions or "pick-ups"*.

## Musical Features of Computer and Video Game Music

### JUMPING BASS LINE

Where the bass line often moves by **LEAP (DISJUNCT MOVEMENT)** leaving 'gaps' between notes



### STACCATO ARTICULATION

Performing each note sharply and detached from the others.

Shown by a dot.



### CHROMATIC MOVEMENT

Melodies and bass lines that ascend or descend by semitones.



### SYNCOPIATION

Accenting the weaker beats of the bar to give an "offbeat" "jumpy" feel to the music.



## How Computer and Video Game Music is Produced



Fully-orchestrated **SOUNDTRACKS** (video game music scores) are now popular – technology is used in their creation but less in their performance. The composer uses **MUSIC TECHNOLOGY** to create the score, it is then played by an **ORCHESTRA** and then digitally converted and integrated into the game. Video game **SOUNDTRACKS** have become popular and are now commercially sold and performed in concerts

## Character Themes in Computer and Video Game Music



Characters within a video game can also have their own **CHARACTER THEMES** or **CHARACTER MOTIFS** – like **LEITMOTIFS** within Film Music. These can be manipulated, altered and changed – adapting the elements of music – **ORCHESTRATION** (the act of arranging a piece of music for an orchestra and assigning parts to the different musical instruments), **TIMBRE, SONORITY, TEXTURE, PITCH, TEMPO, DYNAMICS** – depending on the character's situation or different places they travel to within the game.

## Famous Computer and Video Game Music Composers and their Soundtracks



Koji Kondo  
Super Mario Bros. (1985)  
The Legend of Zelda (1986)



Michael Giacchino  
The Last World: Jurassic Park (1997)  
Medal of Honour (1999) Call of Duty (2003)



Mieko Ishikawa  
Dragon Slayer (1993)



Martin O'Donnell and Michael Salvatori  
Halo (2002)



Daniel Rosenfield  
Minecraft (2011)



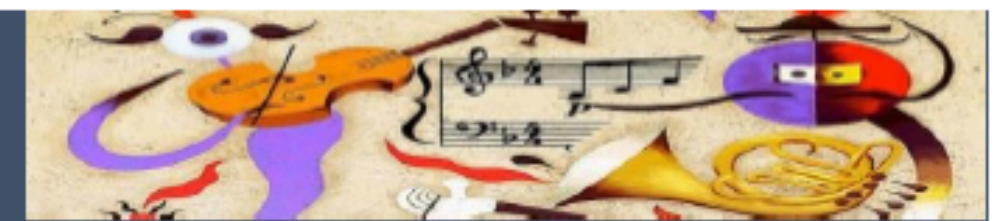
Tom Di Prisco  
Fortnite (2017)



# New Directions

## Exploring ways to develop music from small ideas in C20th Music

There were many different types, styles, genres and movements of music in the twentieth century. These include: Impressionism, 20<sup>th</sup> Century Nationalism, Jazz Influences, Polytonality, Atonality, Expressionism, Serialism, Microtonality, Electronic Music, Experimentalism, Minimalism, Pointillism and Music Concrète.



### A. Features of Music in the Twentieth Century (How Composers used the Elements of Music)

| A1. Melody & Dynamics                                                                                                                                                                                                                                         | A2. Harmony                                                                                                                                      | A3. Rhythm                                                                                                                                                                                                              | A4. Timbres and Sonorities                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONJUNCT</b> - wide leaps, angular and spiky.<br><b>CHROMATIC</b> - uses all 12 notes (black and white) of the <b>CHROMATIC SCALE</b> .<br><b>DISSONANCE</b> - harsh sounds.<br><b>EXTREMES OF DYNAMICS</b> - ( <i>pppp-ffff</i> ) No clear melody/"tune". | <b>ATONALITY</b> – no (sense of) key.<br><b>POLYTONALITY</b> – two or more keys played at once.<br><b>DISCORDS</b> – dissonant, clashing chords. | <b>SYNCOPIATION</b> – half beat followed by full beat emphasising weaker beats of the bar.<br><b>IRREGULAR ACCENTS</b> (>) – e.g. <i>The Rite of Spring</i><br><b>IRREGULAR TIME SIGNATURES</b> – 5 or 7 beats per bar. | Strange, intriguing, and exotic sounds; striking, sometimes explosive, contrasts.<br><b>PERCUSSION</b> – expanded in orchestra and more emphasis on percussion timbre and sonorities.<br>Unfamiliar sounds from strange instruments such as <b>EXTREME PITCH RANGES</b> and playing instruments in different and unusual ways.<br><b>TOTALLY NEW SOUNDS</b> often involving <b>ELECTRONIC EQUIPMENT</b> and <b>MAGNETIC TAPE</b> . |

### B. Minimalism

Based on **CELLS** or **MOTIFS** – short simple ideas.

Use of **REPETITION** – also called **LOOPING**.

**LAYERED TEXTURES**

**NO CLEAR MELODY**

**GRADUAL CHANGES OVER TIME**



**PHASE SHIFT (PHASE IN/OUT)** – when two or more motifs or cells begin in **UNISON** and gradually become "out of sync" with each other through displacement, either forwards or backwards. **METAMORPHOSIS** – tiny changes are made over time to one note or to one part of the rhythm. This can go a "full circle" and end up exactly the same at the end.



**ADDITIVE MELODY** – adding notes to an original melodic cell gradually.

**ISORHYTHMIC OVERLAP** – combining different length motifs or ostinato patterns

**AUGMENTATION** – doubling the note values of a motif or cell.

**DIMINUTION** – halving the note values of a motif or cell.

**RETROGRADE/INVERSION/RETROGRADE INVERSION** (see D. Serialism)

**Famous Minimalist Composers include:** Terry Riley, Steve Reich, Philip Glass, Michael Nyman.



### C. Expressionism

"Expressionism" is borrowed from painting and is concerned with dark, secret terrors, mental breakdowns, and fantastic visions.

**ATONAL, DISSONANCE, DISJUNCT, LARGE ORCHESTRAS, UNUSUAL AND STRANGE TIMBRES AND SONORITIES.**

Expressionist composers often use

**HEXACHORDS** as a form of **ACCOMPANIMENT**.

are chords formed of **SIX** hexachord can be formed on the **CHROMATIC SCALE**, but must follow a strict pattern of **TONES** and **SEMITONES**:

**Semitone – Tone – Semitone –**

**Tone+Semitone – Semitone**

The notes can then be arranged in any order in different (and often extreme!) pitch ranges.

**Famous Expressionist Composers include:**

**Arnold**

**Schoenberg, Alban Berg, Anton Webern**



Hexachords  
**NOTES.** A  
any note of



### D. Serialism

**TONE/NOTE ROWS** – use the 12 notes of the **CHROMATIC SCALE** into an order (the **PRIME/ORIGINAL**) on which the entire composition is based. All 12 notes are of equal importance and none should appear out of turn.



As well as being used in its **PRIME/ORIGINAL**, the tone/note row could also be used in:

**INVERSION** (intervals upside down)

**RETROGRADE** (backwards)

**RETROGRADE INVERSION** (the inversion row backwards)

These 4 rows would then become the bases of the composition, used either vertically (as chords) or horizontally (as melody).

**Famous Serialist Composers include:** Arnold Schoenberg, Alban Berg, Anton Webern, Igor Stravinsky





# SAMBA

Samba is a musical genre and dance style with its roots in Africa via the West African slave trade and African religious traditions. Samba is an expression of Brazilian cultural expression and is a symbol of carnival. Samba schools form and compete bringing people together.



## A. Key Words and Terms in Samba Music

**CALL AND RESPONSE** – one person plays or sings a musical phrase, then another person/group responds with a different phrase or copies the first one.

**CYCLIC RHYTHM** – a rhythm that is repeated over and over again.

**IMPROVISATION** – making up music as you go along, without preparation.

**OSTINATO** – a repeated pattern. Can be rhythmic or melodic; usually short.

**PERCUSSION** – Instruments that are mostly hit, scraped or shaken to produce sound. Samba uses many percussion instruments which together are called a **BATERIA**.

**POLYRHYTHM** – the use of several rhythms performed simultaneously, often overlapping each other to create a thick texture.

**PULSE** – a regular beat that is felt throughout music

**RHYTHM** – a series of notes of different lengths that create a pattern. Usually fits with a regular beat or pulse.

**SYNCOPIATION** – accenting or emphasising the weaker beats of the bar (often a half beat (quaver) followed by a full beat (crotchet)) giving the rhythm an **OFFBEAT** feel.

**SAMBISTA** – the leader of a Samba band or ensemble, often signalling cues to the rest of the band of when to change sections within the music with an **APITO** (Samba whistle)

## B. Form and Structure of Samba

Samba music often starts with an **INTRODUCTION** often featuring **CALL AND RESPONSE RHYTHMS** between the Samba Leader and ensemble. The main Ostinato rhythm of Samba is called the **GROOVE** when all the instruments of the Samba Band play their respective rhythms over and over again (**CYCLIC RHYTHMS**) forming the main body of the piece. The **GROOVE** is broken up by **BREAKS** - 4 or 8 beat rhythms providing contrast and **MID SECTIONS** – one or two instruments change the rhythm of their ostinato and the others stay the same or stop. Sometimes **BREAKS** and **MID SECTIONS** feature a **SOLOIST** who “shows off” their rhythms. The **SAMBISTA** must signal to the group when to change to a different section which is normally done with an **APITO** (Samba Whistle – loud!). A piece of Samba can end (this section is called the **CODA**) with either a **CALL AND RESPONSE** pattern or a pre-rehearsed ending phrase of rhythm. The **FORM AND STRUCTURE** of a piece of Samba may look like the following:

|       |        |       |        |             |        |             |        |       |        |      |
|-------|--------|-------|--------|-------------|--------|-------------|--------|-------|--------|------|
| Intro | Groove | Break | Groove | Mid-Section | Groove | Mid-Section | Groove | Break | Groove | Coda |
|-------|--------|-------|--------|-------------|--------|-------------|--------|-------|--------|------|

## C. Texture of Samba Music

Texture varies in Samba music, often **MONOPHONIC** where a single rhythm is heard as in **CALL AND RESPONSE** sections, sometimes **POLYPHONIC** where sections of the Samba band play different rhythms (**OSTINATOS**) creating **CROSS-RHYTHMS** (when two rhythmic patterns that “conflict” with each other occur simultaneously) creating a thick texture of interweaving and interlocking rhythms – a **POLYRHYTHM** or a **POLYRHYTHMIC TEXTURE**.

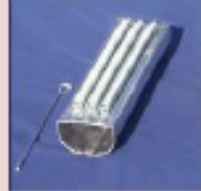
## D. Dynamics of Samba Music

The dynamics of Samba music are normally **VERY LOUD** – it is music designed to be performed outdoors at carnivals and is played by large numbers of instrumentalists and to accompany dancers and processions with large audiences watching and listening. Sometimes, a **CRESCENDO** is used at the end of a piece of Samba music for dramatic effect.

## E. Tempo of Samba Music

Samba music is generally **FAST** at around 104 bpm and keeps a constant tempo to assist the dancers or processional nature of the music. Sometimes the **SAMBISTA** (Samba leader) uses **(TEMPO) RUBATO** – tiny fluctuations in tempo for expressive effect.

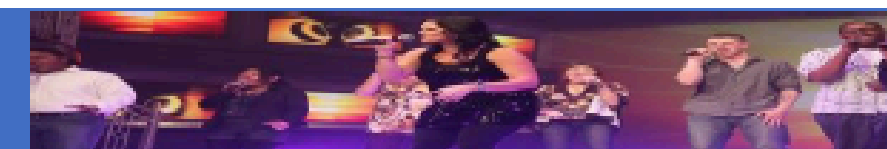
## F. Instruments, Timbres and Sonorities of Samba

|                                                                                     |                                                                                     |                                                                                      |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>SURDO</b>                                                                        | <b>REPINIQUE</b>                                                                    | <b>TAMBORIM</b>                                                                      | <b>CHOCOLO</b>                                                                        | <b>RECO-RECO</b>                                                                      | <b>APITO</b>                                                                          | <b>AGOGO BELLS</b>                                                                    | <b>CAIXA DE GUERRO</b>                                                                |
|  |  |  |  |  |  |  |  |



# What Makes a Good Song?

Exploring Popular Songs and Musical Arrangements



## A. Popular Song Structure

**SONG STRUCTURE** – How a song is made up of or divided into different sections (see below) and the order in which these sections occur. To work out the structure of a song, it's helpful to analyse the **LYRICS** and listen to a recording for the song (for instrumental sections). **INTRO** – often shortened to 'intro', the first section of a song which sets the mood of the song and is sometimes, but not always, an instrumental section using the song's chord pattern.

**VERSES** – songs normally have several verses. Verses introduce the song's theme and have the same melody but different lyrics for each verse which helps develop the song's narrative and story. Songs made up entirely of verses are called **STROPHIC**.

**LINK** – a optional short section often used to join different parts of a song together, often instrumental, and sometimes joins verses together or appears at other points within a song.

**PRE-CHORUS** – an optional section of music that occurs before the **CHORUS** which helps the music move forward and "prepare" for what is to come.

**CHORUS** – occurs several times within a song and contains the most memorable **HOOK/RIFF**. The chorus relays the message of the song and is repeated with the same melody and lyrics each time it is heard. In popular songs, the chorus is often repeated several times towards the end of the song.

**MIDDLE 8/BRIDGE** – a section (often 8 bars in length) that provides contrasting musical material often featuring an instrumental or vocal solo using new musical material allowing the performer to display their technical skill on their instrument or voice.

**CODA/OUTRO** – The final section of a popular song which brings it to an end (Coda is Italian for "tail"!).

## B. Key Words

**LYRICS** – The words of a song, usually consisting of **VERSES** and a **CHORUS**.

**HOOK** – A 'musical hook' is usually the 'catchy bit' of the song that you will remember. It is often short and used and repeated in different places throughout the piece. Hooks can be either **MELODIC**, **RHYTHMIC** or **VERBAL/LYRICAL**.

**RIFF** – A repeated musical pattern often used in the introduction and instrumental breaks in a song or piece of music. Riffs can be rhythmic, melodic or lyrical, short and repeated.

**MELODY** – The main tune of the song often sung by the **LEAD SINGER**.

**COUNTER-MELODY** – An 'extra' melody often performed 'on top of' the main melody that 'fits' with it a **DESCANT** or **INSTRUMENTAL SOLO**.

**TEXTURE** – The layers that make up a song e.g., *Melody, Counter-Melody, Hooks/Riffs, Chords, Accompaniment, Bass Line*.

## C. Lead Sheet Notation and Arrangements

A **LEAD SHEET** is a form of musical **NOTATION** that contains only the essential elements of a popular song such as the **MELODY**, **LYRICS**, **RIFFS**, **CHORDS** (often as guitar chord symbols) and **BASS LINE**; it is not as developed as a **FULL SCORE ARRANGEMENT** and is open to interpretation by performers who need to use and adapt the given elements to create their own musical **ARRANGEMENT**: their "version" of an existing song.

**COVER (VERSION)** – A new performance, remake or recording by someone other than the original artist or composer of the song.

## D. Conjunct and Disjunct Melodic Motion

**CONJUNCT MELODIC MOTION** – Melodies which move mainly by step or use notes which are next to or close to one another.

**DISJUNCT MELODIC MOTION** – Melodies which move mainly by leap or use notes which are not next to or close to one another.

**MELODIC RANGE** – The distance between the lowest and highest pitched notes in a melody.

## E. Song Timbre and Sonority (Instruments that are used to Accompany Songs)

Pop Bands often feature a **DRUM KIT** and **PERCUSSION** to provide the rhythm along with **ELECTRIC GUITARS (LEAD GUITAR, RHYTHM GUITAR and BASS GUITAR)** and **KEYBOARDS**. Sometimes **ACOUSTIC INSTRUMENTS** are used such as the **PIANO** or **ACOUSTIC GUITAR**. **ORCHESTRAL INSTRUMENTS** are often found in pop songs such as the **STRINGS**, **SAXOPHONE**, **TROMBONE** and **TRUMPET**. Singers are essential to a pop song - **LEAD SINGER** – Often the "frontline" member of the band (most famous) who sings most of the melody line to the song. **BACKING SINGERS** support the lead singer providing **HARMONY** or a **COUNTER-MELODY** (a melody that is often higher in pitch and different, but still 'fits with' the main melody) and do not sing all the time but just at certain points within a pop song e.g. in the chorus.





# THS

TIVERTON HIGH SCHOOL

## **Year 9**

## **Religion**

**Work hard. Be kind. Belong.**

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# Year 9 Philosophy of Life and Death

What gives life and death meaning?



## A) Philosophical worldviews



Philosophy is the study of life, existence and the world. Some key philosophers are Socrates, Plato, Simone De Beauvoir, Ludwig Wittgenstein. Philosophers can be religious or non-religious. Philosophers repeatedly question the nature of truth and whether truth actually exists.

There appear to be six philosophical worldviews (how people see the world)

|                                                                                    |                                                                                          |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Rational agnostic</b> —willing to say they don't know what gives life meaning.  | <b>Humanist Optimist</b> —takes life as it comes and hopes for a meaning to life.        |
| <b>Nihilist</b> —believes in nothing and sees no purpose or meaning to life.       | <b>Spiritual post-modernist</b> —relies on personal experiences to give life meaning.    |
| <b>Theistic believer</b> —sees God and/or religion as a source of meaning in life. | <b>Eastern worldview</b> —sees life as part of a great mysterious, but purposeful cycle. |

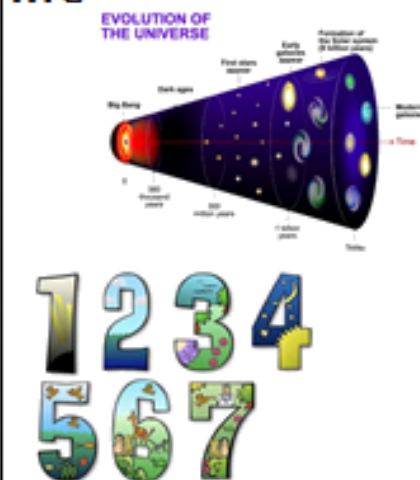
**Plato's Allegory of the Cave**—metaphorical story about life

A group of prisoners are chained in a cave their whole life only ever seeing shadows on a wall which are created by other people holding up statues of living things. One day one of the prisoners leaves the cave and sees the real world—all the creatures he saw as shadows are now in front of him. The prisoner realises that the life he knew was a lie and goes back to the cave to tell the others; some are too scared of reality and choose to stay in the cave; others want to experience the real world for themselves and venture out; and some try to attack him because they think he is mad/dishonest.



1. Philosophy—the study of life and the world
2. Philosophers—someone who studies the meaning of life and other philosophical ideas
3. Nihilist—someone who believes life has no meaning
4. Theistic believer—someone who looks to religion or God to give life meaning
5. Humanist Optimist—someone who believes humanity makes life meaningful
6. Rational Agnostic—someone who doesn't know what makes life meaningful
7. Allegory—a metaphorical story to teach a philosophical lesson

## B) Understanding life



- ⇒ Four types of knowledge: Scientific (what science tells us), Historical (what history tells us), Spiritual/Religious (what religions tell us) and Moral (what our instincts tell us).
- ⇒ Some believers say "all scripture is God-breathed" meaning the information in their holy texts comes directly from God. Others believe it is 'God-inspired' - meaning the people who wrote it were inspired by God but wrote in their own words and context.

How and why were humans created?

|                           | How?                                                                                                                                                     | Why?                                                                                                                               |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Religious view</b>     | Intelligently and intentionally designed by an all-powerful God. For example, Christians believe God created the world in 6 days according to the Bible. | To fulfil special purposes described in holy texts e.g. to be good stewards, create meaningful lives, help others and worship God. |
| <b>Non-religious view</b> | Process of evolution started by a random explosive event referred to as The Big Bang                                                                     | No particular cause or intent.                                                                                                     |

8. Authority—someone or something which others look up to for information or guidance
9. Scripture—important writings from a religion
10. Big Bang—a scientific theory that states the universe was created by rapid expansion in space
11. Evolution—a scientific theory that humans developed from previous species
12. Creationism—the belief that the universe was created by an all-powerful God

## C) Understanding death



- ⇒ A funeral is a **ceremony** connected with a **burial or cremation** for a person who has died. Funerals are **specifically designed** to reflect religious beliefs used by a culture to remember the dead.
- ⇒ Some less-conventional methods of body disposal include **air/sky, water and green/eco burials**.
- ⇒ The term 'good death' is sometimes applied to situations where someone has died for a "good" reason: for example, in defence of another; during wartime; as a martyr; peacefully.
- ⇒ The **Dignity in Dying Movement** is an organisation whose primary aim is for individuals to have greater choice and more control over end-of-life decisions, so they might alleviate any suffering.

13. Funeral—a ceremony to mark the end of a person's life
14. Death—the end of a person's physical existence
15. Dignity—the quality or state of a person's life



The disciplinary approaches to this unit will be:

Developing deeper knowledge of philosophical theories and worldviews

Philosophical evaluation of the concepts of knowledge, truth and meaning

Sociological understanding of the impact philosophical worldviews



# Year 9 Muslim Worldview

How challenging is it to be Muslim in Britain?



|                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                               |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>A) The Ummah (community)</div> <div></div>       | <div><div>⇒ Islam is split into two main groups (denominations) called Sunni (~90%) and Shi'a (~10%) They share almost all the same beliefs and teachings, except for leadership.</div><div>⇒ Britain has around 1750 mosques and nearly half of all British Muslims were born in the UK. In WW2 500 000 Muslim soldiers fought for the British and after the war were invited to Britain to help make up the workforce to rebuild the country.</div><div>⇒ In recent years countries such as Iraq, Afghanistan and Syria have suffered war and great poverty which has led to many having to flee and seek refuge in other countries.</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <div><div>1. <b>Ummah</b>—global community of Muslims</div><div>2. <b>Sunni</b>—majority group of Muslims</div><div>3. <b>Shi'a</b>—minority group of Muslims</div><div>4. <b>Mosque</b>—Islamic place of worship</div></div> |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <div>B) Core beliefs and teachings</div> <div></div> | <div><div>⇒ All Muslims believe in Tawhid - meaning 'one God'. Muslims believe strongly that there is only one God, referred to as Allah. Allah has no equals and no partners. Allah has no physical form and therefore has no image. Muslims use 99 names to describe the key characteristics of Allah (merciful, powerful, all-knowing, creator etc).</div><div>⇒ The five pillars of Sunni Islam are:</div><table><tr><td>1. Shahadah</td><td>the declaration of faith which should ideally be the first and last thing a Muslim says/hears. It states "There is no god but Allah, and Muhammad is his messenger".</td></tr><tr><td>2. Salah</td><td>complete the 5 daily prayers. Key features of Islamic prayer are; a prayer mat, facing the direction of Makkah, placing forehead to the ground, washing before prayer.</td></tr><tr><td>3. Zakah</td><td>donate money/goods for the benefit of others and reminds Muslims to put others before themselves.</td></tr><tr><td>4. Sawm</td><td>fasting for the month of Ramadan; this is done to remember the struggle of others and to show spiritual discipline.</td></tr><tr><td>5. Hajj</td><td>annual pilgrimage to the holy city (Makkah). When there, Muslims spend a week performing sacred tasks and rituals designed to remember their past and to test their faith.</td></tr></table><div>⇒ Shi'a Islam teaches that there are 10 Obligatory Acts; some of them are the same as the five pillars but others are different; for example:</div><div><div>Amr-bil-maroof—encourage what is good</div><div>Nahil Anril Munkar —discourage what is bad</div><div>Jihad—to struggle to be a good Muslim</div></div></div> | 1. Shahadah                                                                                                                                                                                                                   | the declaration of faith which should ideally be the first and last thing a Muslim says/hears. It states "There is no god but Allah, and Muhammad is his messenger". | 2. Salah | complete the 5 daily prayers. Key features of Islamic prayer are; a prayer mat, facing the direction of Makkah, placing forehead to the ground, washing before prayer. | 3. Zakah | donate money/goods for the benefit of others and reminds Muslims to put others before themselves. | 4. Sawm | fasting for the month of Ramadan; this is done to remember the struggle of others and to show spiritual discipline. | 5. Hajj | annual pilgrimage to the holy city (Makkah). When there, Muslims spend a week performing sacred tasks and rituals designed to remember their past and to test their faith. | <div><div>5. <b>Tawhid</b>—belief in one god</div><div>6. <b>Allah</b>—Islamic term for God</div><div>7. <b>Shahadah</b>—declaration of faith</div><div>8. <b>Salah</b>—five daily prayers</div><div>9. <b>Sawm</b>—month of fasting (aka Ramadan)</div><div>10. <b>Zakah</b>—donation of 2.5% (or more) to charity</div><div>11. <b>Hajj</b>—pilgrimage to Makkah</div><div>12. <b>Obligatory Act</b>—actions Allah has instructed Shi'a Muslims to perform</div><div>13. <b>Amr-bil-maroof</b>—encourage what is good</div><div>14. <b>Nahil Anril Munkar</b> —discourage what is bad</div><div>15. <b>Jihad</b>—to struggle to be a good Muslim</div></div> |
| 1. Shahadah                                                                                                                            | the declaration of faith which should ideally be the first and last thing a Muslim says/hears. It states "There is no god but Allah, and Muhammad is his messenger".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                               |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 3. Zakah                                                                                                                               | donate money/goods for the benefit of others and reminds Muslims to put others before themselves.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4. Sawm                                                                                                                                | fasting for the month of Ramadan; this is done to remember the struggle of others and to show spiritual discipline.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                               |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 5. Hajj                                                                                                                                | annual pilgrimage to the holy city (Makkah). When there, Muslims spend a week performing sacred tasks and rituals designed to remember their past and to test their faith.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                               |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <div>C) Islam in Britain</div> <div></div>          | <div><div>⇒ Today, Muslims represent Britain in; sport, entertainment and politics. As well as contributing to society in the fields of medicine, science, food, retail and construction.</div><div>⇒ Islamophobia translates to 'fear of Islam'. In the UK there is strong evidence of Islamophobia with reports of hate crimes, abuse and damage to Islamic buildings increasing in recent years.</div><div>⇒ The Muslim Council of Britain works closely with government and communities to build a positive representation of Islam and to reduce Islamophobia within the UK.</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <div><div>16. <b>Islamophobia</b>—fear or hatred of Muslims</div><div>17. <b>Discrimination</b>—mistreatment or abuse of a person or group due to a prejudice</div></div>                                                     |                                                                                                                                                                      |          |                                                                                                                                                                        |          |                                                                                                   |         |                                                                                                                     |         |                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



The disciplinary approaches to this unit will be:

Historical understanding of the development of Islam

Theological knowledge of Islamic core beliefs and teachings

Sociological understanding of the impact of Islamic practices





The **BIG** Question

Sociological understanding the impact of evil and suffering





# THS

TIVERTON HIGH SCHOOL

## **Year 9 Science**

**Work hard. Be kind. Belong.**

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# Knowledge Organiser – 4.1.1 Cell Biology

Click on the links below  
for online content

## 4.1.1 Cell Structure

### 4.1.1.1. Eukaryotes & Prokaryotes:

**Eukaryotic** (plant, animal & fungal cells).

- Cell membrane
- Cytoplasm
- Genetic material enclosed in membrane

**Prokaryotic** (bacteria and archaea)

- smaller with no true nucleus.
- No mitochondria or chloroplasts.
- DNA loops called plasmids
- Bacteria are prokaryotes.

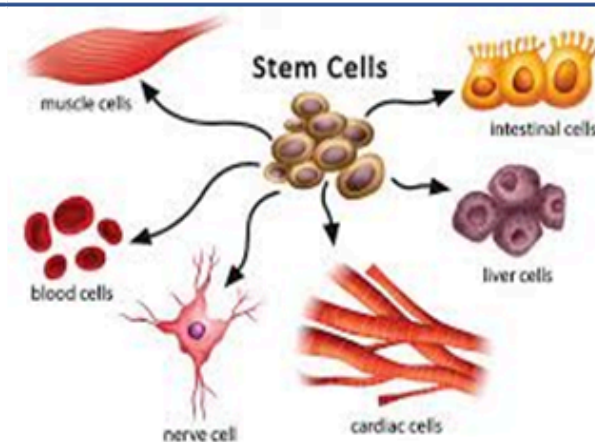
### 4.1.1.2 Definitions

|                  |                                                                                |
|------------------|--------------------------------------------------------------------------------|
| eukaryotic       | A type of cell that has a nucleus.                                             |
| prokaryotic cell | A simple cell that does not have a nucleus – the DNA is free in the cytoplasm. |
| mitochondria     | Structures in the cytoplasm of all cells where aerobic respiration takes place |
| ribosome         | The site of protein synthesis.                                                 |
| sub-cellular     | Structures smaller than a cell that are found within it.                       |
| tissue           | A group of similar cells that carry out the same function, eg muscle tissue.   |
| Nucleus          | Contains the cell's genetic materials                                          |
| Cell membrane    | Controls the movement of substances in and out of the cell                     |
| Cytoplasm        | where many chemical reactions take place                                       |
| Chloroplasts     | where photosynthesis occurs                                                    |
| Vacuole          | Filled with cell sap to help support the plant                                 |
| Cell wall        | made of cellulose to strengthen the cell.                                      |

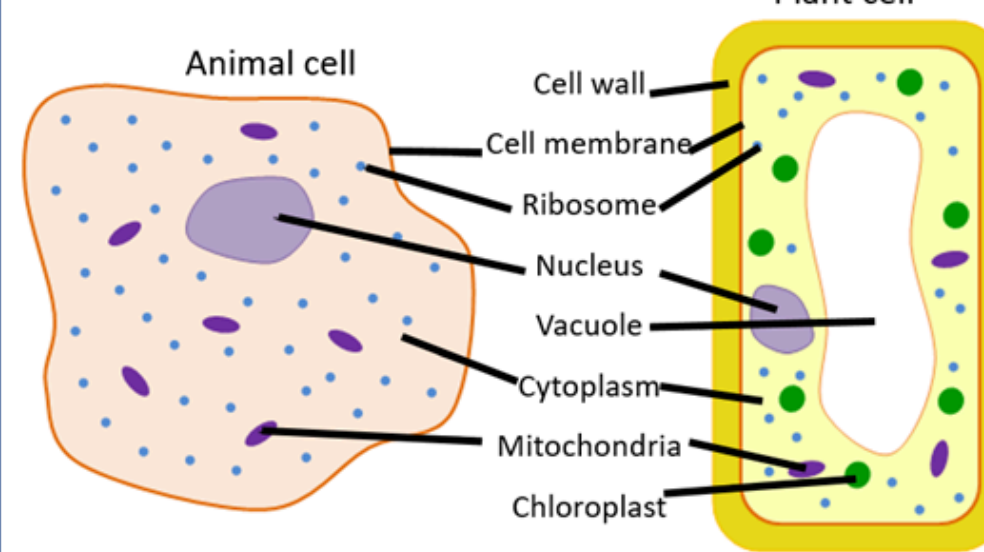
### 4.1.1.4 Cell differentiation

As an organism develops, cells differentiate to form different types of cells.

- Most types of animal cell differentiate at an early stage.
- Many types of plant cells retain the ability to differentiate throughout life.



### 4.1.1.2 Animal & plant cells



You must be able to label the animal and plant cells

### Sub-cellular structures:

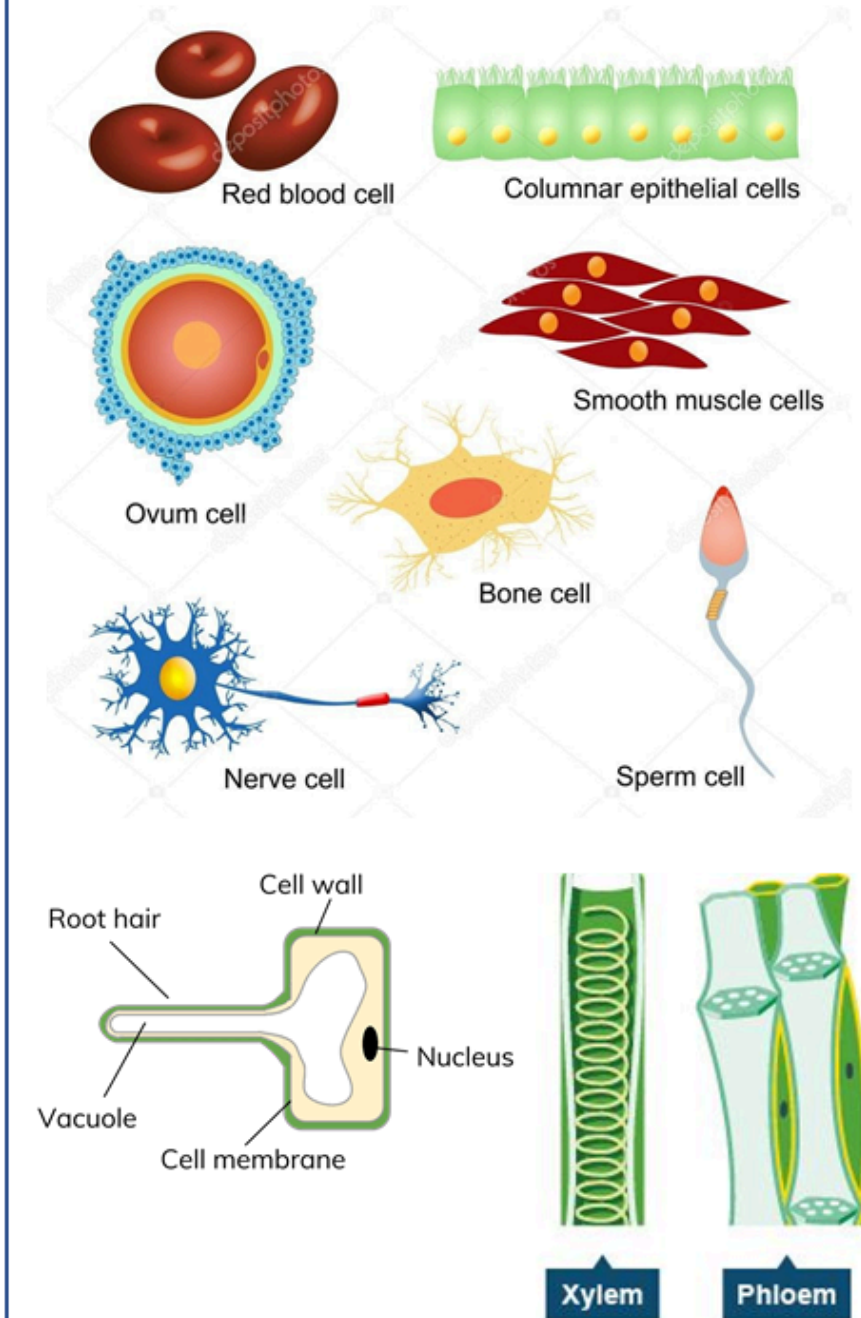
Most animal cells have the following

- **nucleus**
- **cytoplasm**
- **a cell membrane**
- **mitochondria**
- **ribosomes.**

In addition to the parts found in animal cells, plant cells often have:

- **chloroplasts**
- a permanent **vacuole** filled with cell sap.
- Plant and algal cells also have a **cell wall made of cellulose**, which strengthens the cell

### 4.1.1.3. Cell specialisation:



Click on the links below  
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### 4.1.1.3. Cell specialisation:

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[freesciencelessons](#)

[& freesciencelessons](#)

[TedEd](#)

### 4.1.1.5 Microscopy

[BBC bitesize](#)

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[TedEd](#)

### 4.1.1.2 Animal & plant cells

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[& BBC bitesize](#)

[freesciencelessons](#)

[& freesciencelessons](#)

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### 4.1.1.4 Cell differentiation

[BBC bitesize](#)

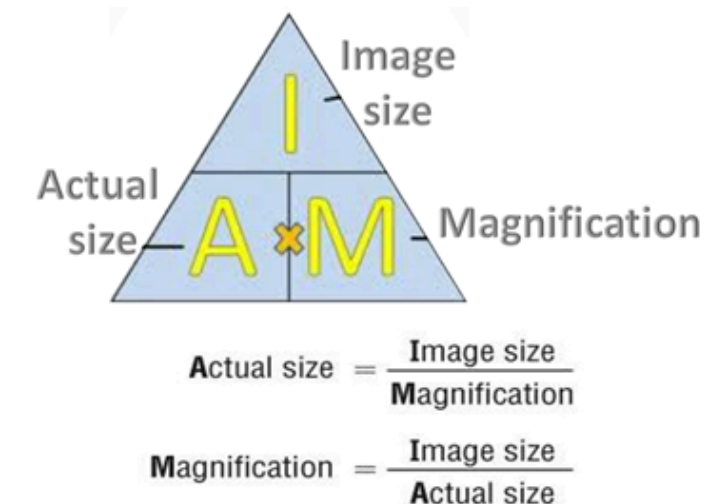
[freesciencelessons](#)

[AmoebaSisters](#)

### 4.1.1.5 Microscopy

#### Electron microscope

- has much **higher magnification** and **resolving power** than a light microscope.
- Can be used to **study cells in much finer detail.**
- Enabled biologists to see and **understand many more sub-cellular structures.**

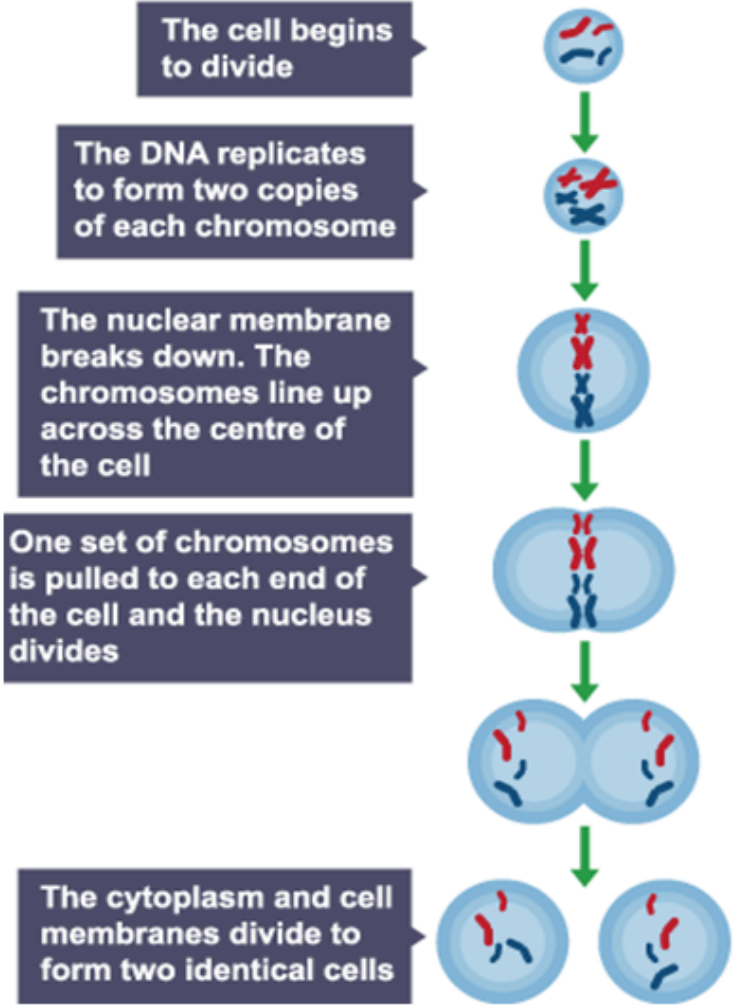




# Knowledge Organiser – 4.1.2 Cell Biology

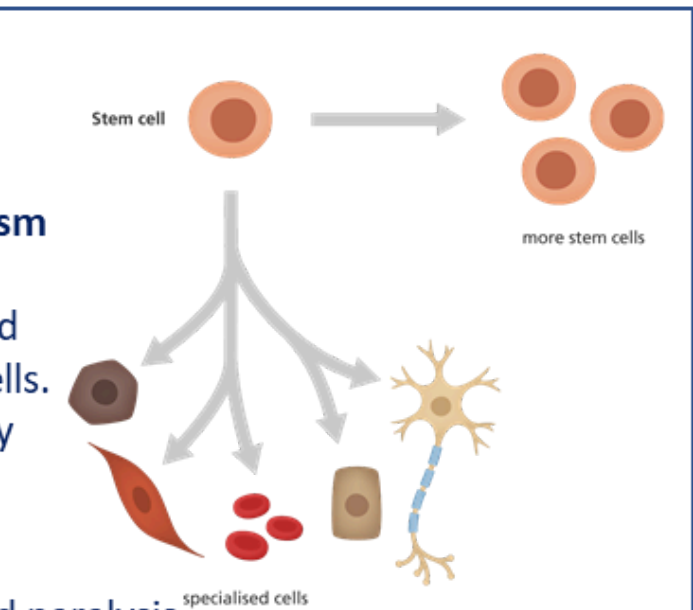
## 4.1.2 Cell Division : MITOSIS

- The nucleus of a cell contains **chromosomes** made of **DNA** molecules.
- Each chromosome carries a large number of **genes**.
- In body cells the chromosomes are **normally found in pairs**.
- Mitosis** is **cell division for growth & repair**.
- 2 genetically identical daughter cells are formed.



### 4.1.2.3 Stem cells - Plants

- Meristem tissue** in plants can **differentiate into any type of plant cell**, throughout the life of the plant.
- can be used to **produce clones** of plants quickly and economically and to prevent extinction.
- Crop plants** with special features such as disease resistance can be cloned to produce large numbers of identical plants for farmers.



### 4.1.2.3 Stem cells - animals

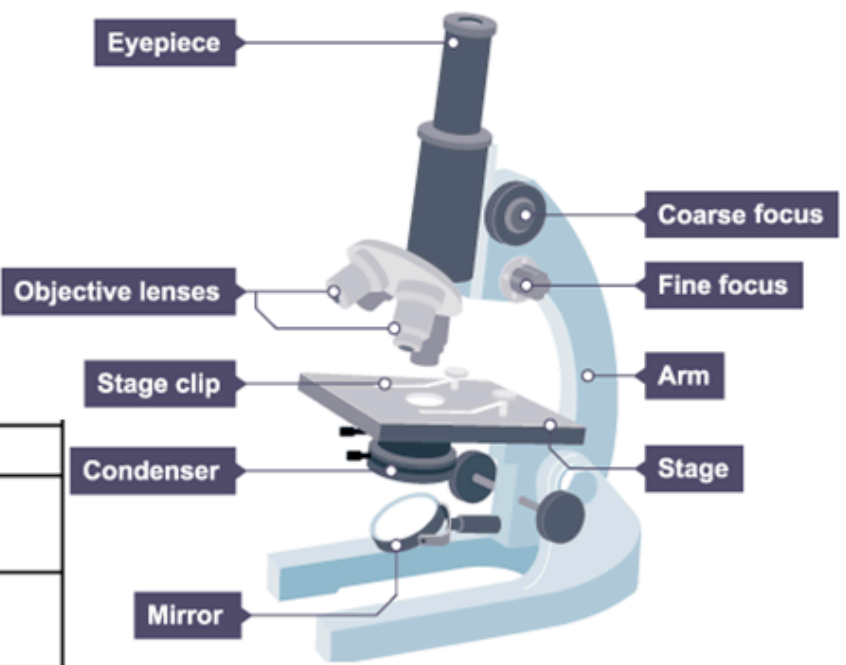
- A **stem cell** is an **undifferentiated cell of an organism** which is capable of giving rise to cells of any type.
- Stem cells from human embryos** can be **cloned** and made to **differentiate into most** types of human cells.
- Stem cells from adult bone marrow** can form many types of cells including **blood cells**.

### Treatment with stem cells

- may be able to help conditions such as diabetes and paralysis.
- In **therapeutic cloning** an embryo is produced with the same genes as the patient. Stem cells from the embryo are not rejected by the patient's body so they may be used for medical treatment.
- The use of stem cells has potential risks such as transfer of viral infection, and some people have ethical or religious objections.

| RPA: Microscopy    | Definitions                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| calibrate          | To set an instrument or scale against a standard.                                                                                                                                                                                                                                          |
| field of view      | The area seen when looking through a microscope.                                                                                                                                                                                                                                           |
| graticule          | The graticule has a scale ruled on it and is used to estimate the size of a specimen when viewed with a microscope.                                                                                                                                                                        |
| magnification      | The amount that an image of something is scaled up when viewed through a microscope.                                                                                                                                                                                                       |
| order of magnitude | For each order of magnitude, a number is ten times the previous one.                                                                                                                                                                                                                       |
| resolution         | The fineness of detail that can be seen in an image - the higher the resolution of an image, the more detail it holds.                                                                                                                                                                     |
| significant figure | Giving a number to a specified number of significant figures is a method of rounding.<br>E.g., in the number 7483, the most significant, or important, figure is 7, as its value is 7000. To give 7483 correct to one significant figure (1 sf), would be 7000. To 2 sf, it would be 7500. |
| stage micrometer   | A glass slide with a scale etched on it. It is used to calibrate the eyepiece graticule of a microscope.                                                                                                                                                                                   |
| standard form      | A system in which numbers are written as a number greater than 1 and less than 10 multiplied by a power of 10 (either positive or negative. )                                                                                                                                              |

**Required practical activity:** use a light microscope to observe, draw and label a selection of plant and animal cells.  
A magnification scale must be included



|                              |              |                   |
|------------------------------|--------------|-------------------|
| Millimetre (mm)              | 0.001m       | $10^{-3}\text{m}$ |
| Micrometre ( $\mu\text{m}$ ) | 0.000001m    | $10^{-6}\text{m}$ |
| Nanometre (nm)               | 0.000000001m | $10^{-9}\text{m}$ |



# Knowledge Organiser – 4.1.3 Transport in Cells

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4.1.3.1 Diffusion

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4.1.3.1

Diffusion across Alveoli

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## 4.1.3.1 Diffusion

**Substances may move into and out of cells across the cell membranes via diffusion.**

- Diffusion is the spreading out of the particles of any substance in solution, or particles of a gas, resulting in a **net movement from an area of higher concentration to an area of lower concentration.**

Some of the substances transported in and out of cells by diffusion are:

- oxygen** and **carbon dioxide** in gas exchange,
- waste product **urea** from cells into the blood plasma for excretion in the kidney.

Factors which affect the rate of diffusion are:

- the difference in concentrations (**concentration gradient**)
- the **temperature**
- the **surface area** of the membrane.

The effectiveness of an exchange surface is increased by:

- having a **large surface area**
- a membrane that is **thin** to provide a short diffusion path
- (in animals) having an **efficient blood supply**
- (in animals, for gaseous exchange) being **ventilated**.

4.1.3.1 Diffusion across leaf

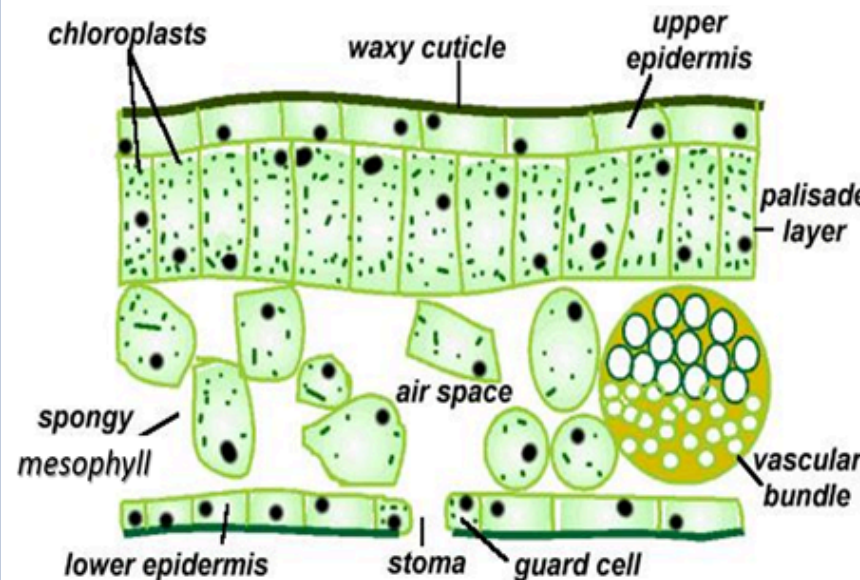
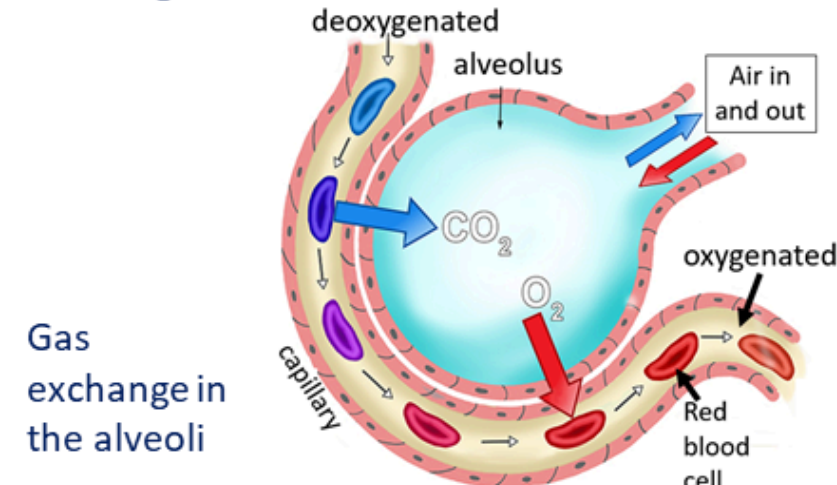
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## 4.1.3.1 Diffusion - examples

**Single-celled organisms** have a **large surface area to volume ratio**, allowing sufficient transport of molecules in and out of the cell.

**Multicellular organisms** have a **relatively small surface area to volume ratio** so they **need specialised exchange surfaces** and a transport system:

- Large surface area
- Thin membranes for a short diffusion path
- Efficient blood supply (animals)
- Being ventilated (animals)

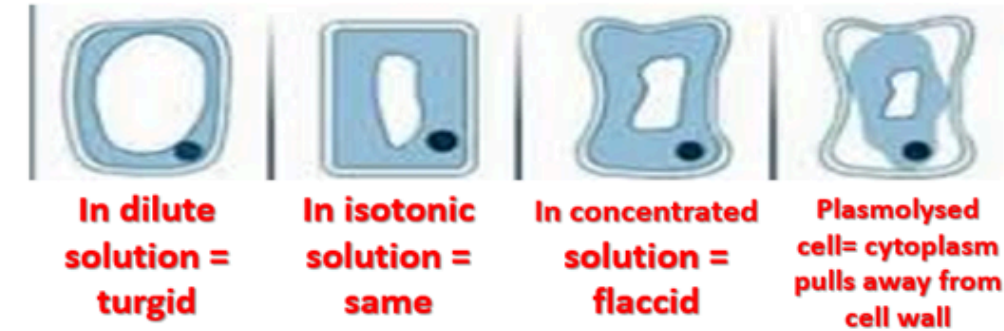


CO<sub>2</sub> diffuses from high concentration in the air space to a low concentration inside the mesophyll cells

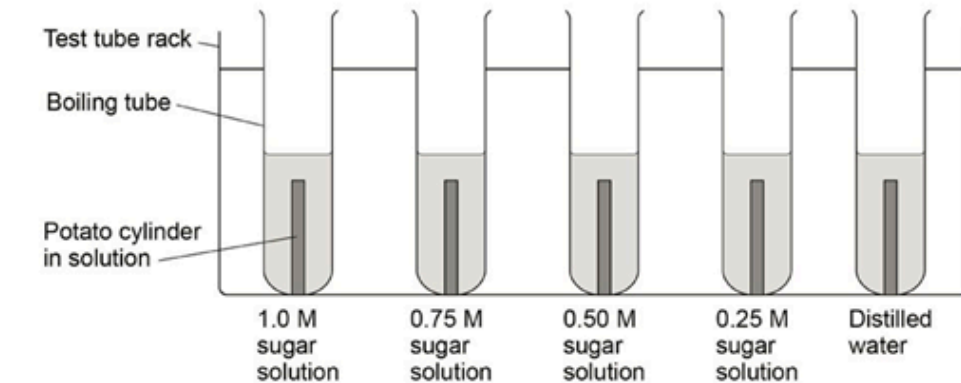
## 4.1.3.2 Osmosis

Osmosis is the **diffusion of water from a dilute solution to a concentrated solution** through a partially permeable membrane.

### Effects of Osmosis on Plant Cells



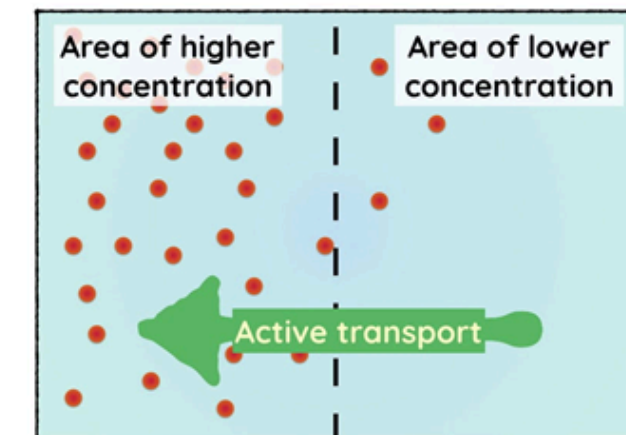
**RPA: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue**



## 4.1.3.3 Active Transport

Is the movement of substances from a more dilute to a more concentrated solution (**against the concentration gradient**). It needs **ENERGY** from respiration. for respiration.

Eg 1- **Mineral ions** absorbed **into root hair cells** from very dilute solutions in the soil.  
Eg 2- **Sugar molecules** absorbed **from the gut** (lower concentration) into the blood for respiration.



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4.1.3.2 Osmosis

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Required Practical: Osmosis

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4.1.3.3 Active Transport

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# Knowledge Organiser – 4.2 Organisation

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## 4.2.1 Principles of organisation

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### 4.2.2.1 Human digestive system

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### 4.2.2.1 Enzymes

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[AmoebaSisters](#)

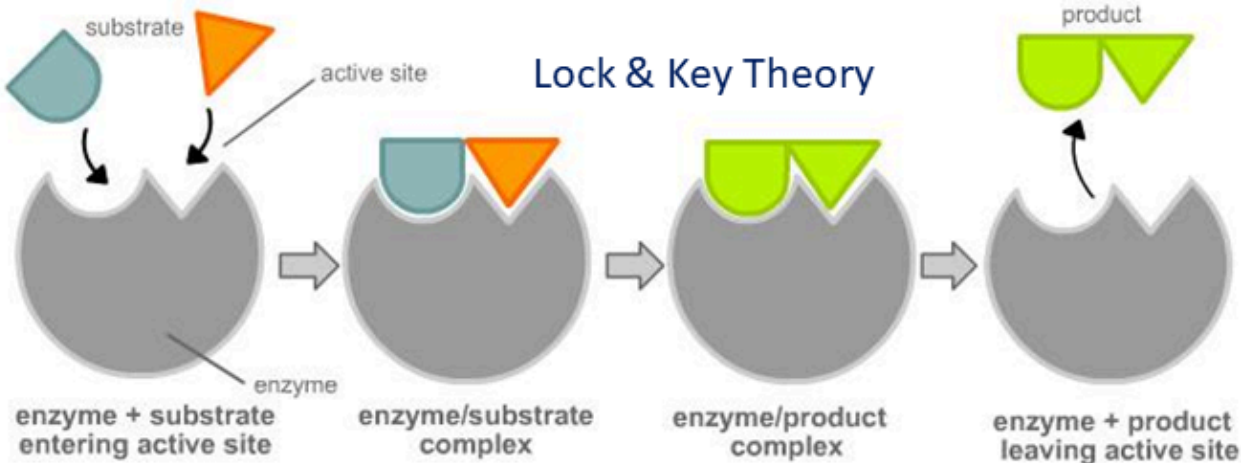
## 4.2.1 Principles of organisation

| 4.2.1            | Definitions                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------|
| Cells            | The basic building blocks of all living organisms. Eg. Muscle, skin, nerve, root hair and palisade leaf cells |
| Tissue           | A group of cells with a similar structure and function (job). Eg. Muscle, heart, xylem and epidermal tissue   |
| Organs           | A group of tissues performing a specific function. Eg. Heart, liver, brain, roots, stem, leaf & flower        |
| Organ systems    | Groups of organs working together to form an organism. Eg. circulatory, nervous & transpiration systems       |
| Digestive system | Organ system in which several organs work together to digest & absorb food.                                   |

| Enzyme                      | Produced                  | Nutrients acted upon       | Products (smaller molecules) | Optimum pH & temperature |
|-----------------------------|---------------------------|----------------------------|------------------------------|--------------------------|
| Carbohydrase<br>Eg. Amylase | Salivary glands           | Carbohydrate<br>Eg. starch | Simple sugars<br>Eg. glucose | <b>pH7</b> 37°C          |
| Protease                    | Stomach, pancreas         | Protein                    | Amino acids                  | <b>pH2</b> 37°C          |
| Lipase                      | Pancreas, small intestine | Lipid (fats & oils)        | Glycerol & fatty acids       | <b>pH8</b> 37°C          |

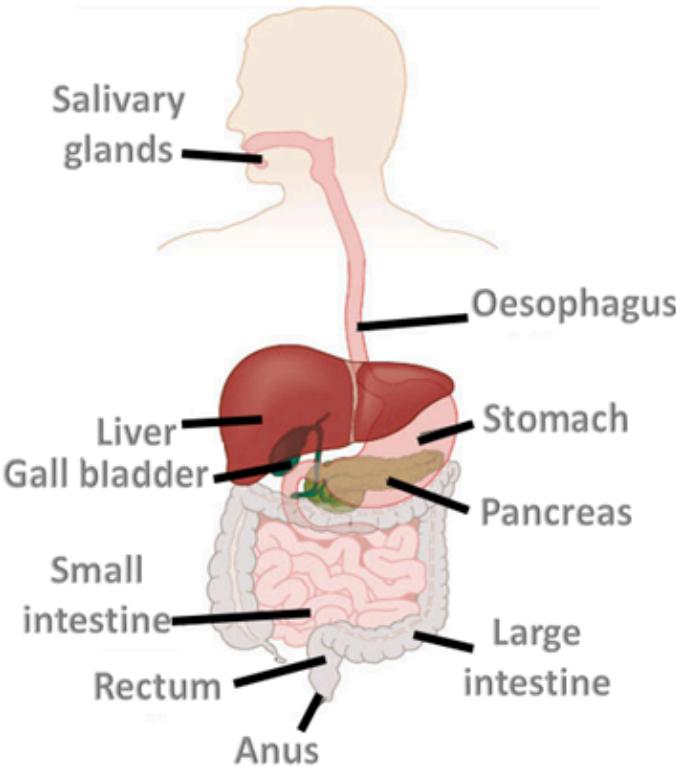
**Enzymes are biological catalysts** that breakdown food into small, soluble molecules that can be absorbed into the bloodstream from the digestive system.

**Denature.** If the optimum conditions are not correct for an enzyme, it loses its shape and cannot attach to the substrate (nutrient molecule). It is “denatured”.



## 4.2.2 Animal tissues, organs and organ systems

### 4.2.2.1 The human digestive system



|                  |                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| bile             | Made in the liver, stored in gall bladder. Emulsifies fats to for digestion and neutralises stomach acid.                                                                             |
| carbohydrate     | Food consisting of sugars, starch and cellulose. Carbohydrates are vital for energy in humans and are stored as fat if eaten in excess.                                               |
| digestion        | The breakdown of large insoluble food molecules to smaller soluble ones.                                                                                                              |
| digestive system | Organ system involved in breaking food down so that it can be absorbed into the bloodstream.                                                                                          |
| egestion         | The process of passing out the remains of food that has not been digested, as faeces, through the anus.                                                                               |
| emulsify         | To mix water with lipids to produce a cloudy mixture called an emulsion.                                                                                                              |
| fats             | Naturally occurring compounds of carbon, hydrogen and oxygen. They are esters made from fatty acids and glycerol.                                                                     |
| fatty acids      | Carboxylic acids with a long chain of carbon atoms. Fatty acids react with glycerol to produce lipids (fats and oils).                                                                |
| gall bladder     | Stores bile before releasing it into the duodenum.                                                                                                                                    |
| glucose          | A simple sugar used by cells for respiration.                                                                                                                                         |
| glycogen         | Animals store glucose as glycogen in their liver and muscle tissues.                                                                                                                  |
| gut              | The digestive system.                                                                                                                                                                 |
| lipid            | Fat or oils, composed of fatty acids and glycerol.                                                                                                                                    |
| liver            | The large organ, beside the stomach, which has many functions, including processing substances absorbed by the digestive system and a role in the storage of the body's carbohydrate. |
| metabolism       | All the chemical reactions in the cells of an organism, including respiration.                                                                                                        |
| microvilli       | Projections from the surface of an epithelial cell of the small intestine wall.                                                                                                       |
| pancreas         | Large gland located in the abdomen near the stomach which produces digestive enzymes and the hormone insulin.                                                                         |
| protein          | Organic compound made up of amino acid molecules. Proteins are needed by the body for cell growth and repair.                                                                         |
| starch           | A type of carbohydrate. Plants can turn the glucose produced in photosynthesis into starch for storage                                                                                |
| sugar            | A simple carbohydrate that is sweet to the taste.                                                                                                                                     |
| villi            | Finger-like projections in the small intestine that provide a large surface area for the absorption of food.                                                                          |

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**KS3 Reminders**  
**Food Groups:**

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RPA: Amylase

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RPA: Food Tests

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4.2.2.3 Blood

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## RPA: investigate the effect of pH on the rate of reaction of amylase on starch

Amylase breaks down starch. Starch turns blue/black when iodine (an orange solution) is added.



- Starch solution (CV)
- Amylase solution (CV)
- Buffer solutions of different pH (**IV**)
- Spotting tiles
- Test tubes
- Water bath (temp CV)
- Iodine solution
- Stop clock

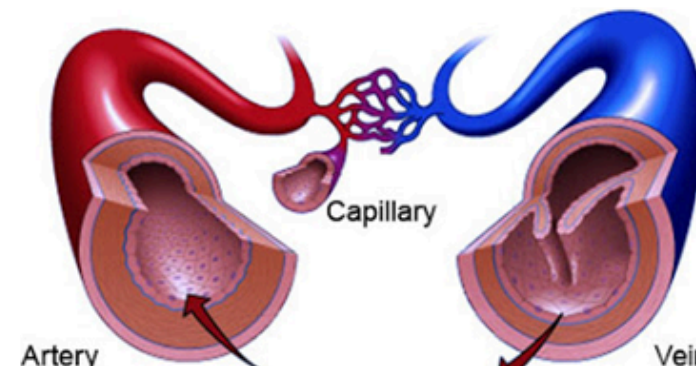
**DV** is the time at which the starch/ amylase solution no longer turns blue/black.

## RPA: use qualitative reagents to test for carbohydrates (starch and glucose), proteins and lipids

| Food group      | Reagent                      | Positive result                 |
|-----------------|------------------------------|---------------------------------|
| Glucose         | Benedict's solution (heated) | Bright blue to orange/brick red |
| Protein         | Biuret's solution            | Bright blue to lilac            |
| Starch          | Iodine solution              | Orange to blue/ black           |
| Lipid (Fat/oil) | Ethanol & water              | Clear to Milky/ cloudy          |

## 4.2.2.3 Blood

- Blood away from heart
- Thick muscular wall
- Small lumen
- Under high pressure



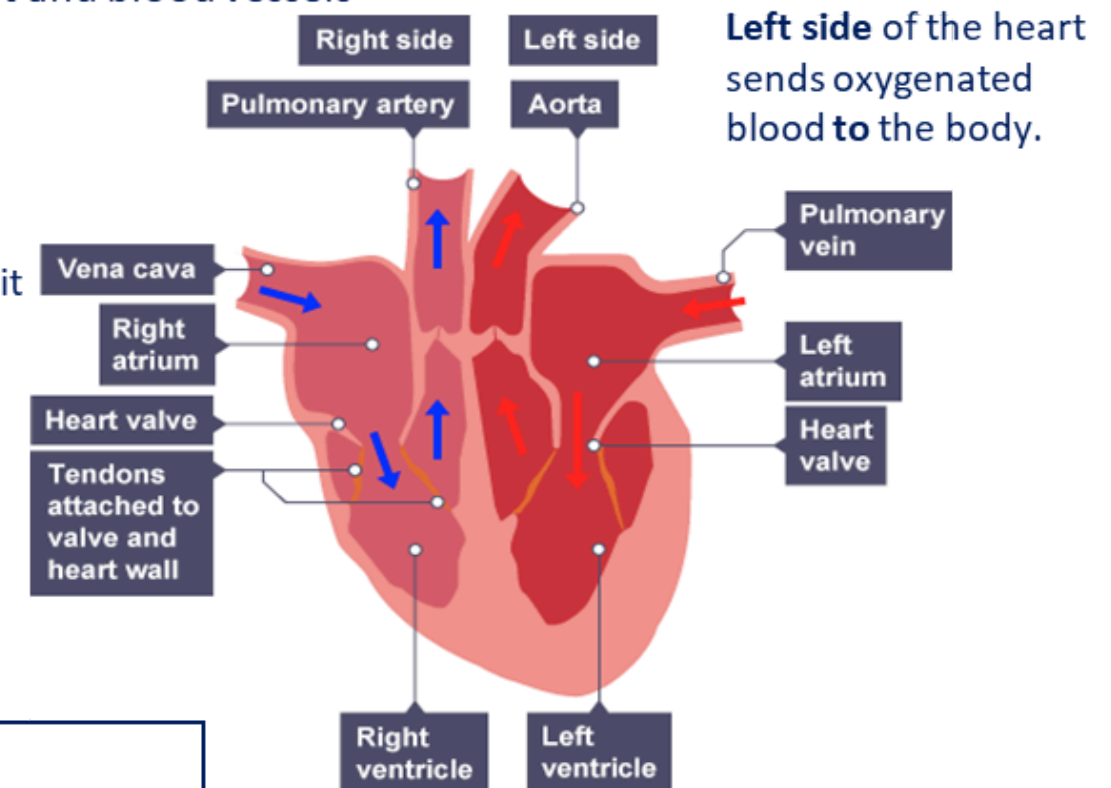
- Blood towards from heart
- Thinner wall
- Large lumen
- Under low pressure

## 4.2.2.2 The heart and blood vessels

**Right side of the heart** receives deoxygenated blood **from** the body and pumps it to the lungs.

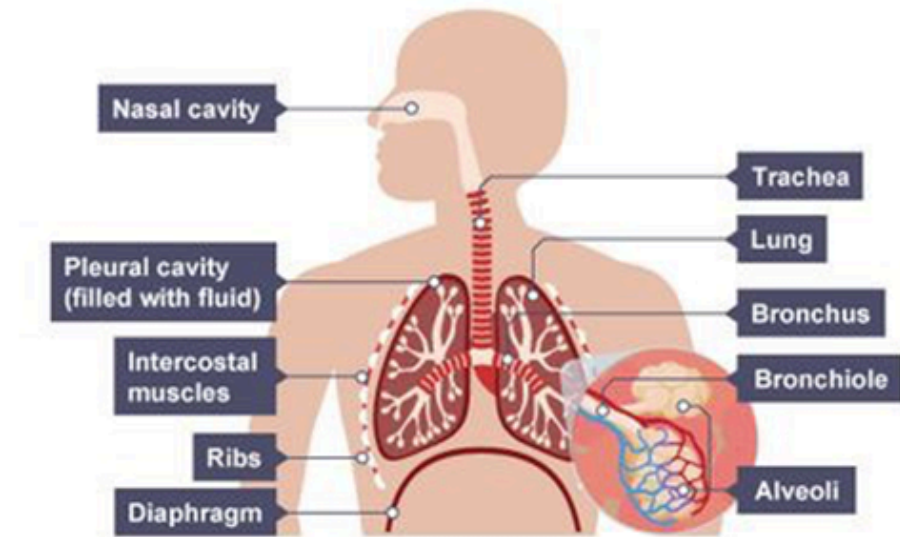
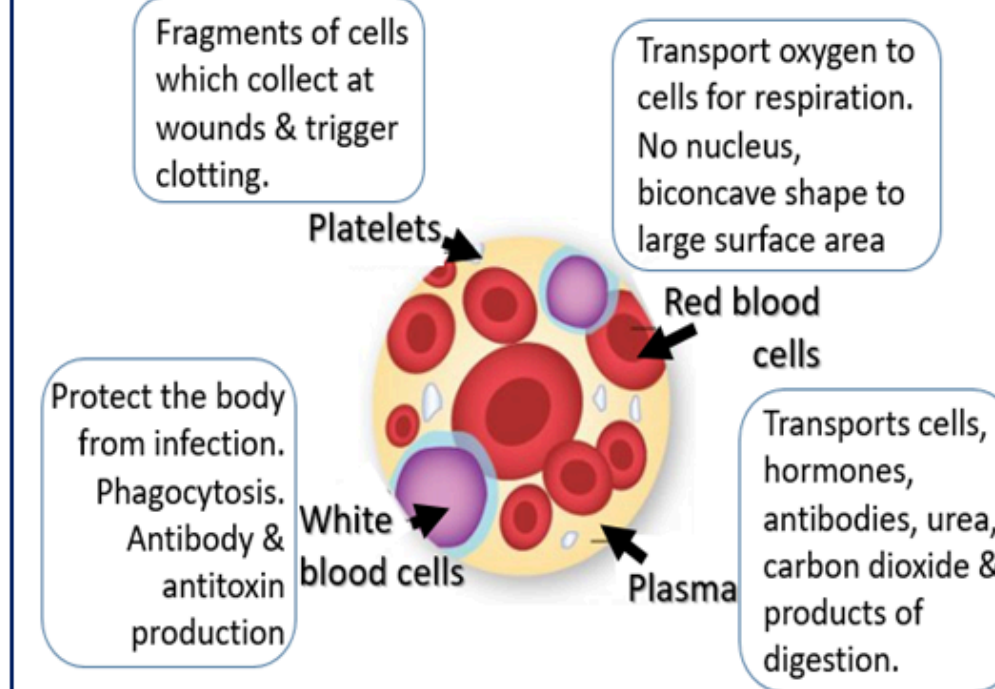
### Pacemaker

Group of cells in the right atrium that control resting heart rate.

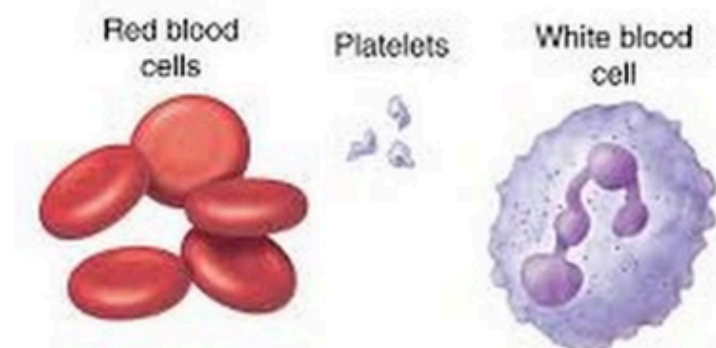


**Left side of the heart** sends oxygenated blood **to** the body.

## 4.2.2.2 The heart and blood vessels



## 4.2.2.3 Blood



Blood is a tissue consisting of plasma containing red blood cells, white blood cells and platelets

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4.2.2.2 The heart

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4.2.2.2 Blood Vessels

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# Knowledge Organiser – 4.2 Organisation

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4.2.2.4 Coronary  
Heart Disease

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4.2.3.1 Plant  
Tissues

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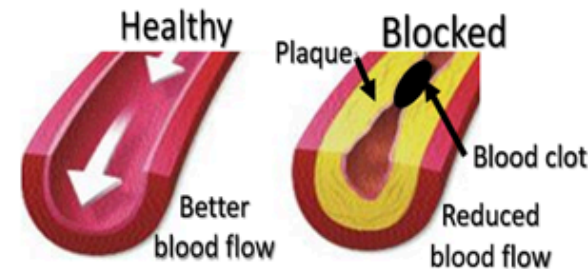
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## 4.2.2.4 Coronary heart disease: a non-communicable disease

- **Coronary heart disease** layers of fatty material build up inside the coronary arteries, narrowing them.
- Reduces the flow of blood through the coronary arteries, resulting in a lack of oxygen for the heart muscle.
- Stents are used to keep the coronary arteries open.
- Statins are widely used to reduce blood cholesterol levels which slows down the rate of fatty material deposit.
- **Heart valves may become faulty**, preventing the valve from opening fully, or the heart valve might develop a leak.
- Faulty heart valves can be replaced using biological or mechanical valves.
- **Heart Transplants:** the case of heart failure a donor heart, or heart and lungs can be transplanted.
- Artificial hearts are occasionally used to keep patients alive whilst waiting for a heart transplant, or the heart to rest as an aid to recovery.



## 4.2.2.5 Health issues & types of disease

**communicable**, can be transferred from one organism to another, e.g. measles, food poisoning and malaria  
**non-communicable**, which are not transferred between people or other organisms, e.g.

- **cancer**
- **diabetes**
- **genetic diseases** and conditions
- heart disease
- neurological disorders

Other factors that can effect physical and mental health include:

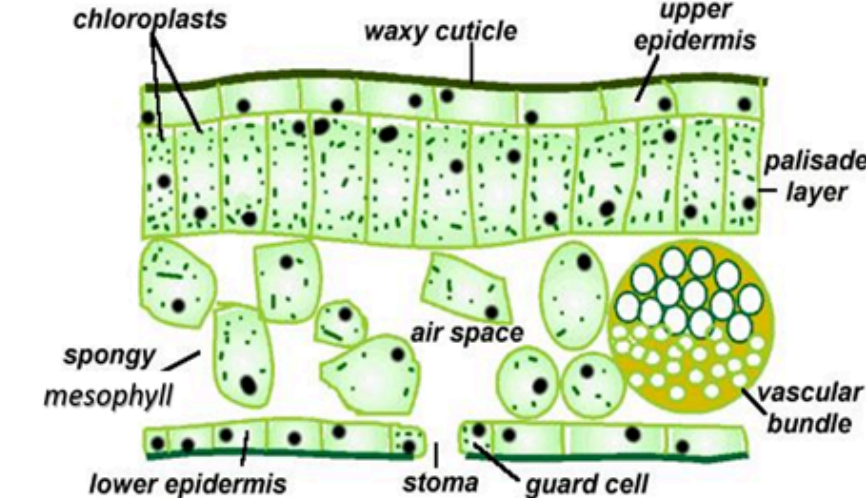
- **diet**
- **lifestyle factors** such as alcohol and other drugs
- **stress**
- situations that may occur in a person's life

4.2.2.5 Health  
issues & Types  
of disease

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## 4.2.3.1 Plant tissues



|                    |                                                 |
|--------------------|-------------------------------------------------|
| Epidermis          | Covers outer leaf surface for protection        |
| Palisade mesophyll | Main site for photosynthesis. Many chloroplasts |
| Spongy mesophyll   | Air spaces between cells allow gases to diffuse |

## 4.2.2.6 lifestyle on non-communicable disease

Risk factors are linked to increased rate of a disease. aspects of a person's lifestyle

- substances in the body or environment.
- The effects of diet, smoking and exercise on cardiovascular disease.
- Obesity as a risk factor for Type 2 diabetes.
- The effect of alcohol on liver & brain function.
- Effect of smoking on lung disease & lung cancer.
- Effects of smoking & alcohol on unborn babies.
- Carcinogens, including ionising radiation, as risk factors in cancer.

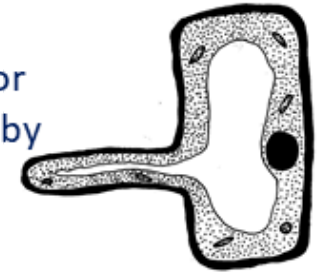
## 4.2.2.7 Cancer

**Benign tumours** are abnormal cell growths contained in one area, **usually within a membrane**. They do not invade other parts of the body.  
**Malignant tumour** cells are cancers. Invade neighbouring tissues and **spread to different parts of the body** where they form secondary tumours.

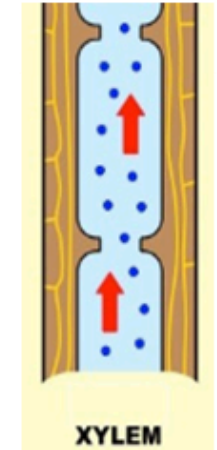
## 4.2.3.2 Plant organ system

Roots, stem, leaves form plant transport organ system.

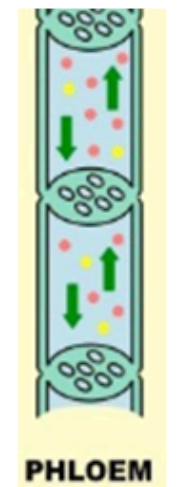
- **Root hair cells** are adapted for the efficient uptake of water by osmosis, and mineral ions by active transport.



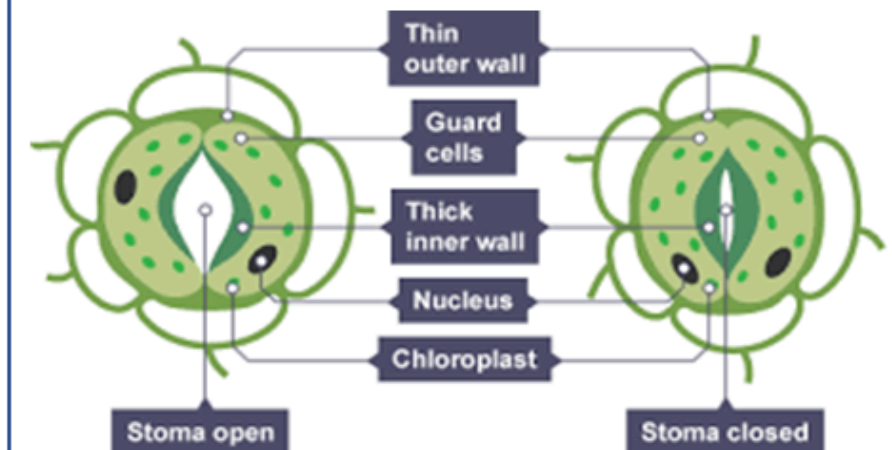
- **Xylem tissue** transports water and mineral ions from the roots to the stems and leaves.
- Made of hollow tubes strengthened by **lignin** adapted for the transport of water in the **transpiration** stream.



- **Phloem tissue** transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage. This transport is called **translocation**.
- **Phloem** is composed of tubes of elongated cells. **Cell sap can move from one phloem cell to the next through pores in the end walls**.



- **Stomata and guard cells** control gas exchange and water loss.



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4.2.2.6:  
Lifestyle effect  
on non-  
communicable  
disease

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4.2.2.7 Cancer

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4.2.3.2 Plant  
Organ System

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# Knowledge Organiser – 4.4 Bioenergetics

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4.4.1  
Photosynthetic  
reaction

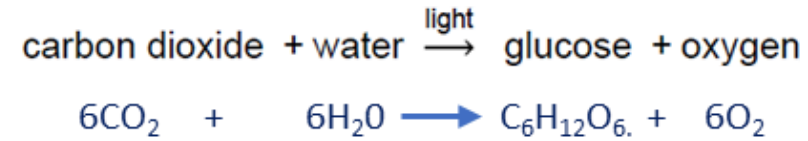
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## 4.4.1 Photosynthetic reaction

- Captures light energy from the sun and uses it to produce chemical potential energy
- transfer of light energy to chemical potential energy in cells
- **endothermic** reaction.
- Trapped by chlorophyll in chloroplasts

The reaction can be shown in these equations:



## 4.4.1.2 Rate of Photosynthesis

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| Key Terms              | Photosynthesis Definitions                                                                                                                                                                                                       |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Photosynthesis</b>  | The endothermic reaction that transfers light energy to chemical potential energy. In it, simple molecules (CO <sub>2</sub> and H <sub>2</sub> O) are converted into more complex molecules (glucose) that can be used for food. |
| <b>Nitrates</b>        | Ions containing nitrogen and oxygen. These are found in the soil; plants need nitrates to produce amino acids.                                                                                                                   |
| <b>Rate</b>            | As always, rate means how quickly something happens.                                                                                                                                                                             |
| <b>Light intensity</b> | The amount/strength of light. Use this term instead of 'amount of light'.                                                                                                                                                        |
| <b>Chlorophyll</b>     | The green pigment in leaves that absorbs light for photosynthesis. Chlorophyll is found in chloroplasts.                                                                                                                         |

## 4.4.1.3 Uses of glucose from photosynthesis

- Used in respiration in the cells of the plant/algae
- Converted into insoluble **starch** for storage.
- Produces **fats or oils (lipids)** for storage. Eg Nuts & seeds
- Used to produce **cellulose**, which strengthens the cell wall.
- Used to produce **amino acids**, to synthesise proteins. To produce amino acids, plants also require **nitrates** from the soil.

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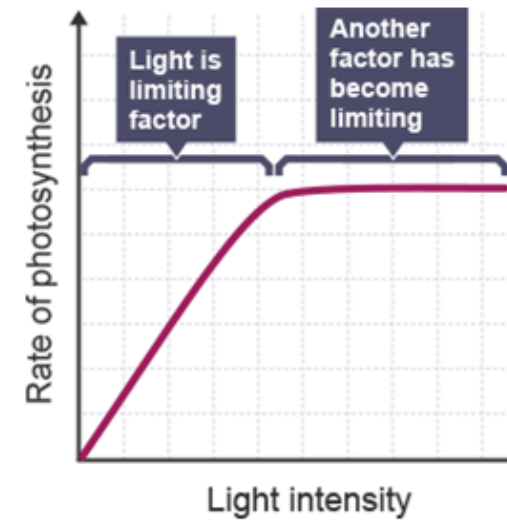
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## 4.4.1.2 Rate of Photosynthesis

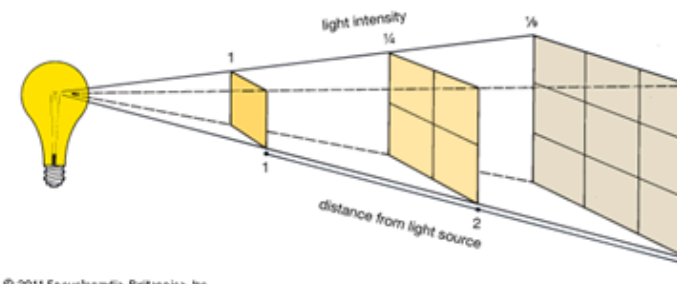
The following factors affect the rate of photosynthesis:

- **Temperature:** because all chemical reactions speed up as the temperature increases. As photosynthesis is controlled by enzymes which are affected by temperature



- **Carbon dioxide concentration:** the higher the concentration of CO<sub>2</sub> in the air, the more is available for photosynthesis, so the rate increases as concentration increases.
- **Light intensity:** as the equation shows, photosynthesis requires light energy. So, the higher the light intensity, the higher the rate of photosynthesis.

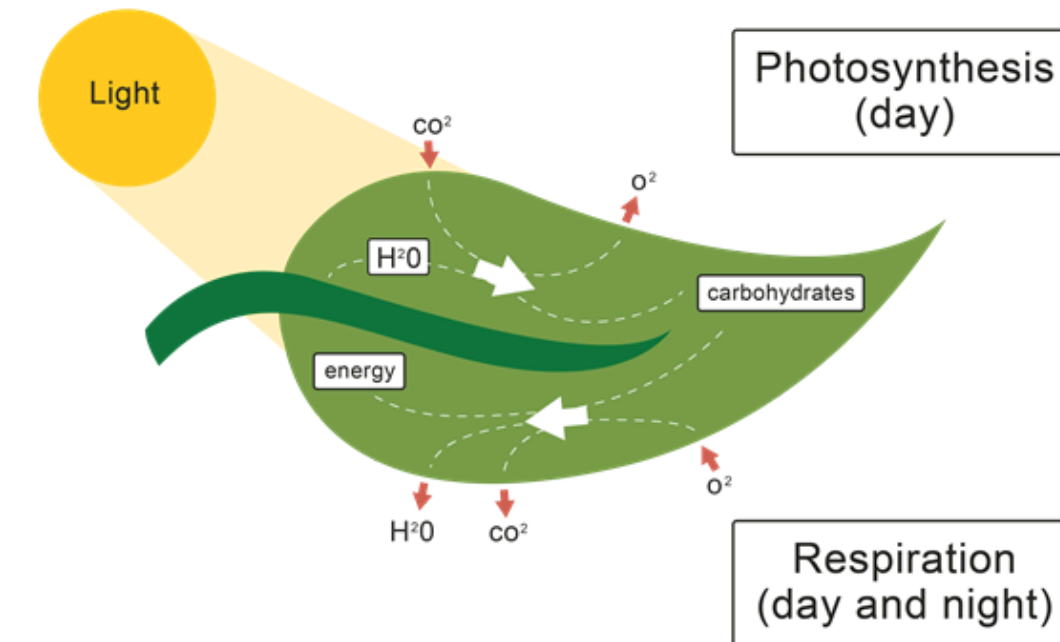
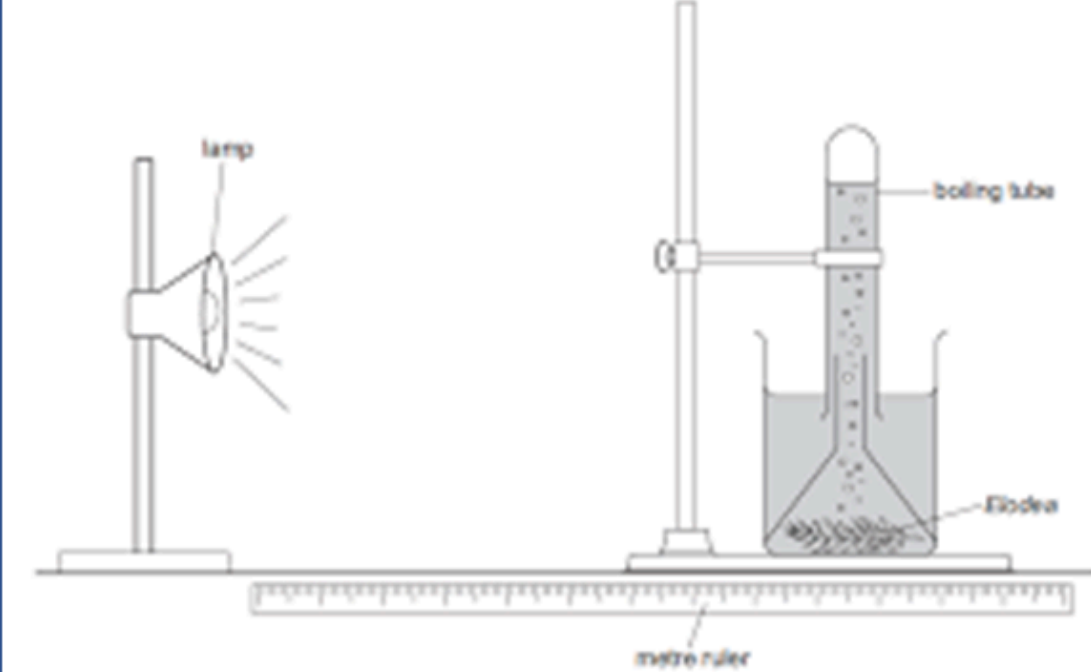
$$\text{light intensity} = \frac{\text{distance from source}^2}{\text{area of surface}} \quad \text{or} \quad \frac{1}{\text{distance from source}^2}$$



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- **Amount of chlorophyll:** more chlorophyll means more light can be absorbed.

**RPA:** investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.



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# Knowledge Organiser – 4.4 Bioenergetics

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4.4.2.1. Aerobic  
and Anaerobic  
respiration  
  
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[AmoebaSisters](#)

4.4.2 Respiration

- the chemical potential energy stored in food molecules is released through **oxidation** reactions
- The energy released allows living cells to do **work including:**.
  - Chemical reactions to build larger molecules from smaller ones
  - Movement.
  - Keeping warm.
- There are two types of respiration: **aerobic** and **anaerobic**.

4.4.2.1 Aerobic and anaerobic respiration

Aerobic respiration occurs when oxygen is used in the reaction  
glucose + oxygen → carbon dioxide + water  
 $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$

**aerobic respiration releases much more energy than anaerobic respiration.**

Anaerobic respiration occurs when there is insufficient oxygen available for complete oxidation of the glucose.

The reaction differs depending on the organism

In *animals*: glucose → lactic acid  
In *plants and yeast*: glucose → ethanol and carbon dioxide  
 $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$

In yeast, anaerobic respiration is called fermentation. Used for:

- making bread (the CO2 makes it rise)
- making alcoholic drinks (since ethanol is a type of alcohol).

| Key Terms          | Respiration Definitions                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Aerobic</b>     | Using oxygen                                                                                                                                              |
| <b>Anaerobic</b>   | Not using oxygen                                                                                                                                          |
| <b>Oxidation</b>   | A reaction with oxygen. In this case, food molecules like glucose reacting with oxygen.                                                                   |
| <b>Fatigue</b>     | Tiredness. Fatigue in muscles is caused by a build-up of lactic acid, which is produced during anaerobic respiration (when there is insufficient oxygen). |
| <b>Oxygen debt</b> | After exercise, the lactic acid has built up and caused an extra need for oxygen – called the oxygen debt.                                                |
| <b>Lactic acid</b> | Chemical produced by the incomplete oxidation of glucose (anaerobic respiration).                                                                         |

4.4.2.2 Response to exercise

During exercise, more energy is required by the body than when resting, due to increased muscle contractions.

The body reacts to this increased **demand** for energy:

- heart rate, breathing rate, and volume of each breath all increase.**
- these **increase the amount of oxygenated blood** reaching the muscles.
- oxygenated blood provides the **extra oxygen and glucose** needed for **respiration in muscle cells**, to transfer more energy to meet demand.

If insufficient oxygen reaches muscles but exercise continues, the muscle cells use **anaerobic respiration** to transfer energy.

- incomplete oxidation of glucose takes place
- lactic acid** is produced which is a poison
- lactic acid builds up and causes an **oxygen debt** causing **fatigue**.
- breathing deeply after exercise repays the oxygen debt.

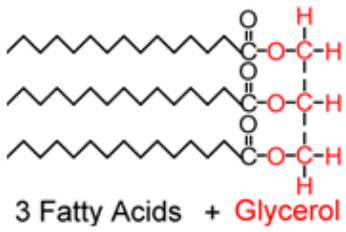
4.4.2.3 Metabolism

Metabolism is the sum of ALL the chemical reactions happening in a cell or in the whole body.

- Metabolism relies on energy transferred by respiration.
- chemical reactions in cells are controlled by enzymes.
- Reactants are used to make products: new molecules are synthesised.

metabolism includes these reactions:

- Conversion of glucose to glycogen (animals), or to starch or cellulose (plants).
- Formation of lipid (fat) molecules from one molecule of glycerol and three molecules of fatty acids
- In plants, the use of glucose and nitrate ions to make amino acids. These amino acids are then used to synthesise proteins.
- Respiration, both aerobic and anaerobic.
- Breaking down excess proteins into urea for excretion





4.4.2.2 Response to exercise (HT)

**HT:** oxygen debt is the amount of extra oxygen needed to react with lactic acid in muscles and remove it from cells.

- The blood flow through muscles removes lactic acid and transports it to the liver to be converted back into glucose.

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Metabolism  
  
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4.4.2.2  
Response to  
Exercise  
  
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[BBC bitesize \(HT\)](#)



# Knowledge Organiser – 5.1 Atomic structure & the periodic table

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5.1.1.1 Atoms,  
elements &  
compounds

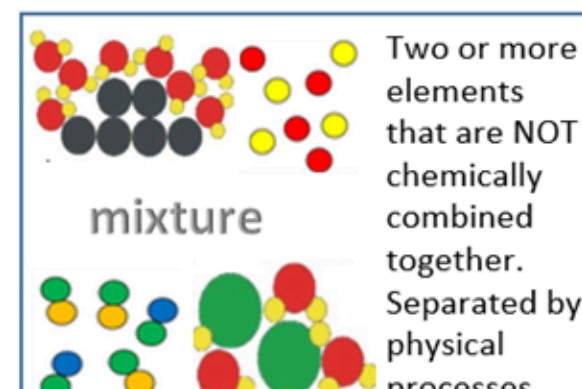
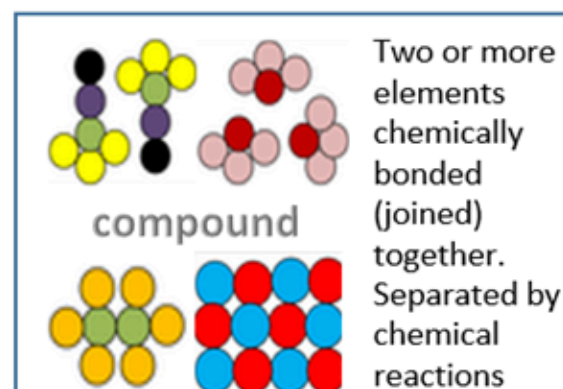
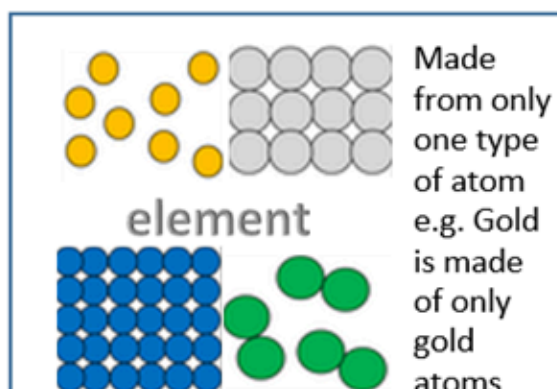
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5.1.1.1

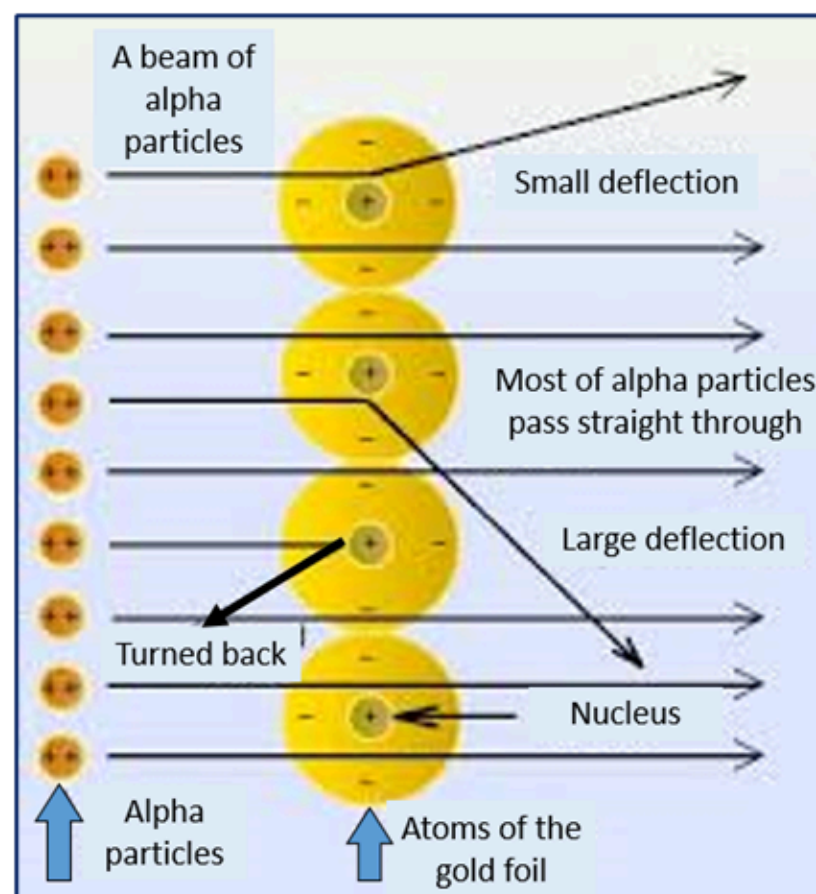
Atoms, elements &  
compounds

An **Atom** is the  
**smallest part of an  
element that can  
exist.**



5.1.1.3 The development of the model of the atom

Ideas about atoms have changed over time. Scientists developed  
new atomic **models** as they gathered new experimental evidence.

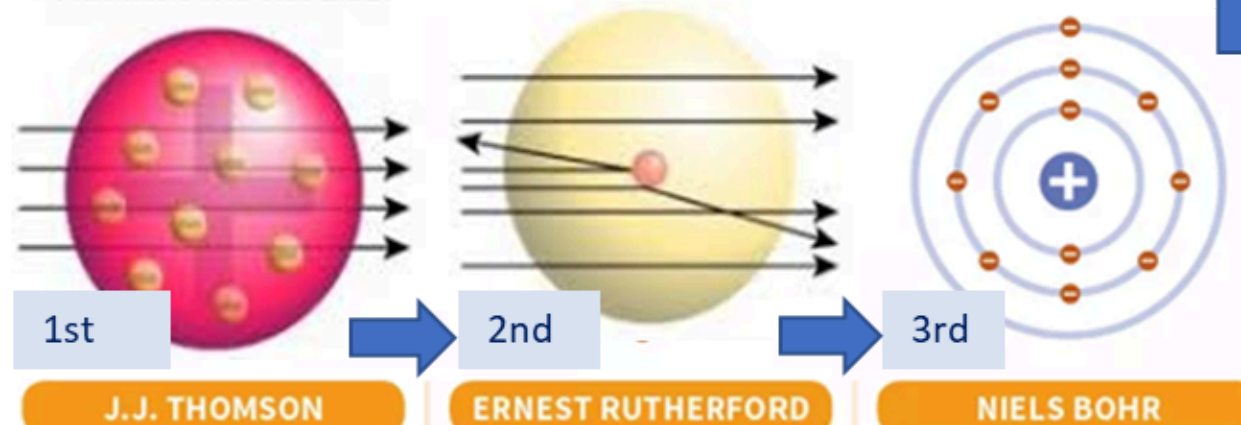
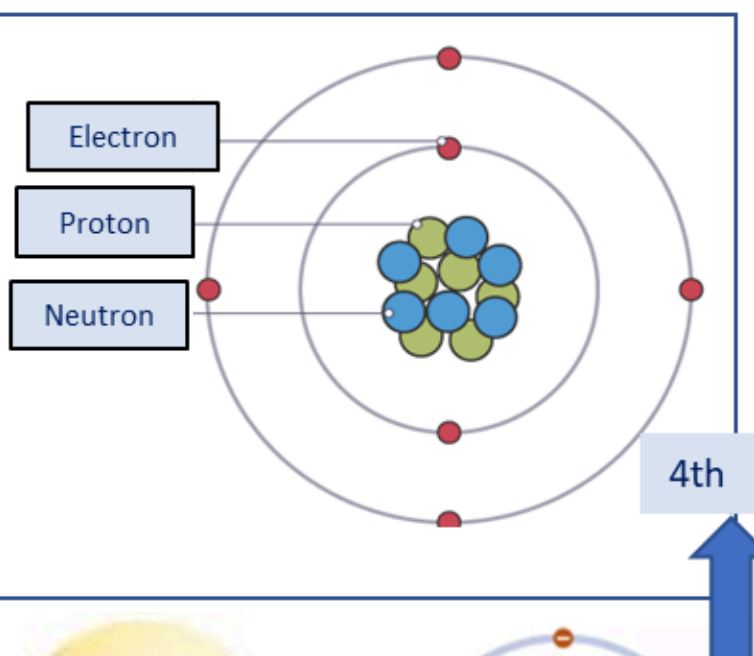


**Ernest Rutherford's Gold scattering  
experiment**

- **Positive alpha particles** fired at gold leaf
- **Most passed straight through** suggesting the atom was mainly empty space
- **Some deflected at angles** suggesting the presence of electrons
- **Some bounced straight back** suggesting a positive nucleus repelled the alpha particles.

**The Nuclear Model**

In 1932 James Chadwick found evidence for the existence of particles in the nucleus with mass but no charge. These particles are called **neutrons**. This atomic model is still used today.



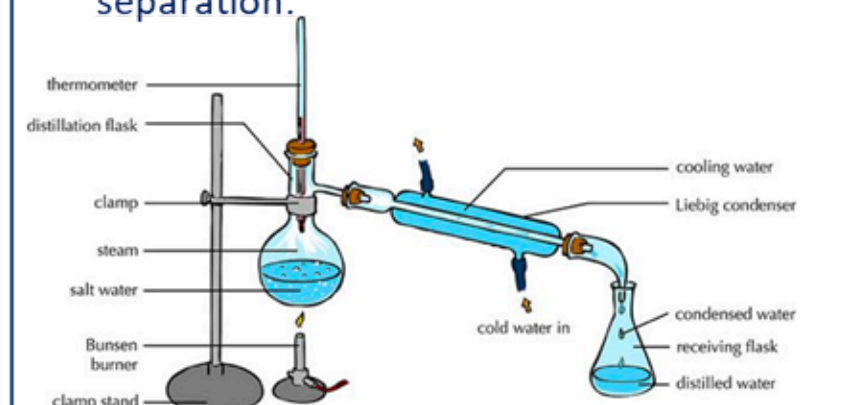
1904- **electron**  
discovered, placed  
in a sphere of  
positive charge (the  
**plum pudding  
model**)

1911 - gold scattering  
experiment discovered mass  
was concentrated in a central  
positive **nucleus** (the nuclear  
model)- further experiments  
led to discovery of **protons**

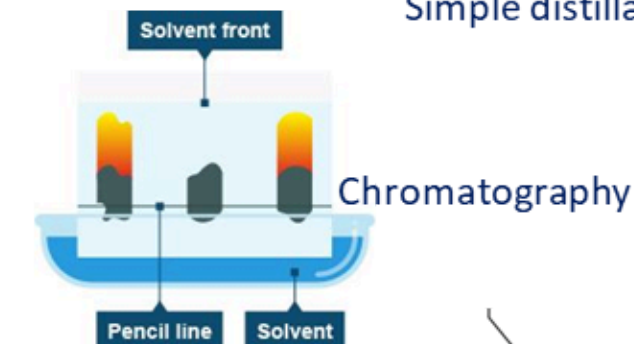
1913 - Suggested  
electrons orbit the  
nucleus in **shells**.  
The shells are at  
certain distances  
from the nucleus.

5.1.1.2 Mixtures

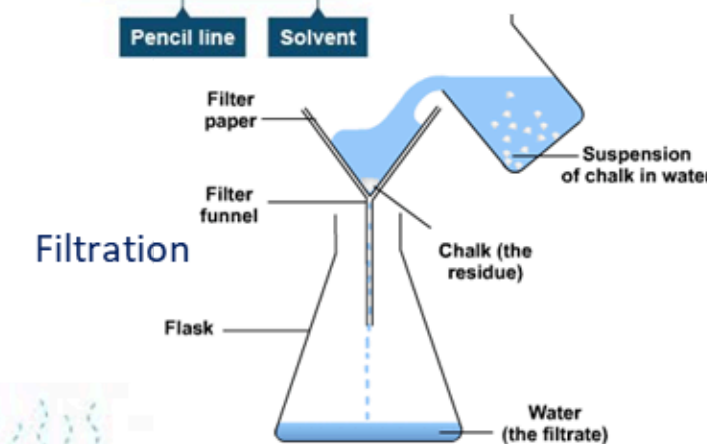
- Mixtures can be **separated by physical processes** such as **filtration, crystallisation, simple distillation, fractional distillation & chromatography.**
- These physical processes **do not involve chemical reactions and no new substances are made.**
- Examples of the specified processes of separation:



Simple distillation



Chromatography



Filtration



Crystallisation

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5.1.1.2  
Mixtures

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5.1.1.3  
Development of  
model of atom

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# Knowledge Organiser – 5.1 Atomic structure & the periodic table

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5.1.1.4 Relative  
electrical  
charges of  
subatomic  
particles

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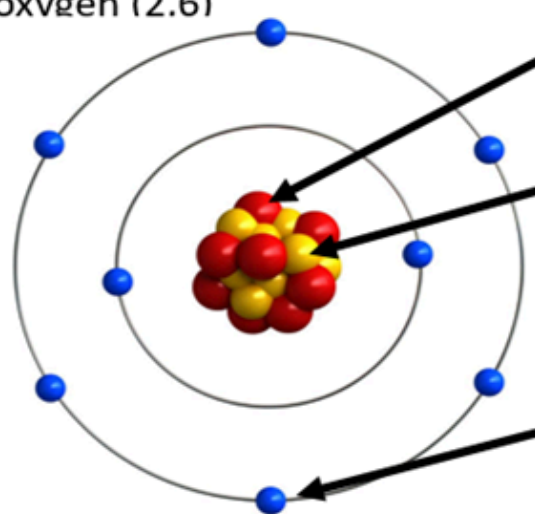
## 5.1.1.4 Relative electrical charges of subatomic particles & 5.1.1.7 Electron structure

**Innermost**, lowest energy level, **shell** has **2 electrons**.

**Next shell 8, next shell 8.** (2,8,8)

**Electronic structure** can be shown as a diagram or a number  
eg. oxygen (2.6)

Sub-atomic Particles



**Proton:** Positive subatomic particle in the nucleus. Relative mass 1, charge +1

**Neutron:** Neutral subatomic particle in the nucleus. Relative mass 1, Charge 0 (no charge)

**Electron:** Negative subatomic particle orbiting the nucleus. Very small relative mass. Charge -1. Can be represented by dots or crosses

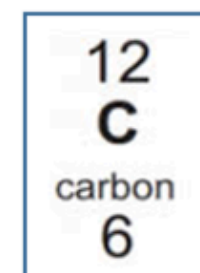
**Atomic radius:**  
0.1 nm

**Nucleus:** The centre of an atom in which most of the mass of the atom is concentrated

## 5.1.1.5 Size and mass of atoms

- Atoms are **very small**, having a radius of about 0.1 nm ( $1 \times 10^{-10}$  m).
- Atomic mass number: The sum (total) of the protons and neutrons in the nucleus of an atom of an element.
- Atomic (Proton) number: The number of protons in an atom of an element. Balanced by number of electrons in an atom of that element. (so atoms have no overall charge).

| Name of particle | Relative mass |
|------------------|---------------|
| Proton           | 1             |
| Neutron          | 1             |
| Electron         | Very small    |



## 5.1.2.2 Development of the periodic table

- Early versions organized by atomic mass
- Didn't take account of isotopes
- Many elements missing
- Mendeleev ordered elements by atomic (proton) number
- Left gaps for undiscovered elements. Later discoveries proved him right.

5.1.1.5 Size and  
mass of atoms

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5.1.2.2 Dev. Of  
the periodic  
table

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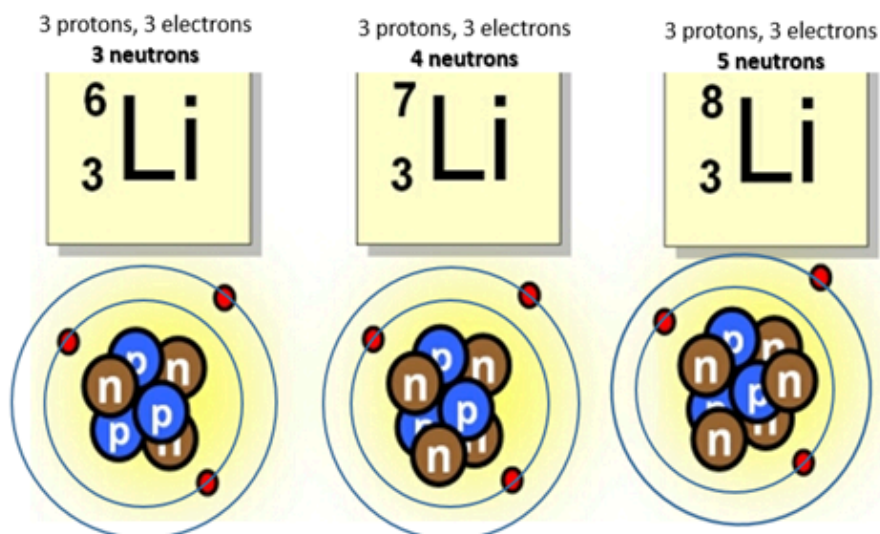
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## 5.1.1.6 Relative atomic mass

**Isotopes** are atoms of the same element with different numbers of neutrons in the nucleus.

**Relative atomic mass:** Average value that takes account of the **abundance** of the different isotopes of that element.



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5.1.1.6 Relative  
atomic mass

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## 5.1.2 Periodic Table Shows the ~100 known elements in order of atomic (proton) number

Period

Group

Elements in groups have similar  
properties and have the same number  
of electrons in their outer shell

**Group 1: Alkali Metals**  
1 electron on the outer shell. Reactivity **INCREASES** going down the group. Vigorous reactions with oxygen, chlorine and water.

**Group 7: Halogens**  
7 electrons on the outer shell. Non-metals. Exist as diatomic (2 atoms) molecules. Reactivity decreases going down the group.

**Group 0: Noble Gases**  
Have full outer shells so stable and unreactive. Boiling points increase going down the group.

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5.1.2 Periodic  
table

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## 5.1.2.3 Metals & Non-metals



Elements that react to form positive ions are **metals**.

vs



Elements that do NOT form positive ions are **non-metals**.

| Metals                                                         | Non-metals                             |
|----------------------------------------------------------------|----------------------------------------|
| Good conductors of heat and electricity                        | Bad conductors of heat and electricity |
| Malleable: can be beaten into thin sheets, hammered into shape | Brittle: breaks easily if solid        |
| Ductile: can be stretched into wires                           | Non-ductile: snap easily               |
| Shiny (lustre)                                                 | Dull                                   |

5.1.2.3 Metals  
& Non-metals

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# Knowledge Organiser – 5.2 Structure & bonding

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## 5.2.1.1 Chemical bonds

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## 5.2.1.2 Ionic bonding

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## 5.2.1.3 Ionic compounds

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## 5.2.1.4 Covalent Bonding

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## 5.2.2.1 States of matter

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### 5.2.1.1 Chemical bonds

There are three types of strong chemical bonds: ionic, covalent and metallic.

**Ionic bonding:** particles are oppositely charged ions. Ionic bonding occurs in compounds formed from metals combined with non-metals

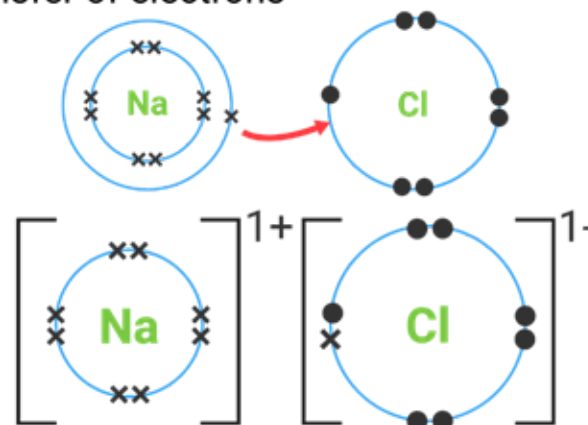
**Covalent bonding** the particles are atoms which share pairs of electrons. Covalent bonding occurs in most non-metallic elements and in compounds of non-metals

**Metallic bonding** the particles are atoms which share delocalised electrons. Metallic bonding occurs in metallic elements and alloys.

### 5.2.1.2 Ionic Bonding

#### Ionic Bonding

transfer of electrons

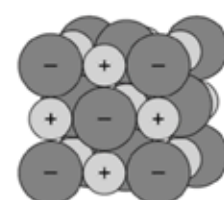
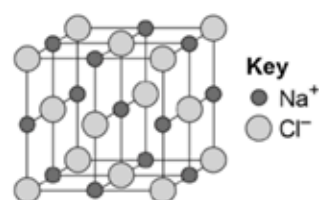


- Between a metal atom and a non-metal atom
- Metals lose electrons to form positive ions
- Non-metals gain electrons & form negative ions
- Electrons **transferred** (ions formed)
- Strong **electrostatic** forces
- Giant **lattice** structures
- High melting/boiling points
- If **molten** or in **solution** ions will conduct electricity

### 5.2.1.3 Ionic compounds

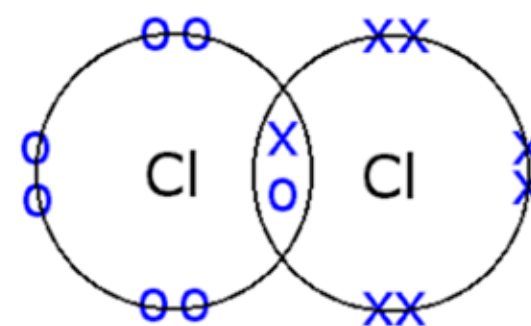
- An ionic compound is a **giant structure of ions**.
- Ionic compounds are held together by **strong electrostatic forces of attraction** between oppositely charged ions.
- These **forces act in all directions in the lattice** and this is called **ionic bonding**.

Eg: structure of sodium chloride

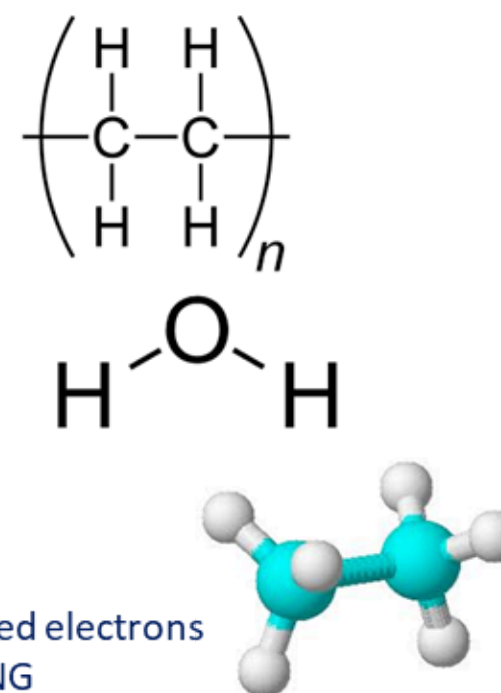


### 5.2.1.4 Covalent Bonding

Sharing electrons



- Between two non-metal atoms
- Electrons are **shared**
- A **covalent** bond is one pair of shared electrons
- Covalent bonds are ALWAYS STRONG



### 5.2.2.1. The three states of matter

- **Freezing** take place at the **melting point**
- **Boiling** and **condensing** take place at the **boiling point**.
- **Particle theory** can help to explain melting, boiling, freezing and condensing.
- The **amount of energy needed to change state** from solid to liquid and from liquid to gas **depends on the strength of the forces** between the particles of the substance.
- **The stronger the forces between the particles the higher the melting point and boiling point of the substance.**

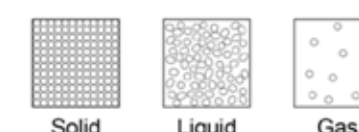
### 5.2.2.3 Properties of Ionic compounds

- have **high melting points** and **high boiling points** because of the **large amounts of energy needed to break the many strong bonds**.
- When melted or dissolved in water, ionic compounds **conduct electricity** because the **ions are free to move and so charge can flow**.

### 5.2.2.2. State symbols

In chemical equations, the three states of matter are shown as (s), (l) and (g).

(aq) for aqueous solutions eg salt water or acid solutions.



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## 5.2.2.4 Prop. Of small molecules

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### 5.2.2.4 Properties of Small molecules

- Usually **gases or liquids** with **low melting point & low boiling point**.
- Weak **intermolecular** forces (because they are small molecules) which are overcome when substance melts or boils.
- e.g. gases, water
- Do not conduct electricity as no overall electric charge.

### 5.2.2.5 Polymers

- **Long** molecules with atoms linked by **strong covalent bonds**.
- Solid at room temperature as **relatively strong intermolecular forces**.
- **Repeating** units e.g. plastics

### 5.2.2.6 Giant covalent structures

#### Giant lattices

- High melting point and boiling point
- Strong covalent bonds which must be overcome to melt or boil.
- e.g. silicon dioxide, diamond, graphite

## 5.2.2.5 Polymers

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## 5.2.2.6 Giant Covalent structures

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# Knowledge Organiser – 5.2 Structure & bonding

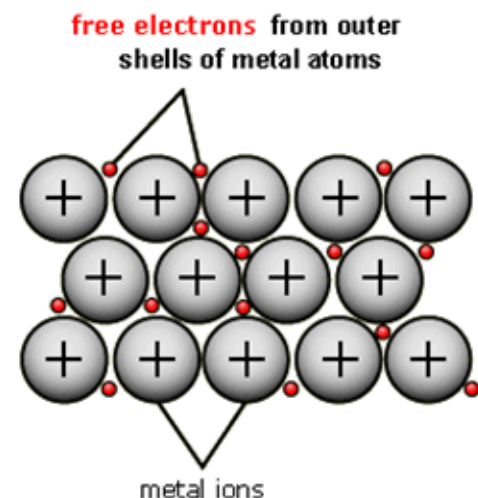
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## 5.2.1.5 Metallic bonding

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### 5.2.1.5 Metallic Bonding

- Bonding between atoms of a metal
- **Delocalised** electrons (negative) & metal ions (positive)
- Shared delocalised electrons form strong metallic bonds
- Delocalised electrons **conduct** heat and electricity



- Pure metals are soft: layers of atoms can slide over each other

## 5.2.2.7 Properties of metals and alloys

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### 5.2.2.7 Properties of metals and alloys

- Metals have **giant structures of atoms** with **strong metallic bonding**. Therefore most metals have **high melting and boiling points**.
- In **pure metals**, atoms are arranged in **layers**, which allows metals to be **bent and shaped**. (malleable)
- **Pure metals** are too soft for many uses and so are **mixed with other metals to make alloys which are harder**.
- In **alloys**, different atoms **disrupt** the layers
- Alloys are **harder** than pure metals

## 5.2.28 Metals as Conductors

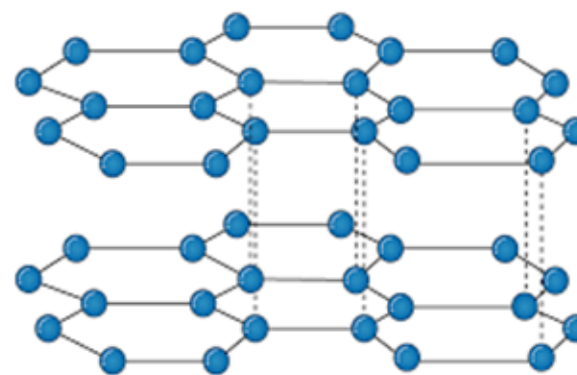
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### 5.2.2.8 Metals as conductors

- Metals are **good conductors of electricity** because the **delocalised electrons** in the metal **carry electrical charge** through the metal.
- Metals are **good conductors of thermal energy** because **energy is transferred by the delocalised electrons**.

## 5.2.3 Structure & bonding of carbon

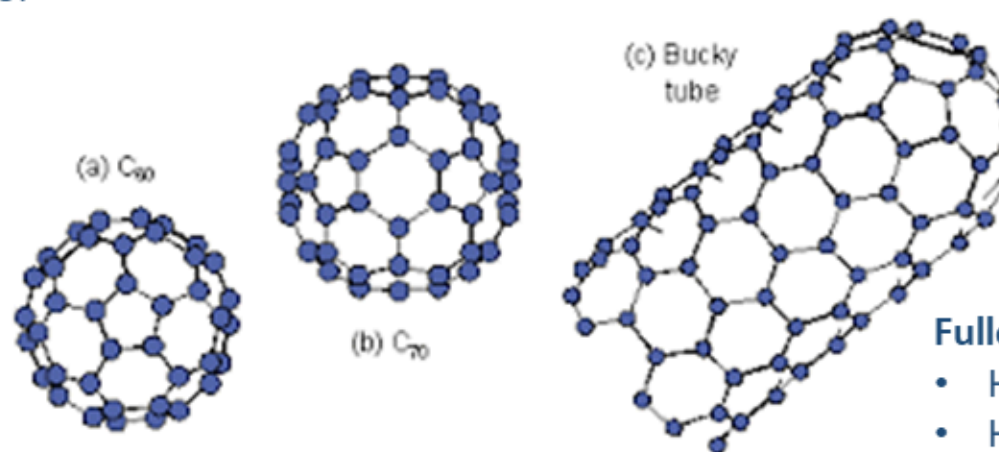
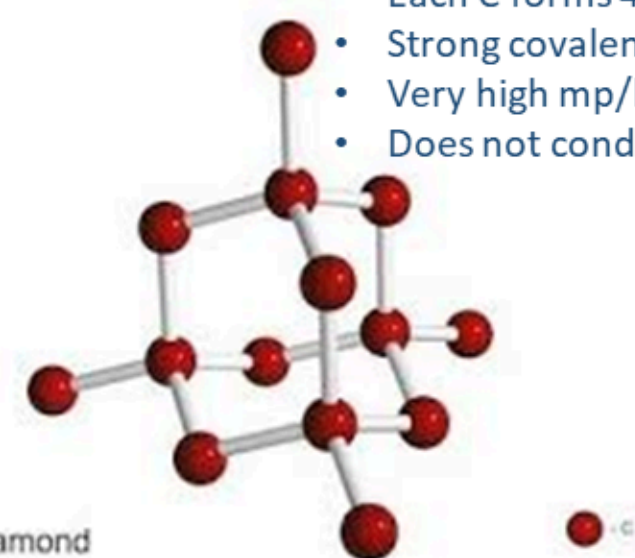


### Graphite

- Giant lattice (in layers)
- Each C forms 3 bonds
- Layers of hexagonal rings with no bonds between layers
- Giving 1 delocalised electron
- Good conductor

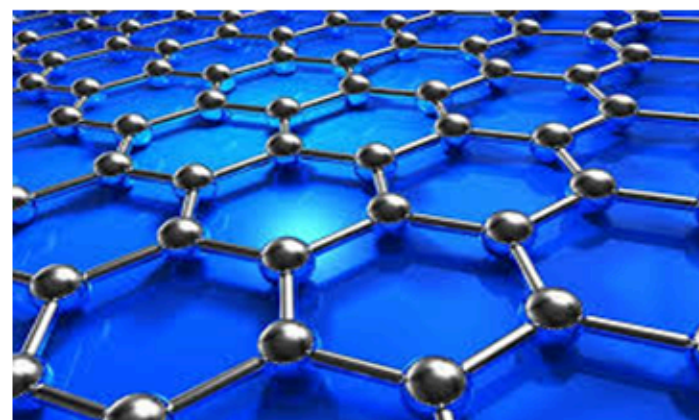
### Diamond: Giant lattice

- Each C forms 4 bonds
- Strong covalent bonds
- Very high mp/bp
- Does not conduct electricity



### Fullerenes

- Hollow shapes
- Hexagonal rings, but may also contain rings of 5 or 7 Cs
- Buckminsterfullerene (C<sub>60</sub>) spherical.
- Carbon nanotubes are cylindrical. Very useful for nanotechnology, electronics



### Graphene

- A single layer of graphite
- Useful in electronics and composites

Note: carbon is a non-metal so the bonds between carbon atoms must be COVALENT.

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## 5.2.3 Structure & bonding of carbon

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# Knowledge Organiser – 5.5 Energy Changes

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5.5.1.1 Energy  
transfer during  
exothermic and  
endothermic  
reactions

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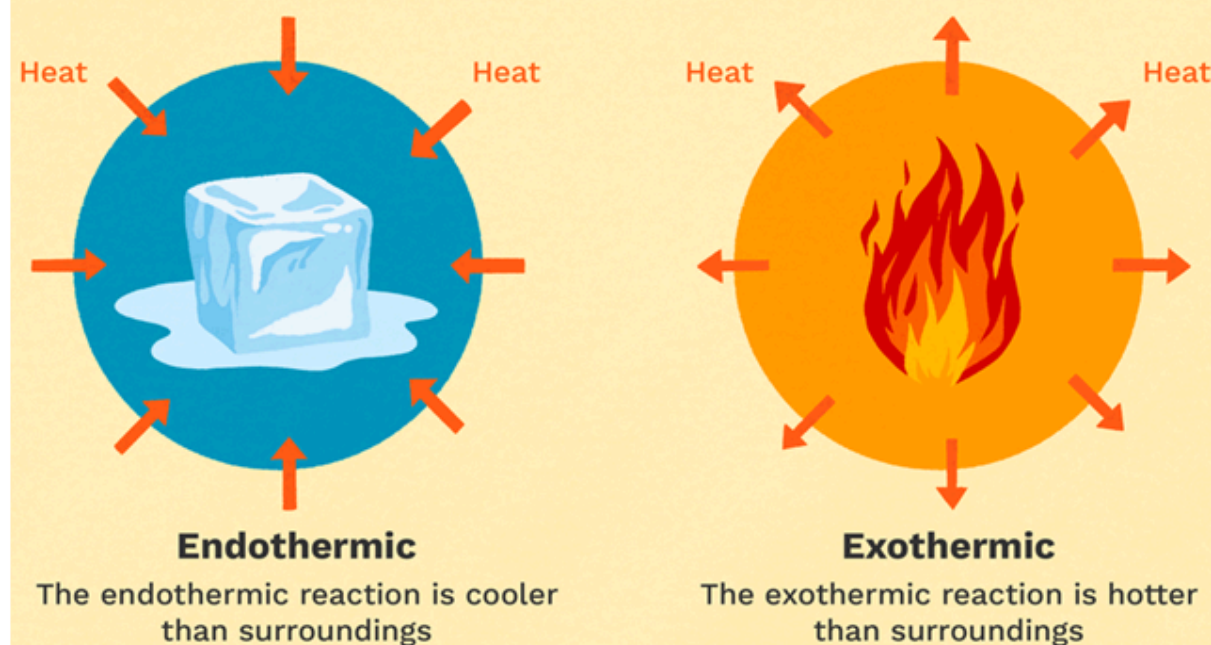
## 5.5.1 Exothermic and endothermic reactions

### 5.5.1.1 Energy transfer during Exothermic and endothermic reactions

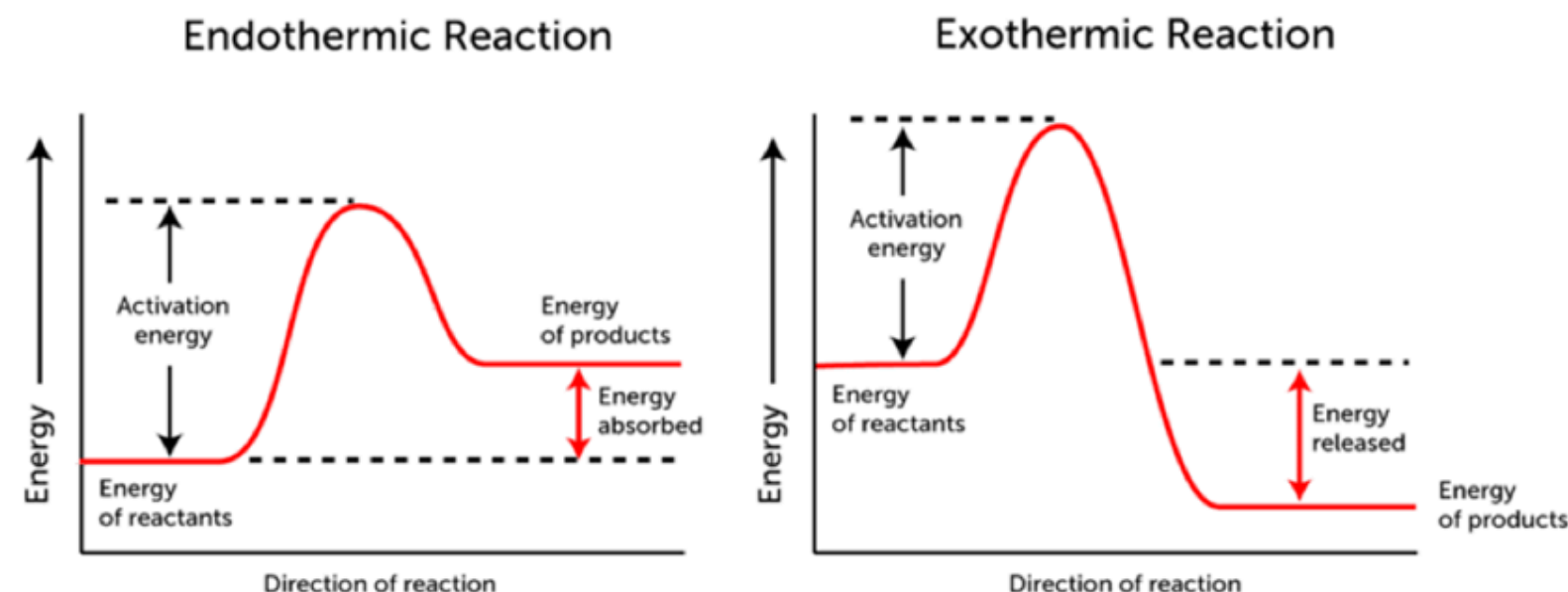
- **Energy is conserved** in chemical reactions.
- The amount of energy in the universe at the end of a chemical reaction is the same as before the reaction takes place.
- If a **reaction transfers energy to the surroundings** the **product** molecules must have **less energy than the reactants, by the amount transferred**.
- **Exothermic reactions give out energy to the surroundings.**  
**Exo = exit.**
  - Examples: combustion, neutralisation, hand warmers.
- **Endothermic reactions take in energy from the surroundings.**  
**Endo = enter.**
  - Examples: thermal decomposition, reaction of citric acid and sodium hydrogencarbonate and sports injury packs.

## Endothermic vs. Exothermic Reactions

Energy is conserved in chemical reactions. The total energy of the system is the same before and after a reaction

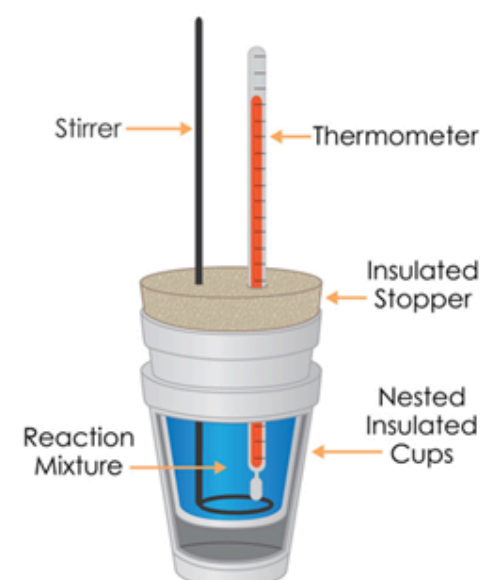


## 5.5.1.2 Reaction Profiles



- In an **endothermic** reaction profile the **products finish higher in energy** than the reactants.
- In an **exothermic** reaction profile the **products finish lower in energy** than the reactants.
- **Activation energy** is the **minimum** energy required for a reaction to happen when particles **collide**.
- The **overall energy change** is the difference between the relative energy of the reactants and the products.

## RPA Investigate the variables that affect temperature in reacting solutions



The variables you could change are:

- Type of reactant (metal, carbonate, alkali)
- Type of acid used.
- Concentration of acid.
- Size of reactant pieces (if solid).
- Concentration of alkali.

**If one of these variables is changing, then all others stay the same.**

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5.5.1.2 Reaction  
profiles

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RPA reacting  
solutions &  
temperature

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# Knowledge Organiser – 5.5 Energy Changes

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## 5.5.1.3 Energy change of reactions

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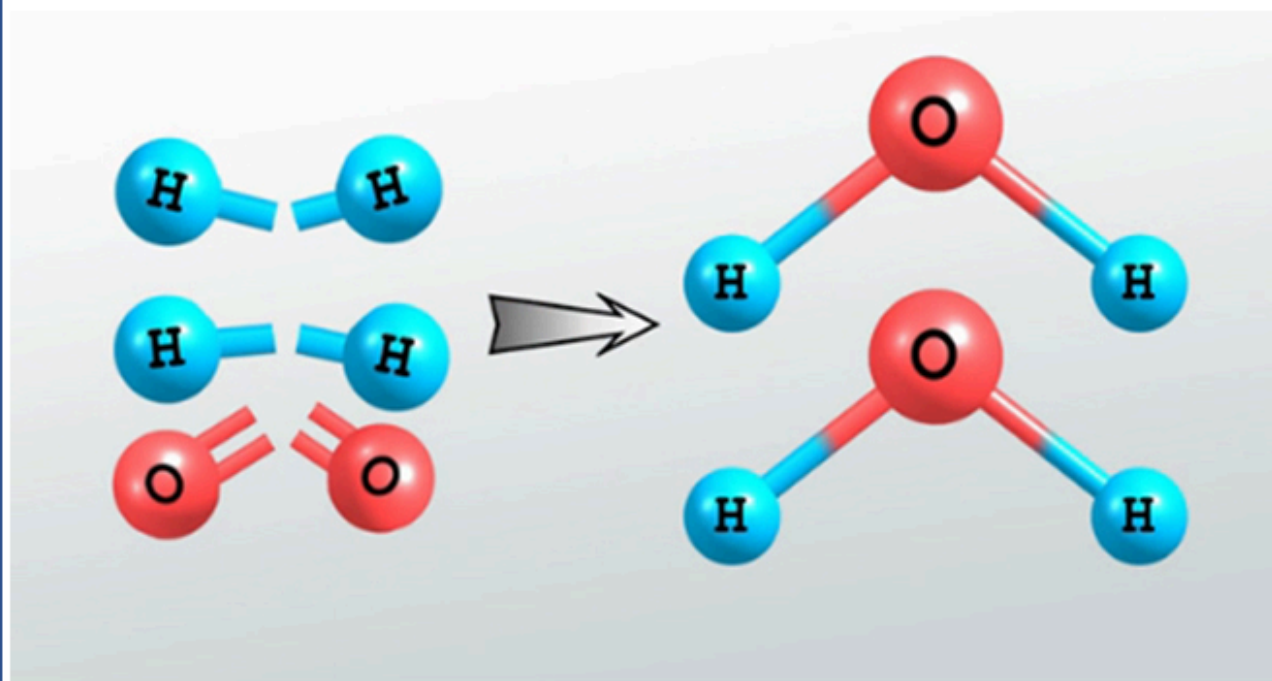
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### 5.5.1.3 Energy change of reactions (HT only)

During a chemical reaction:

- **Energy must be put in** to break bonds in the reactants.
- **Energy is given** out when **bonds in the products are formed**.



- If **overall energy change is negative** = **exothermic** reaction.
- If **overall energy change is positive** = **endothermic** reaction.

- In **exothermic** reactions, the **energy released** from forming new bonds is **greater** than the energy needed to break existing bonds.
- In **endothermic** reactions, the **energy needed to break existing bonds** is **greater** than the energy released from forming new bonds.
- The **difference between the sum of the energy needed to break bonds** in the reactants and the **sum of the energy released when bonds in the products are formed** is the **overall energy change of the reaction**.

Example:

| Bond  | Average bond energy (kJ mol <sup>-1</sup> ) |
|-------|---------------------------------------------|
| H — H | 436                                         |
| O — H | 463                                         |
| O = O | 498                                         |

Bonds broken:

- 2 x H-H = 2 x 436 = 872 kJ/mol
- O=O = 498 kJ/mol
- Total = 872 + 498 = 1370 kJ/mol

Bonds formed:

- 4 x H-O = 4 x 463 = 1852 kJ/mol
- Total = 1852 kJ/mol

Total energy change = reactants - products:

$$1370 \text{ kJ/mol} - 1852 \text{ kJ/mol} = -482 \text{ kJ/mol}$$



# Knowledge Organiser – 6.1 Energy

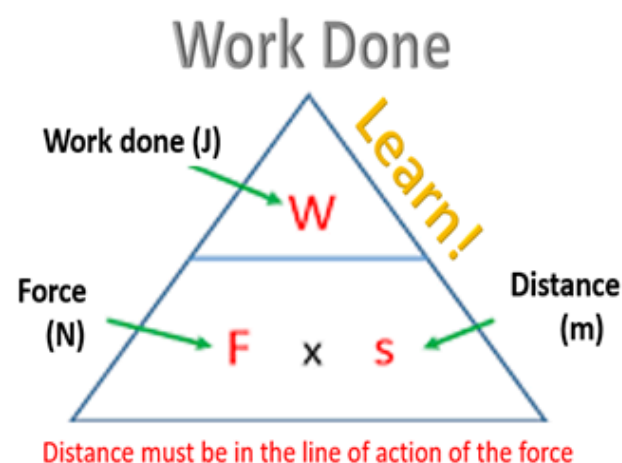
## 6.1.1.1. Energy stores

### and systems

#### 6.1.1.1 Energy stores and systems

| Energy store            | Description                                                                                                                                                                                                                        | Examples                                                                                        |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Magnetic                | The energy stored when <b>repelling poles have been pushed closer</b> together or when <b>attracting poles have been pulled further apart</b> .                                                                                    | Fridge magnets, compasses, maglev trains which use magnetic levitation.                         |
| Internal (thermal)      | Total kinetic and potential energy of the particles in an object, eg <b>the vibrations - also known as the kinetic energy - of particles</b> . In <b>hotter objects, the particles have more internal energy</b> & vibrate faster. | Human bodies, hot coffees, stoves or hobs. Ice particles vibrate slower, but still have energy. |
| Chemical                | The energy <b>stored in chemical bonds</b> , such as those between molecules.                                                                                                                                                      | Foods, muscles, electrical cells.                                                               |
| Kinetic                 | Energy of a <b>moving object</b> .                                                                                                                                                                                                 | Runners, buses, comets.                                                                         |
| Electrostatic           | The energy stored when <b>repelling charges have been moved closer together</b> or when attracting charges have been pulled further apart.                                                                                         | Thunderclouds, Van De Graaff generators.                                                        |
| Elastic potential       | The energy stored when an <b>object is stretched or squashed</b> .                                                                                                                                                                 | Drawn catapults, compressed springs, inflated balloons.                                         |
| Gravitational potential | The energy of an <b>object at height</b> .                                                                                                                                                                                         | Aeroplanes, kites, mugs on a table.                                                             |
| Nuclear                 | The energy stored in the <b>nucleus of an atom</b> .                                                                                                                                                                               | Uranium nuclear power, nuclear reactors.                                                        |

- When a **force** causes a body to move, work is being done on the object by the force.
- Work is the measure of energy transfer when a force ( $F$ ) moves an object through a distance ( $d$ ).
- When work is done, **energy** has been transferred from one energy store to another.
- Therefore Energy transferred = work done



#### Energy transfers

- Light
- Thermal (heat)
- electrical
- sound



**joule (J) = unit of energy**

| Quantity                     | Unit   |
|------------------------------|--------|
| Current                      | A      |
| Energy                       | J      |
| Mass                         | kg     |
| Power                        | W      |
| Time                         | s      |
| Temperature                  | °C     |
| Height                       | m      |
| Velocity                     | m/s    |
| Extension                    | m      |
| Spring constant              | N/m    |
| Force                        | N      |
| Gravitational field strength | N/kg   |
| Specific heat capacity       | J/kg°C |

#### 6.1.1.2 Changes of energy

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**Kinetic energy** of a moving object can be calculated using the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times \text{speed}^2$$

$$E_k = \frac{1}{2} m (v)^2 \text{ Learn!}$$

- kinetic energy,  $E_k$ , in joules, J
- mass,  $m$ , in kilograms, kg
- speed,  $v$ , in metres per second, m/s

**Elastic potential energy** stored in a stretched spring can be calculated using the equation (assuming the limit of proportionality has not been exceeded):

$$\text{elastic potential energy} = 0.5 \times \text{spring constant} \times \text{extension}^2$$

$$E_e = \frac{1}{2} k e^2 \text{ Given!}$$

- elastic potential energy,  $E_e$ , in joules, J
- spring constant,  $k$ , in newtons per metre, N/m
- extension,  $e$ , in metres, m

**Gravitational potential energy** gained by an object raised above ground level can be calculated using the equation:

$$\text{g.p.e.} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$E_p = mgh \text{ Learn!}$$

- gravitational potential energy,  $E_p$ , in joules, J
- mass,  $m$ , in kilograms, kg
- gravitational field strength,  $g$ , in newtons per kilogram, N/kg
- height,  $h$ , in metres, m

### 6.1.1.2 Changes in energy

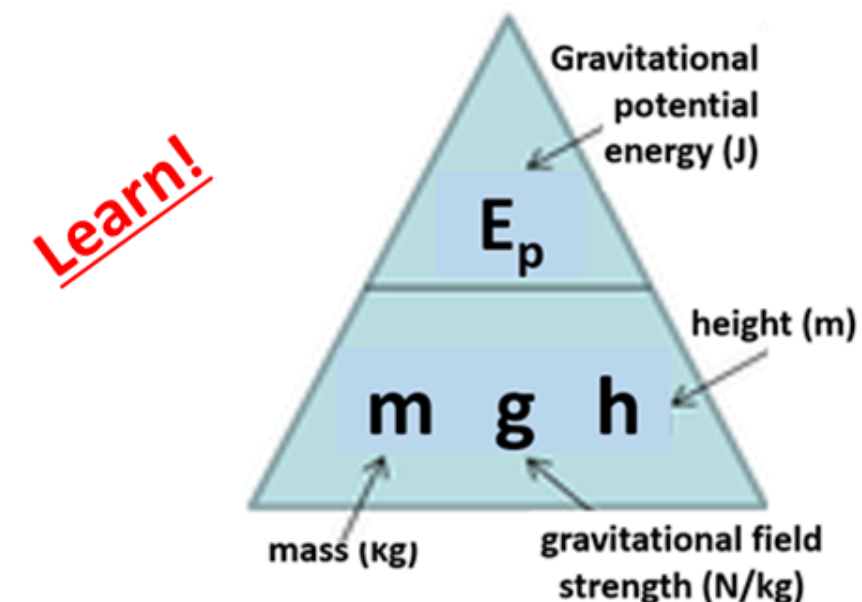
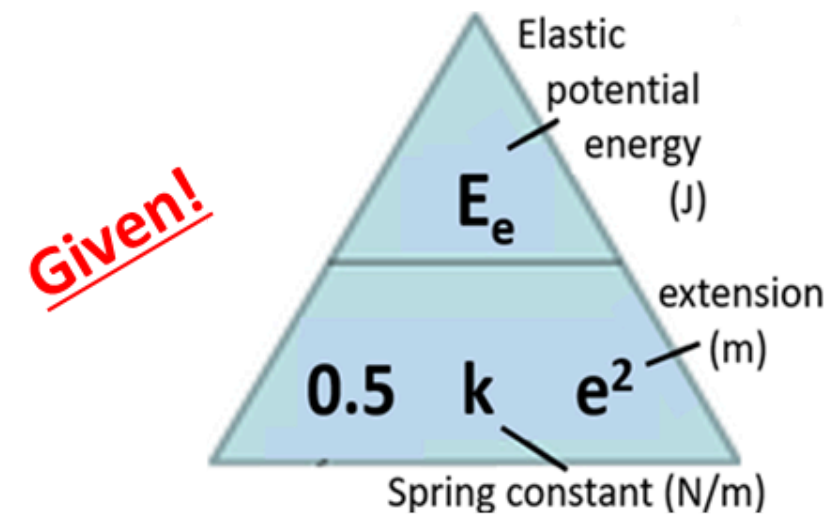
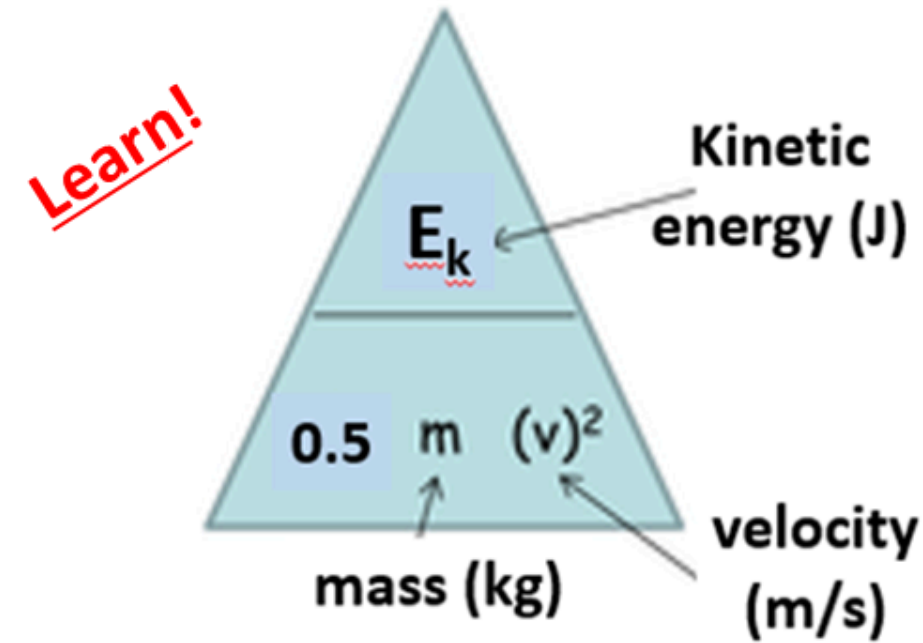
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Gravitational field strength is 9.8N/kg on Earth.  
**(g will be given in the exam).**



# Knowledge Organiser – 6.1 Energy

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## 6.1.1.3 Energy changes in systems

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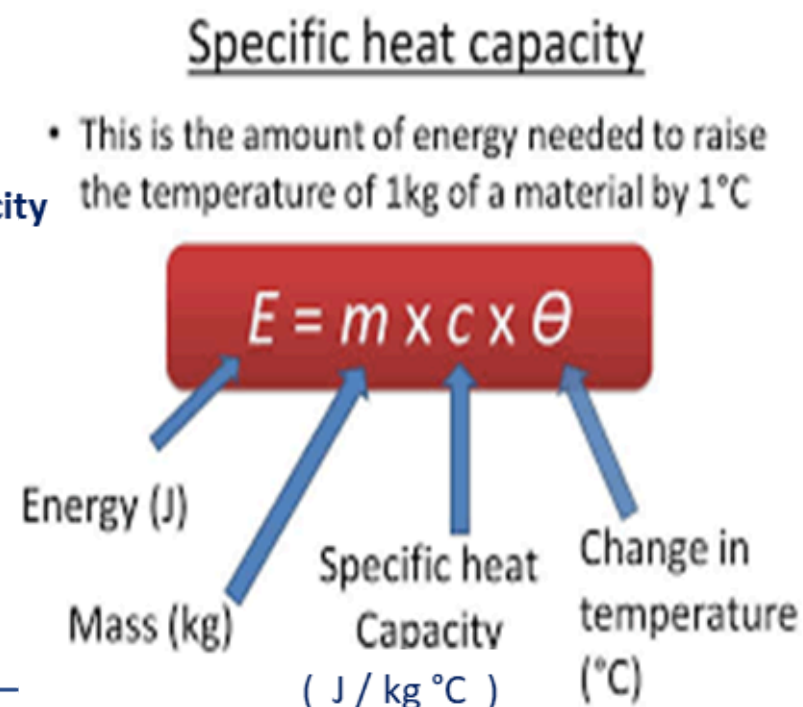
### 6.1.1.3 Energy changes in systems

The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation:

**change in thermal energy = mass × specific heat capacity × temperature change**

$$\Delta E = m c \Delta \theta \quad \text{Given!}$$

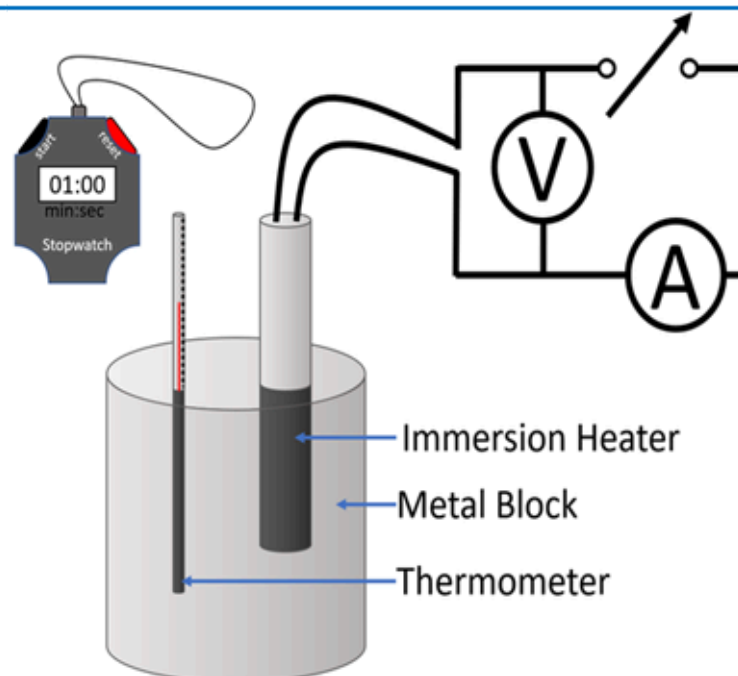
- change in thermal energy,  $\Delta E$ , in joules, J
- mass,  $m$ , in kilograms, kg
- specific heat capacity,  $c$ , in joules per kilogram per degree Celsius, J/kg °C
- temperature change,  $\Delta \theta$ , in degrees Celsius, °C



**RPA: an investigation to determine the specific heat capacity of one or more materials.** The investigation involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored

#### Method:

1. Place the immersion heater into central hole at top of block.
2. Place the thermometer into smaller hole and add drops of oil into the hole to ensure thermometer is surrounded by hot material.
3. Fully insulate the block by wrapping it loosely with cotton wool.
4. Record the temperature of the block.
5. Connect the heater to the power supply and turn it off after ten minutes. After ten minutes the temperature will still rise even though the heater has been turned off and then it will begin to cool.
6. Record the highest temperature that it reaches and calculate the temperature rise during the experiment.



#### Improving accuracy:

- Place the metal block on a heatproof mat to reduce the thermal energy lost to the table surface by conduction.
- Wrap the metal block in a thermal insulator to reduce the thermal energy lost to the air.
- Place the electronic balance on a flat, level surface to get an accurate reading of the mass.

#### Improving precision:

- Use a data logger rather than a thermometer to reduce the random error & add more decimal places.
- Ensure the immersion heater and block begin at room temperature to reduce the error in repeat readings.
- Ensure the same thickness and type of insulator is used for every repeat measurement reduce anomalies.

### 6.1.1.4 Power

Power is defined as the rate at which energy is transferred or the rate at which work is done.

- power,  $P$ , in watts, W
- energy transferred,  $E$ , in joules, J
- time,  $t$ , in seconds, s
- work done,  $W$ , in joules, J

An energy transfer of 1 joule per second is equal to a power of 1 watt

$$\text{power (W)} = \frac{\text{work done (J)}}{\text{time taken (s)}}$$

$$\text{power (W)} = \frac{\text{energy transferred (J)}}{\text{time taken (s)}}$$

Learn!

#### Example

Two electric motors are used to lift a 5 N weight through a vertical height of 6 m. Motor A does this in 5 seconds. Motor B does this in 10 seconds.

For both motors the work done is:

$$W = F \times d = 5\text{N} \times 6\text{m} = 30\text{J}$$

For motor A:

$$P = \frac{W}{t} = \frac{30\text{J}}{5\text{s}} = \underline{6\text{W}}$$

For motor B:

$$P = \frac{W}{t} = \frac{30\text{J}}{10\text{s}} = \underline{3\text{W}}$$

Motor B is twice as powerful as motor A.

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## 6.1.1.4 Power

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6.1.2.1 Energy transfers in a system

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Thermal conductivity

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6.1.2.1 Energy transfers in a system

Energy cannot be created or destroyed, only transformed from one form to another (Law of conservation of energy).  
"Work done" is another way of describing energy transfer.

- where there are energy transfers in a closed system, there is no net change to the total energy.
- In all system changes energy is dissipated, so that it is stored in less useful ways. This energy is often described as being 'wasted'.
- Unwanted energy transfers can be reduced, eg. through lubrication and the use of thermal insulation.
- The higher the thermal conductivity of a material the higher the rate of energy transfer by conduction across the material.

High Heat Loss

20°C inside house

0°C outside house

Lower Heat Loss

Insulation

The rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.  
Higher thermal conductivity = higher rate of energy transfer = house cools down quicker.

6.1.2.2 Efficiency

Useful energy output / total energy input x 100%

OR

Useful power output / total power input x 100%

Efficiency can be represented as a decimal or percentage. It has to be <100% (or <1.0) as all energy transfers involve wasted energy.

In a closed system there is no net change to the total energy

Total IN = total OUT

Increase efficiency by insulating or streamlining/ lubricating to reduce friction.

Filament Lamp

Electrical Energy 40 joules

Light 0.8 joules

Thermal 39.2 joules

LED light

Electrical Energy 4 joules

Light 0.8 joules

Thermal 3.2 joules

0.8 / 40 x 100 = 2%

0.8 / 4 x 100 = 20%

The LED is 10 x more efficient than the filament lamp

Investigate thermal conductivity using rods of different materials

Whichever rod gets hottest first at the other end is the best conductor. The material that heats the quickest is said to have a higher thermal conductivity

6.1.3 National and Global energy resources

- Main energy resources available for use on Earth include: fossil fuels (coal, oil and gas), nuclear fuel, biofuel, wind, hydro-electricity, geothermal, the tides, the Sun and water waves.
- A renewable energy resource is one that is being (or can be) replenished as it is used.
- A Non-renewable energy source cannot be replaced after it has been used. It is finite
- The uses of energy resources include: transport, electricity generation and heating.

|                            | Positives                                                                     | Negatives                                                                                        |
|----------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Fossil fuel (coal/oil/gas) | Reliable, cheap to run and mine                                               | Finite, atmospheric pollution (CO2, SO2, NOx)                                                    |
| Nuclear                    | Reliable, No CO2, lots energy released                                        | Long-lasting toxic waste, finite                                                                 |
| Wind                       | Infinite, free, no atmospheric pollution                                      | Unreliable (not always windy), visual pollution, costly to build, sometime noisy                 |
| Sun                        | Infinite, free, put on buildings/ in fields                                   | Costly to set up, pollution from batteries                                                       |
| Geothermal                 | Infinite, free, no atmospheric pollution                                      | Products from ground may contain toxic elements                                                  |
| Tidal                      | Barrages reduce flooding eg Thames, free, no pollution, reliable(2 tides/day) | Disturb ecology and shipping lanes, costly to build                                              |
| Biofuel                    | Can be regrown, cheap, carbon neutral                                         | Use up land that could grow food/ livestock                                                      |
| Hydroelectricity           | No atmospheric pollution, free                                                | High rainfall needed, floods valleys therefore habitats/ villages destroyed                      |
| Water Waves                | No atmospheric pollution, free                                                | Disturb ecology and shipping lanes, costly to build, unreliable (sea does not always have waves) |

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6.1.2.2 Efficiency

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6.1.3 National & Global energy resources

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# Knowledge Organiser – 6.2 Electricity

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## 6.2.1.2 Electrical charge and current

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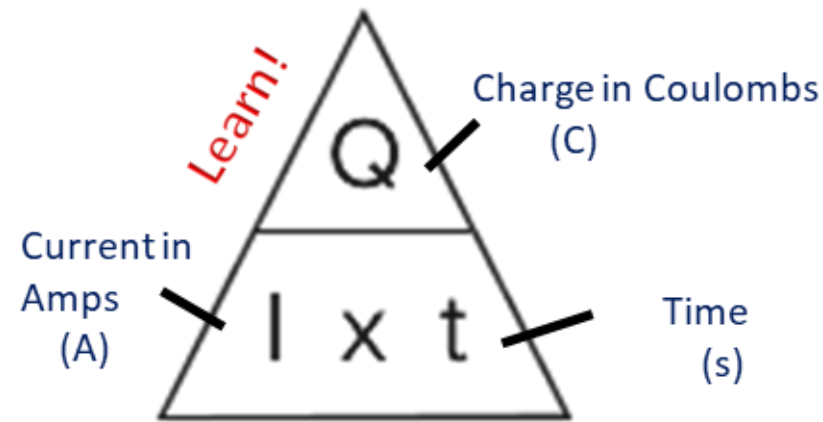
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### 6.2.1.2 Electrical charge and current

**Electric current is a flow of electrical charge.**  
Size of current is **rate of flow of electrical charge**.

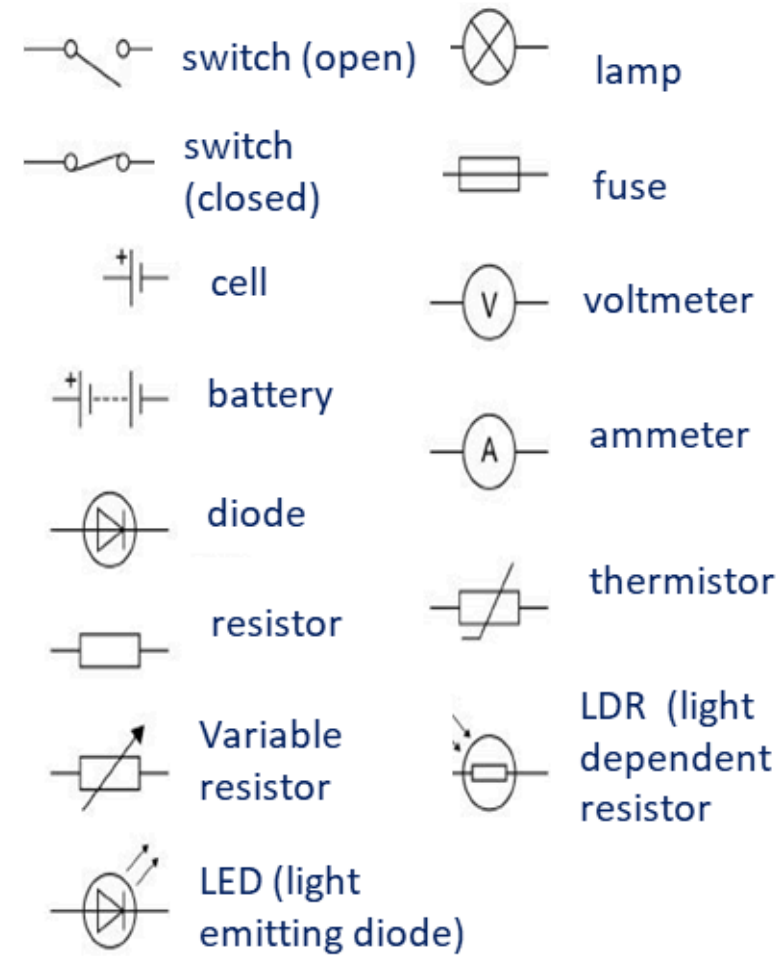
Charge flow, current and time are linked by the equation:

**charge flow = current × time**



- Current has **same value at any point in a single closed loop**.
- Measured with **Ammeter**

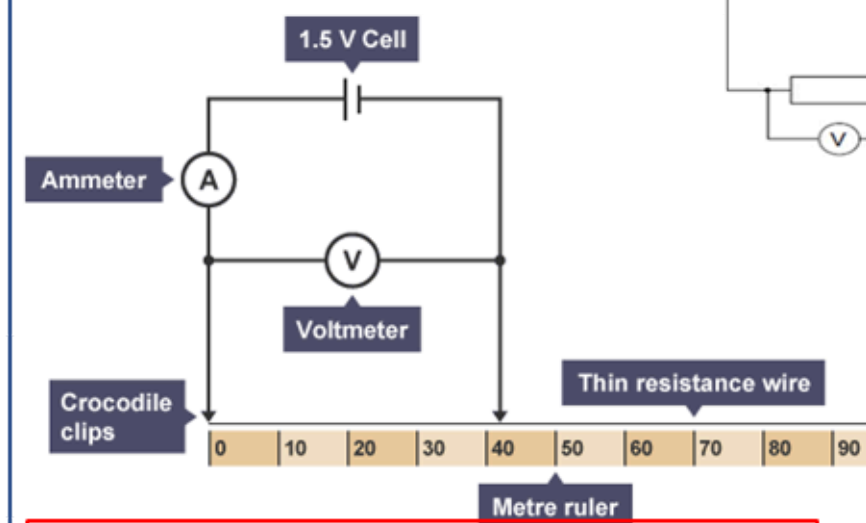
### 6.2.1.1 Standard circuit diagram symbols



**RPA: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits.**

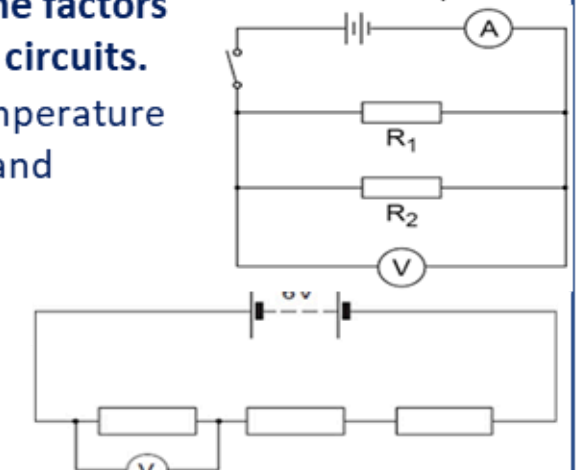
- the length of a wire at constant temperature
- combinations of resistors in series and parallel.

IV: Length of a wire



**Hazard** Heating  
**Consequences** Minor burns  
**Control measures** Set up circuit before closing the switch

IV: resistors in series or parallel



- In series, the resistance of the network is equal to the **sum of the other** resistances.
- In parallel, the resistance of the network is **less than either** of the other resistances.

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## 6.2.1.1 Standard circuit diagrams

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RPA Circuits

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## 6.2.1.3 Current, resistant and potential difference

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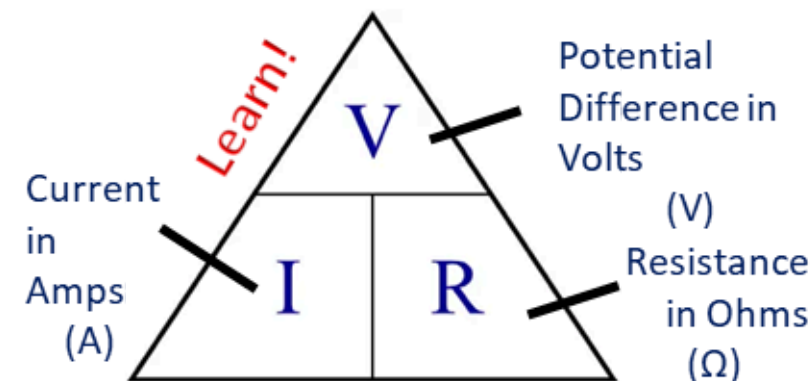
### 6.2.1.3 Current, resistance and potential difference

- Potential difference** is the amount of work energy required to move an electric charge (Coulomb) from one point to another
- Current ( $I$ ) through a component depends on the **resistance** ( $R$ ) of the component and the **potential difference** ( $V$ ) **across the component**.
- The **greater the resistance** of the component the **smaller the current** for a **given potential difference (pd)** across the component.

- Measured with **Voltmeter**
- Voltmeter must be connected in parallel**

**Current, potential difference and resistance** can be calculated using the equation:

**potential difference = current × resistance**



E.g. What is the resistance of a component if 12 V causes a current of 2 A through it?

$$R = V / I = 12V / 2A = 6\Omega$$

### Resistance

- Metal atoms (ions)** in a **wire have delocalised electrons** which are free to move and **carry the charge**.
- Electrons moving** around the circuit **collide with the ions**.
- This is called **resistance**.

**Units of resistance = ohms,  $\Omega$**

**Components with high resistance** often **get hot** (e.g. filament lamp).

- Electrons colliding** with the ions **transfer energy** as **heat** and **light**.
- Causes the ions to vibrate more**, increasing the **resistance** even more.
- This makes it harder for the electrons to pass through without collisions.



# Knowledge Organiser – 6.2 Electricity

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## 6.2.1.4 Resistors

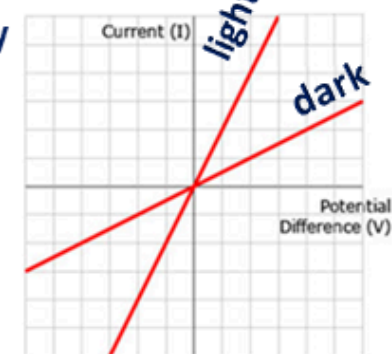
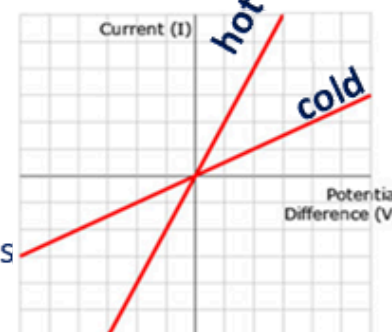
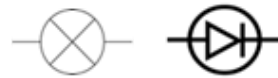
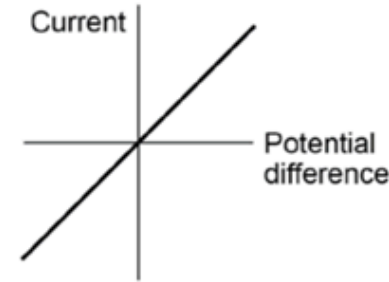
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### 6.2.1.4 Resistors

- Current through an ohmic conductor (at a constant temperature) is **directly proportional to the potential difference** across the resistor.
- Resistance remains constant as the current changes.
- Resistance of components such as lamps, diodes, thermistors and LDRs is **not** constant; it **changes** with the current through the component.
- SEE RPA
- Resistance of a thermistor decreases as the temperature increases.
  - Low temperature = High resistance
  - Used in heat activate fire alarms and thermostats
- Resistance of an LDR decreases as light intensity increases
  - Low light levels = high resistance.
  - An LDR can be used in lights that come on when it's dark.

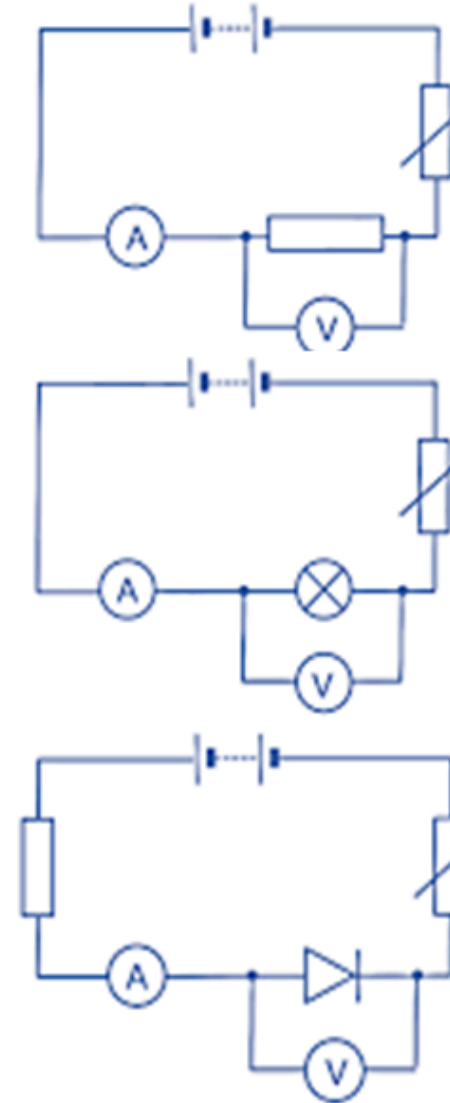


| Unit                 | symbol   |
|----------------------|----------|
| Potential difference | V        |
| Current              | A        |
| Energy               | J        |
| Work done            | J        |
| Charge               | C        |
| Time                 | s        |
| Power                | W        |
| Resistance           | $\Omega$ |

**Charge** is a property of a body which experiences a force in an electric field. **Charge** is measured in **coulombs (C)**. Since electrons are so small and one electron will not have much of an effect anywhere, it is more useful to refer to packages of electrons. One coulomb of charge is a package equivalent to 6,250,000,000,000,000,000 electrons.

One volt is the **potential difference** when one coulomb of charge transfers one joule of energy.

RPA: use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature



The current through a **resistor** at constant a constant temperature is **directly proportional** to the potential difference across the resistor.



The resistance of a **bulb** **increases** as the temperature of the filament increases.



The current through a **diode** flows **in one direction**. It has very **high resistance** in the opposite direction.



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## 6.2.2 Series and Parallel circuits

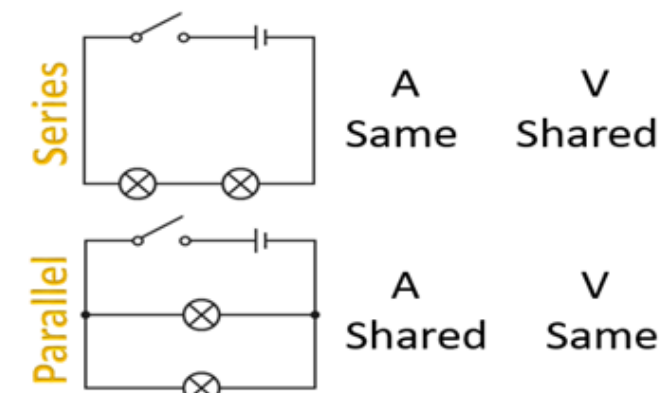
For components connected in series:

- same **current (A)** through each component
- total **potential difference (V)** of the power supply is **shared between components**
- total resistance of two components is the sum of the resistance of each component.

$$R_{\text{total}} = R_1 + R_2 \quad \text{resistance, } R, \text{ in ohms, } \Omega$$

For components connected in parallel:

- potential difference** across each component is the **same**
- total current** through the whole circuit is **sum of the currents** through the separate components
- total resistance of two resistors is less** than the resistance of the **smallest individual resistor**.



## 6.2.2 Series and Parallel circuits

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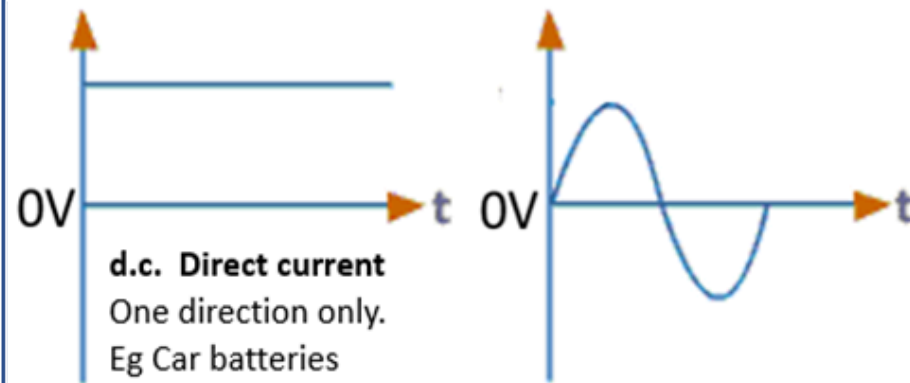
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# Knowledge Organiser – 6.2 Electricity

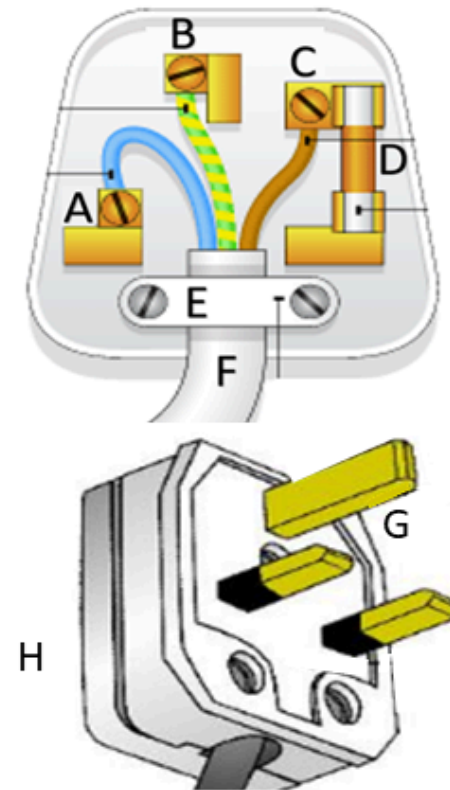
## 6.2.3 Domestic uses and safety

### 6.2.3.1 Direct and alternating potential difference



### 6.2.3.2 Mains electricity

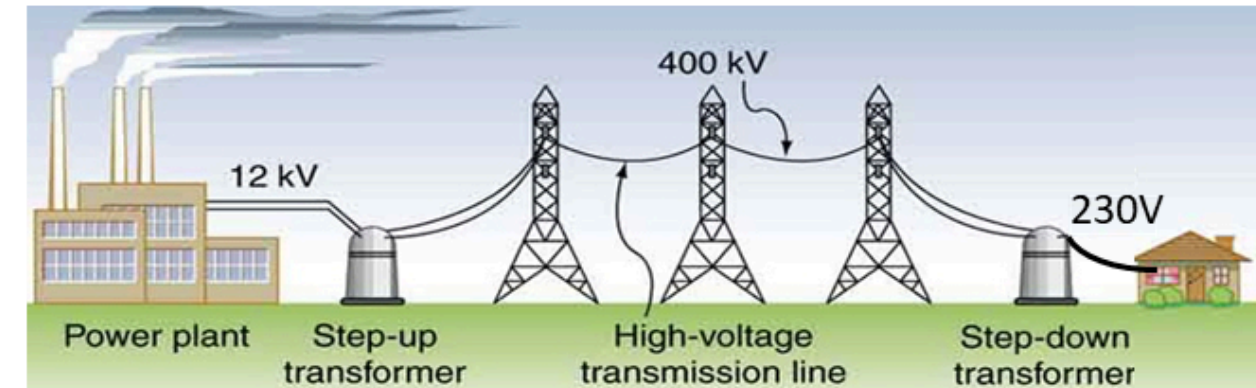
- A**= neutral wire, close to 0V.
- B**= earth wire, 0V, only carries current if there's a fault, stops appliance becoming live.
- C**= live wire, 230V between earth and live.
- D**= Fuse, internal wire melts when current is too big so breaks the circuit.
- E**= cable grip
- F**= three-core cable, copper wire = flexible and good conductor, plastic coating.
- G**= brass pins, hard wearing, good conductor
- H**= plastic casing is an insulator



- a live wire may be dangerous even when a switch in the mains circuit is open
- It is dangerous to provide any connection between the live wire and earth.

## 6.2.4 Energy Transfers

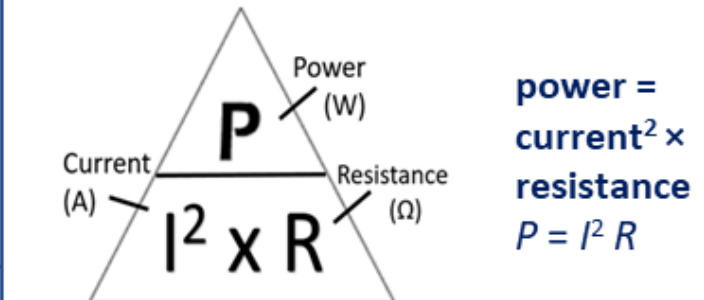
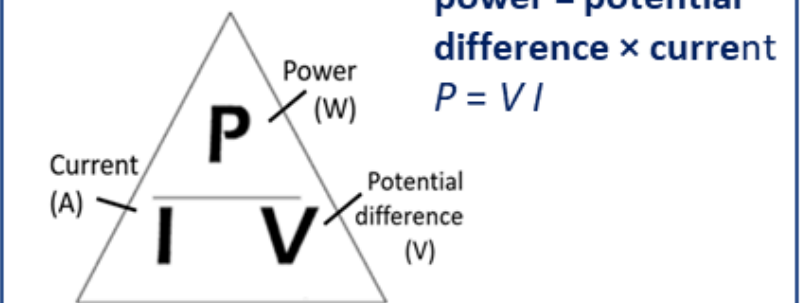
### 6.2.4.3 The National Grid



- Network of cables and transformers linking power stations to consumers
- Step-up transformers = higher potential difference
- Reduced energy loss because resistance is lower in cables (high volts = fewer amps for same power)
- Step-down transformers = decrease potential difference to safe level for domestic use (about 230V in UK)
- Underground cables protected from bad weather but get damaged by diggers in building projects

**E.g.** What is the potential difference between two points if 5 C of charge shifts 10 J?  
 $V = E/Q$   
 $= 10J / 5C$   
 $= \mathbf{2 \text{ volts}}$

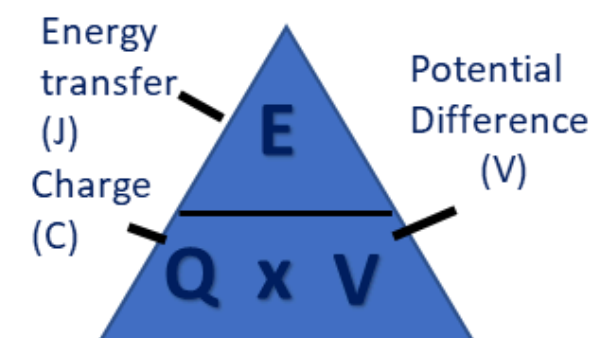
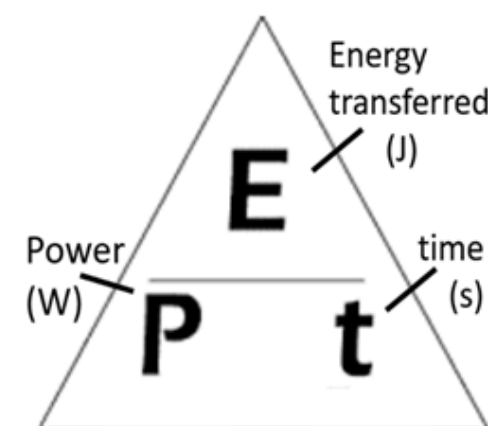
### 6.2.4.1 Power



- power,  $P$ , in watts, W
- potential difference,  $V$ , in volts, V
- current,  $I$ , in amps, A
- resistance,  $R$ , in ohms, Ω

### 6.2.4.2 Energy transfers in everyday appliances

- The rate at which energy is transferred by an appliance is called the **power**.
- Also known as “**work done**” by the components in the circuit when charge flows.
- The energy transferred by an appliance depends on how long it is switched on for and the power of the appliance.



- energy transferred,  $E$ , in joules, J
- power,  $P$ , in watts, W
- time,  $t$ , in seconds, s
- charge flow,  $Q$ , in coulombs, C
- potential difference,  $V$ , in volts, V

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6.2.3.1 Direct and alternating potential difference

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6.2.4.2 Energy Transfers

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# Knowledge Organiser – 6.3 Particle model of matter

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## 6.3.1.1 Density of materials

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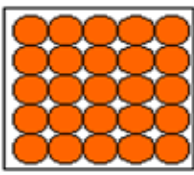
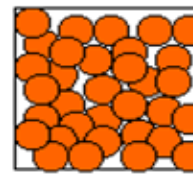
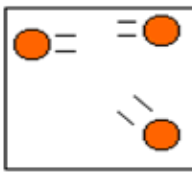
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### 6.3.1.1 Density of materials

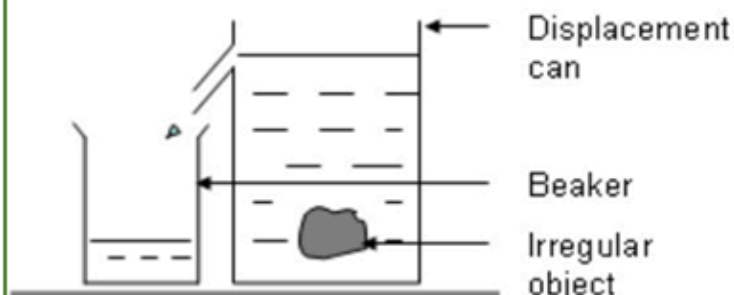
$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\left[ \rho = \frac{m}{V} \right]$$

- density,  $\rho$ , in kilograms per metre cubed, kg/m<sup>3</sup>
- mass,  $m$ , in kilograms, kg volume,  $V$ , in metres cubed, m<sup>3</sup>
- The particle model can be used to explain the different states of matter
- differences in density.

| Solid                                                                                          | Liquid                                                                                                     | Gas                                                                                             |
|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Particles closely packed<br>- vibrate<br>- Little energy<br>- Very strong forces of attraction | Particles touching,<br>- Move past each other<br>- Some energy<br>- Relatively strong forces of attraction | Particles very far apart<br>- Move very fast<br>- Lots of energy<br>- Weak forces of attraction |
|             |                         |              |

### RPA: Measuring volume of irregular objects and calculating density



#### Method 1: Regular solids

Calculate volume  
Regular shape: Length x width x height

Sphere:  $\frac{4}{3}\pi\left(\frac{d}{2}\right)^3$

#### Method 2: Stone or other irregular shaped object

Displacement can

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## 6.3.1.2 Changes of states

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### 6.3.1.2 Changes of State

#### Conservation of mass

- The number of particles does not change during a change of state, only their spacing and arrangement.
- Total mass does NOT change.



- Change of state is **physical**.
- The material **recovers its original properties** if the change is reversed.

### 6.3.2.2 Temperature changes in a system and specific heat capacity

The change in temperature of a system depends on:

- the amount of **thermal energy** transferred to the system
- the mass of the substance
- the nature of the substance itself

change in thermal energy = mass × specific heat capacity × temperature change

$$\Delta E = mc\Delta\theta$$

- change in thermal energy,  $\Delta E$ , in joules, J
- mass,  $m$ , in kilograms, kg
- specific heat capacity,  $c$ , in joules per kilogram per degree Celsius, J/kg °C
- temperature change,  $\Delta\theta$ , in degrees Celsius, °C.

| Key Terms                     | Particle Model of Matter Definitions                                                                                                                                                                   |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>condensation</b>           | A change of state in which gas becomes liquid by cooling.                                                                                                                                              |
| <b>energy</b>                 | The capacity for doing work                                                                                                                                                                            |
| <b>evaporation</b>            | The process in which a liquid changes state and turns into a gas.                                                                                                                                      |
| <b>freeze</b>                 | A change of state in which liquid becomes solid by cooling.                                                                                                                                            |
| <b>Internal energy</b>        | The total kinetic energy and potential energy of the particles in an object.<br>Heating changes the energy stored within the object by increasing the energy of the particles that make up the system. |
| <b>Kinetic energy</b>         | Energy which an object possesses by being in motion                                                                                                                                                    |
| <b>Melting</b>                | The process that occurs when a solid turns into a liquid when it is heated                                                                                                                             |
| <b>Specific heat capacity</b> | The amount of energy needed to raise the temperature of 1 kg of substance by 1°C                                                                                                                       |
| <b>Specific latent heat</b>   | The amount of energy needed to melt or vaporise 1 kg at its melting or boiling point                                                                                                                   |
| <b>Sublimation</b>            | When a solid turns straight into a gas on heating, without becoming a liquid first, or when a gas turns straight into a solid, without becoming a liquid.                                              |
| <b>Temperature</b>            | How warm or cold something is                                                                                                                                                                          |
| <b>Thermal energy</b>         | Scientific term for heat energy                                                                                                                                                                        |

### 6.3.2.2 Temp changes and specific heat capacity.

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## 6.3.1.3 Internal Energy

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### 6.3.1.3 Internal Energy

- Internal Energy:** Energy is stored inside a system by the particles that make up the system. Internal energy is the **total kinetic energy** and **potential energy** of **all the particles** that make up a system.
- Heating **increases** the energy of the particles
- Either **raises the temperature** of the system or **produces a change of state**.



# Knowledge Organiser – 6.3 Particle model of matter

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## 6.3.2.2 Changes of heat and specific latent heat

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### 6.3.2.3 Changes of heat and specific latent heat

If a change of state happens:

- The energy needed for a substance to change state is called **latent heat**.
- When a change of state occurs, the energy supplied **changes the energy stored** (internal energy) but **does not change the temperature**.
- **specific latent heat** of a substance is the **amount of energy required to change the state of one kilogram of the substance** with no change in temperature.

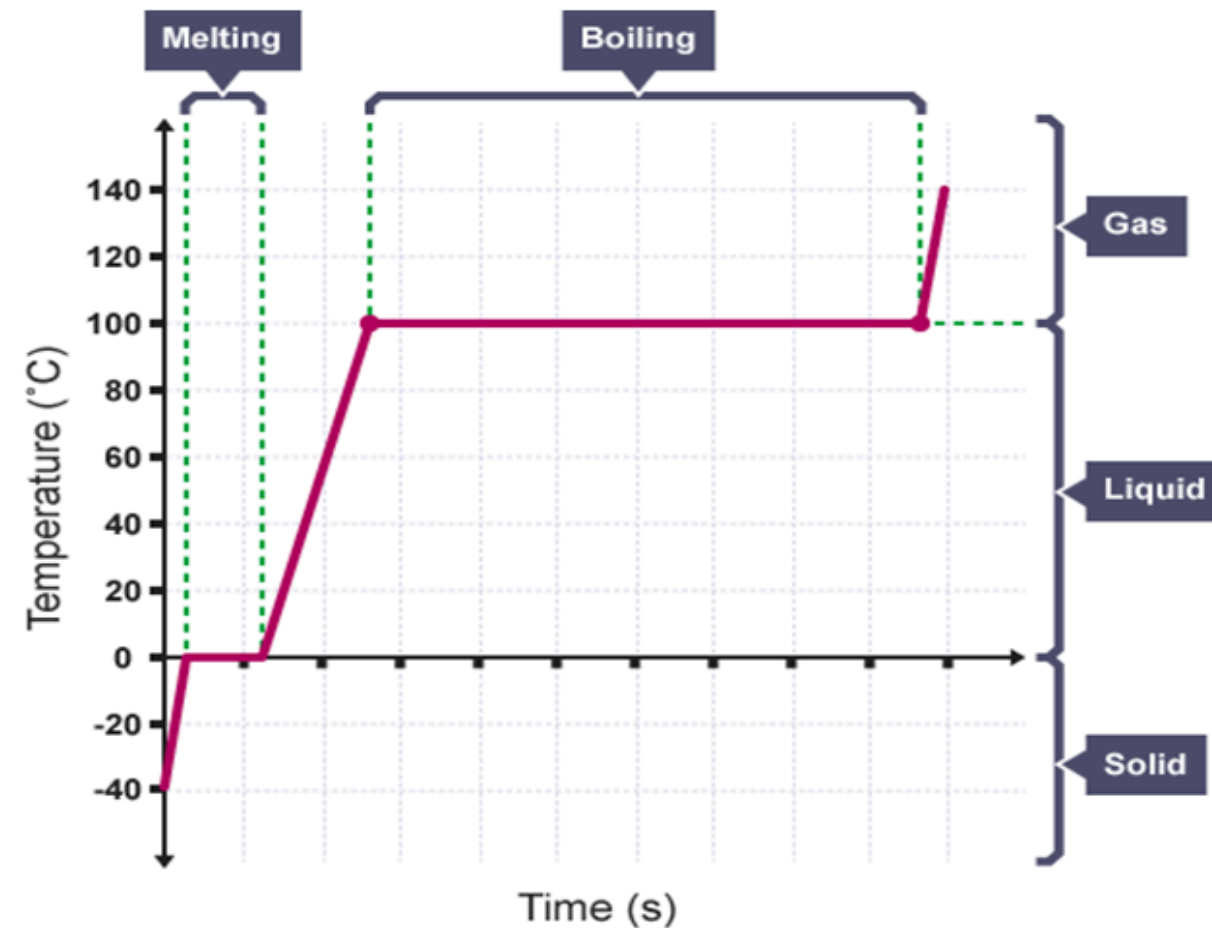
energy for a change of state = mass × specific latent heat

$$E = mL$$

- energy,  $E$ , in joules, J
- mass,  $m$ , in kilograms, kg
- specific latent heat,  $L$ , in joules per kilogram, J/kg
- **specific latent heat**,  $L$ , in joules per kilogram, J/kg

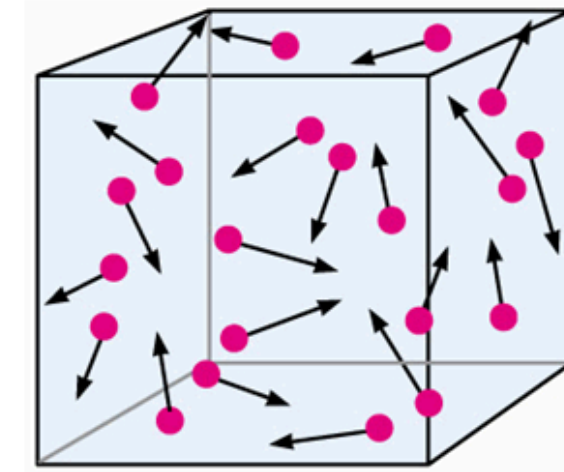
**Specific latent heat of fusion** – change of state from solid to liquid

**Specific latent heat of vaporisation** – change of state from liquid to vapour



### 6.3.3.1 Particle motion in gases

- Molecules of gas in **constant random motion**
- **Temperature** of gas **related to average kinetic energy of the molecules**
- **Changing the temperature** of a gas, held at constant volume, **changes the pressure** exerted by the gas



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## 6.3.3.1 Particle motion in gases

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