



Year 10
Knowledge Organiser

Work hard. Be kind. Belong.



THS

TIVERTON HIGH SCHOOL

Year 10

Art

Work hard. Be kind. Belong.

A01 (15% PP 10% ESA)

Assessment objective 1:

“Develop ideas through investigations, demonstrating critical understanding of sources”

Evidence these marks with:

- Artist research and analysis
- Initial ideas
- Development of ideas in response to sources
- Working in the style of another artist to show understanding of their work.



AO2 (15% PP 10% ESA)

Assessment objective 2: “Refine

work by exploring ideas, selecting and experimenting with appropriate media, materials, techniques and processes”

Evidence these marks with:

- Experimentation with media
- Developing ideas
- Designing
- Refining Ideas
- Learning from mistakes
- Taking creative risks!
- Techniques and processes



AO3 (15% PP 10% ESA)

Assessment objective 3:

“Record ideas, observations and insights relevant to intentions as work progresses”

Evidence these marks with:

- Drawing
- Annotation
- Photography
- Showing your ideas through visual means



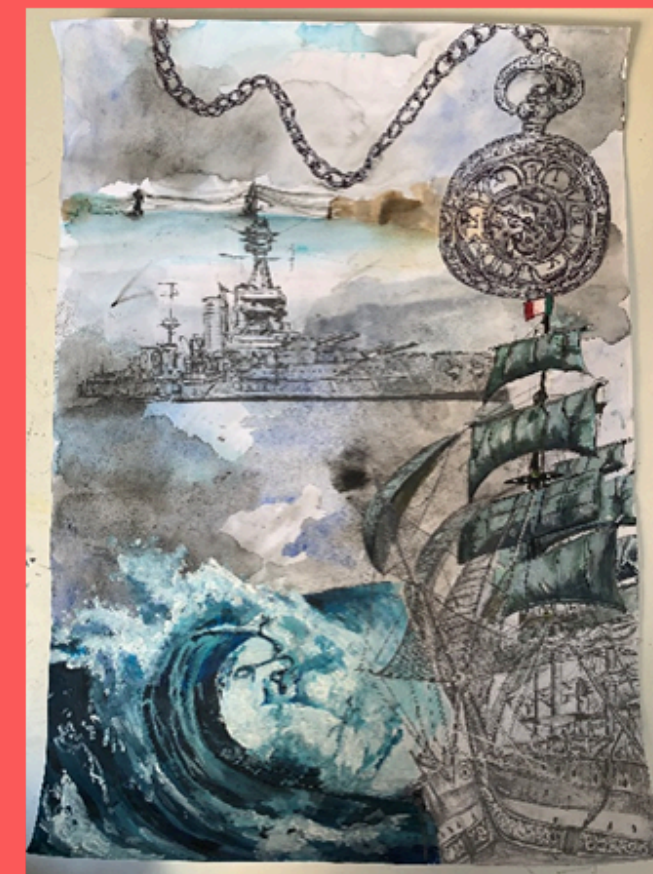
AO4 (15% PP 10% ESA)

Assessment objective 4: “Present

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

Evidence these marks with:

- Final outcome/outcomes
- Evaluation
- Realisation of ideas
- Completion of project
- Best work



Here are three sets of questions you can use to write about an artist. Choose the set of questions most appropriate for you.

3. Artist Analysis – FP 3/4

Content

What is the work of?

- The work is of...

Process

How has the artist made it?

- The artist has used...to...

Form

Describe the artwork.

How did they use the basic elements?

- The artist used... to show...

Connections

What do you think about the work?

- I would like to use.... In my artwork because...

The basic elements

Colour – Bright, Dull, Bold, Strong, Soft

Line – Thick, Thin, Directional, Curved

Pattern – Repeating, Stripes, Dots

Texture – Bumpy, Rough, Smooth, Flat

Form – 3D, Natural, Manmade

Shape – 2D, Outlines, Sharp, Rounded

4. Artist Analysis – FP 5/6/7

Your page should you 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? Describe what you can see.
In this work I can see..

Process – How was the work made?

- What materials do you think the artist has used...and why? *I think that this work was made using...*
- How have they been used? (layering) *The artist has used... to show...*

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

- Describe how the artist has used the basic elements? What effect does this create? *The artist has used... to show...*
- Describe the composition of the work (fore/mid/back ground, Rule of thirds, landscape/portrait). What effect does this create? *The artist has arranged their work by... to show...*

Connections – Links and ideas

- How does their work connect to your project? *The artist's work connects to my project because...*
- What are your next steps? (Development of ideas A02).
My next steps are because...

The basic elements

Line – The path left by a moving point. Curved, overlapping, straight, thin, thick...

Shape – An area enclosed by a line.

Form – A three dimensional shape.

5. Artist analysis FP – 8/9

Your page should you 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?

Tone – The light and dark created by the way light falls on an object.

Texture – Actual texture (how your artwork feels). Visual texture (what it looks like it feels like).

Pattern – Repeating lines, shapes, tones or colours

Colour – Harmonious, complementary, primary, secondary, tertiary.

6

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.

7

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.



8

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.



9

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.



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Ink

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.



10

Watercolour

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.



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Mixed media

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.



11

Acrylic

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.



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Recording

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

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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.

15

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



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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.



18. Sketching a line – Plot out your shape. lightly, use a feathery light line to get the accurate shape. Make the line darker when you are happy this is the best that you can produce



19. Continuous line drawing Draw an object in pen without taking your pen off the paper. This drawing should be an accurate representation of the object but it will have trail lines.

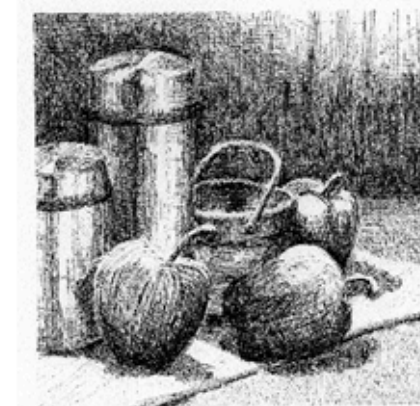
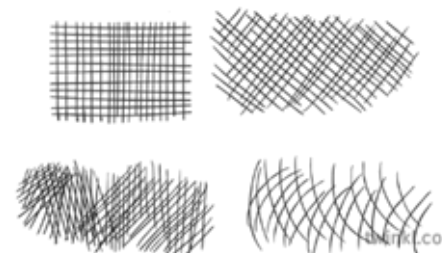


20. Tonal pencil drawing.

Start with the darkest areas first. Have a range of mid tones. Leave the lightest tones as the white paper. Do not make it up, you must look carefully at what you are drawing. You can use directional shading to describe curved forms. Do not use your finger to smudge your drawing.



21. Cross hatching. Build up your ton using overlapping lines.



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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...

23

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.



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AO4 – Final outcomes and bodies of work.

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

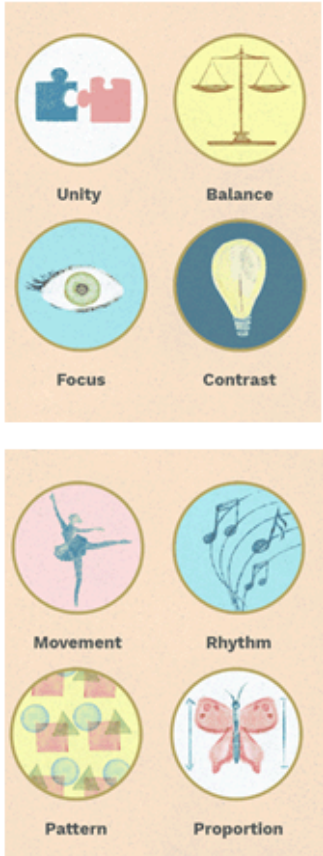
All of your preparatory work leads up to your personal response or final piece. To make a successful final piece, you must:

- 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.

25

Elements of composition in art

- 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.



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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.



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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.



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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.



29

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.

30

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.



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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:

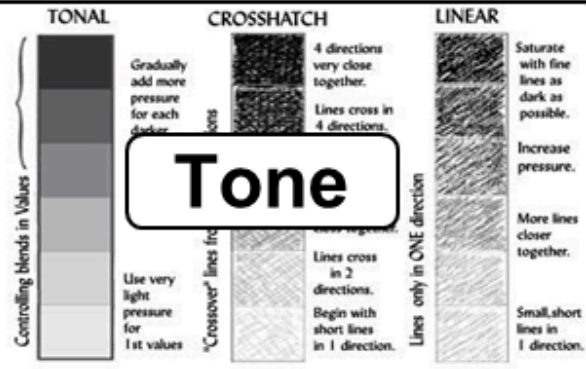
- what you have done and why you did it
- how you did it, such as the **media** and techniques used
- why you chose a particular medium or technique
- how an artwork or design fits in with your project
- what aspects you like
- how you could improve the work
- what you think you will do next



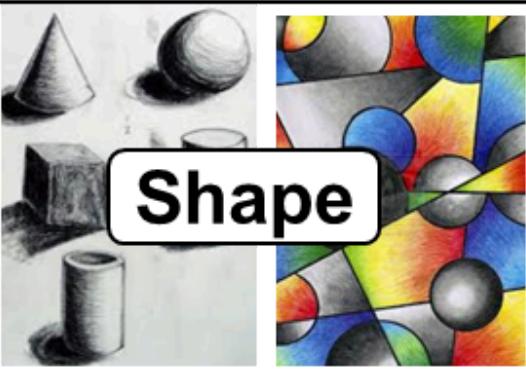
BASIC ELEMENTS



Line



Tone



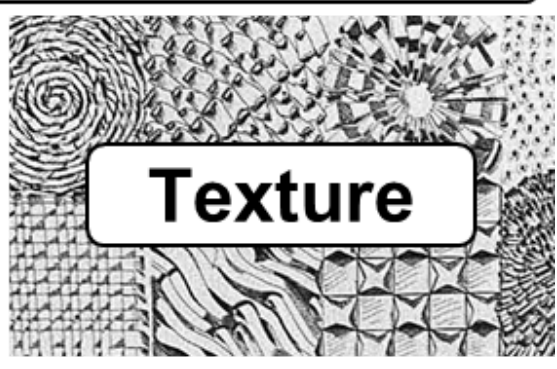
Shape



Colour



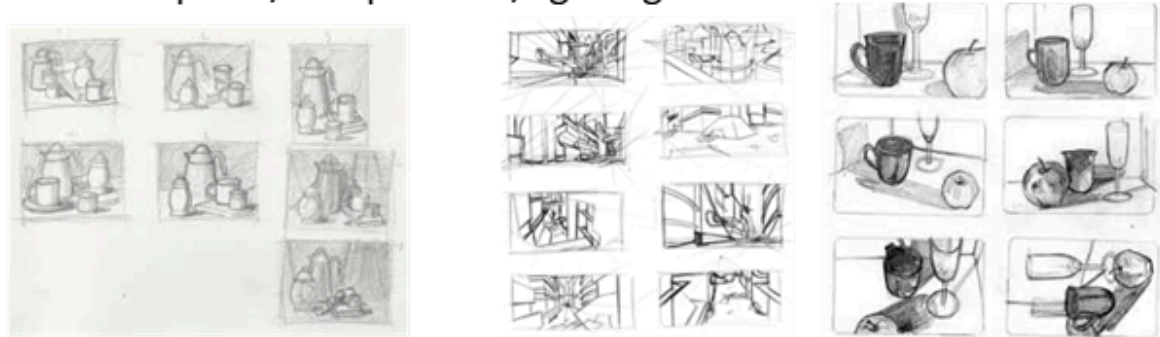
Pattern



Texture

32
Planning a photoshoot using thumbnail drawings

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



33
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’.

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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...

35
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.



36
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?



Year 10

Computing

Work hard. Be kind. Belong.



Tiverton High School Year 10/11 Computer Science Algorithms and Programming Knowledge Organiser

Decomposing problems and developing solutions | Paper 2: 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 | Paper 1 and Paper 2

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 = "orR1bLe"`

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 | Paper 2: 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 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**.

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

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**.

```
if guesses <= 5 :
    print( 'Try again.' )
else :
    print( 'No guesses left.' )
```

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

+	Addition
-	Subtraction
*	Multiplication
/	Division

Relational Operator Symbols when making comparisons

<	less than	>	greater than
<=	less than or equal to	>=	greater than or equal to
==	is the same as	!=	not the same as



Tiverton High School Year 10 J277 GCSE Computer Science Knowledge Organiser / Recap Part 1: The Von Neumann Architecture and CPU

Unit 1-1-1 Architecture of an Electronic Computer

A **computer** is an **electronic device** that follows a **stored program of instructions**.

The **program** of instructions tell it **how** to process data and how to make things happen e.g. activate outputs.

A **computer system** is a **collection** of parts that **work together** to perform a task. It is comprised of **hardware** and **software**.

Modern electronic computers are organised in a particular way. This is called the **Von Neumann Architecture**.

They must contain a **Central Processing Unit (CPU)**, a **main memory** and a **system bus**.

The **CPU** is needed to **execute** the **instructions** from the **program**.

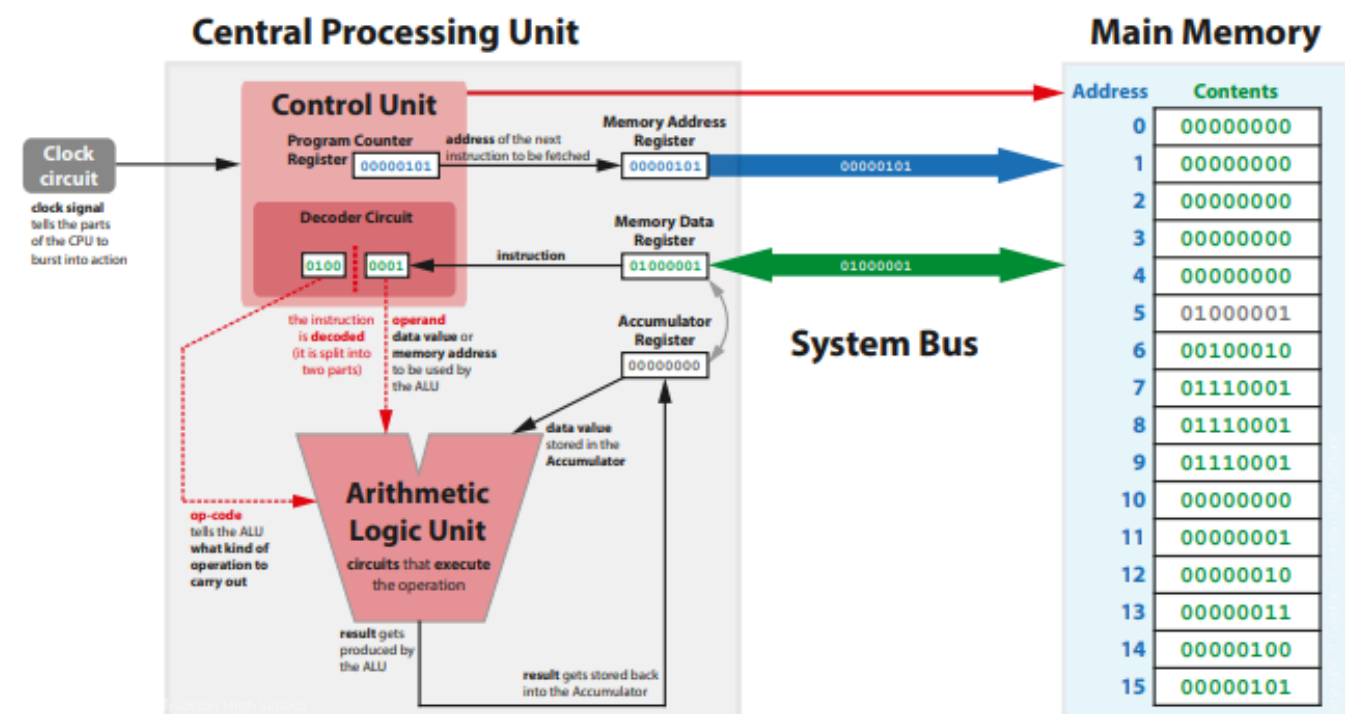
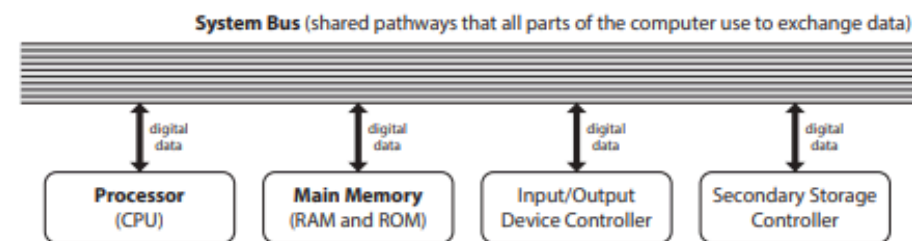
The **Main Memory** (Primary Memory) is used to **store** the **program instructions** and **data values** that the CPU is using.

A **system bus** is a set of **pathways** that program instructions and data can travel along, between different parts of the computer.

Primary Storage (Main Memory) is memory inside the main computer. It is used to hold the program of instructions that the computer will carry out and the data that it will process. Most primary storage is **RAM (Random Access Memory)**. RAM is **volatile** - it can only store things while the computer is **switched on**.

Secondary Storage Devices store data for **long term/when computer is switched off**.

Examples: **Hard-disk drive, solid-state drive, optical drive, USB Flash-drive, magnetic tape drive**.



Unit 1-1-1 Architecture of the Central Processing Unit

The main parts **inside** the CPU are the **Control Unit** and the **Arithmetic Logic Unit**.

Together, these parts carry out the **Fetch-Decode-Execute cycle** to run a computer program.

The **Control Unit** **supervises the fetching and decoding** of each program instruction from main memory.

The **Arithmetic Logic Unit** carries out (**executes**) mathematical (arithmetic) and logical operations (comparisons).

The CPU also contains **Registers**. A register is a **single high-speed memory location inside the CPU**.

The **Program Counter** is a special register inside the Control Unit that **holds the memory address of the next program instruction that needs to be fetched** from main memory into the CPU.

When transferring data values and program instructions between the CPU and main memory, the computer uses the **MAR** and **MDR** registers.

MAR (Memory Address Register) is used to determine **which memory address will be used in a transfer** between the CPU and main memory.

MDR (Memory Data Register) is used as a **buffer** (a holding place) for the actual **value** being transferred into/out of the CPU.

Once the Arithmetic Logic Unit has carried out an operation, any **result** that is produced will usually be stored in a special register called the **Accumulator register**.

Unit 1-1-2 Factors that affect CPU performance

Clock speed - Increasing the clock speed can potentially increase the number of instructions executed per second e.g. increasing clock speed from 2 MHz to 2.5 MHz.

Cache size - Increasing the cache size will reduce the number of memory transfers between the CPU and RAM, so it may speed up processing. With a large cache memory, **less time is spent transferring data between the CPU and RAM**.

Number of cores - Increasing the number of cores may increase the number of instructions executed per second e.g. use a **quad-core** CPU instead of a **single-core** CPU.

Unit 1-1-3 Embedded Systems

An **embedded system** is a **dedicated single-purpose computer** that is **built into some other electronic device**. The embedded computer **controls the operation of that device**.

Embedded systems usually use **cheap, simple electronic components**, so they are **ideal for mass-produced electronic devices and consumer goods**.

Examples of embedded systems include **burglar-alarms, central-heating controllers, microwave ovens, dishwashers, washing machines, digital TV receiver boxes and smart-TVs, robot vacuum cleaners, satellite-navigation systems, car-alarms and engine immobilisers, fuel management systems, traffic lights and pedestrian crossings, lifts/elevators**.

An embedded system usually contains these parts:

A **simple CPU** to execute program instructions. This processor may not be very fast or process many bits in one operation.

A **small amount of RAM** to store values that change while the control program is running (e.g. variables that are needed).

A **non-volatile ROM chip** or some **flash memory** to hold the low-level program that the system will run when you switch it on. Some **input/output ports** that allow it to connect to other components, such as buttons, LED lights, timers etc.

Many of these parts can be built into one single, compact chip, called a **"System On A Chip"**.

An embedded system **usually contains fewer parts/components than a general-purpose desktop computer**.

Because they contain fewer, simpler parts, they **usually cost less to produce** and **consume less power than a full-size computer**.



Tiverton High School Year 10

J277 GCSE Computer Science

Knowledge Organiser / Recap

Part 2: Number Bases and Data Representation

Unit 1-2-3 Number Bases

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

Unit 1-2-4 Converting Binary to Denary

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

= (1 x 64) + (1 x 8) + (1 x 2) = **74** in base ten

Unit 1-2-4 Converting Binary to Hexadecimal

Convert binary value **01011101** to hexadecimal

8	4	2	1
0	1	0	1

8	4	2	1
1	1	0	1

= (1 x 4) + (1 x 1)
= **5** in base ten
= **5** in hexadecimal

= (1 x 8) + (1 x 4) + (1 x 1)
= **13** in base ten
= letter **D** in hexadecimal

So binary value **01011101** is **5D** in hexadecimal

Unit 1-2-4 Converting Hexadecimal to Denary

Hexadecimal is a more **compact** and **convenient** way to represent 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 x 16) + (D x 1)
(2 x 16) + (13 x 1)
32 + 13
45 in base 10.

Unit 1-2-4 How Computers Store Text

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

中文 р у с с к и й 日本語 ☺

All character codes are always stored inside the computer as patterns of **binary digits**.

Unit 1-2-4 How computers Store Images

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.

The **resolution** of an image defines how large the individual pixels are drawn.

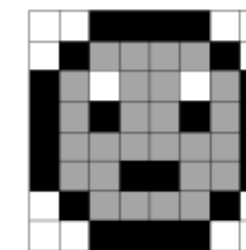
Resolution means the **density** of the pixels in an image: **how many pixels will fit into a certain area**.
The higher the resolution, the more life-like the image/better quality, but the more data will be included in the bitmap file.

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.

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**.



Unit 1-2-4 How Computer Store Audio - Sounds and Music

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, an 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).

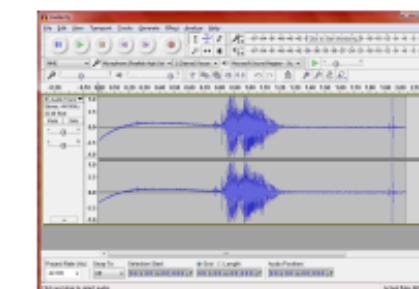
Sample-Rate (how many samples were used each second e.g. 8000 Hz).

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.

Author, genre or **copyright information** about who created the recording.





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Part 3: Memory, Storage and Files

Unit 1-2-1 Primary Storage (Main Memory)

Primary storage means **memory that is inside the main computer**. Primary storage usually includes some RAM and some ROM. Primary storage is used to store program instructions and data **for programs that are running**.

RAM means **Random Access Memory**. The contents of any memory location in RAM can be examined (read) and also **changed** (written). **RAM is volatile**. All data that was stored in RAM will be **lost** when the power is turned off to the computer. When you switch on the computer, RAM is totally empty.

ROM means **Read-Only Memory**. Instructions and data are permanently etched into the circuitry of a ROM Chip. **The contents of ROM cannot be changed or erased**, they can only be examined. They are **read only**. **ROM is non-volatile**. Anything stored in ROM is **persistent**. The contents of ROM will be **kept**, even when the power is switched off.

RAM and ROM are both made up of **memory locations**. Each memory location can hold a sequence of binary digits (either a data value or a program instruction). Each memory location is labelled with a **memory address** (a number) so that you don't mix it up with the other different locations.

Before you can run a program, it must first be **loaded** from secondary storage (e.g. disk) into the computer's main memory (the RAM). The program instructions are usually copied from a file on a hard disk into RAM.

A computer has a limited amount of **physical** RAM to hold programs and data. A hard-disk drive has much more space than physical RAM. Some data can be stored **temporarily** in a special file on a hard-disk drive. This temporary storage space is called **virtual memory**.

Unit 1-2-2 Secondary Storage

Secondary storage devices are used for **long term storage** of data and instructions. We say that secondary storage is "**persistent**" or "**non-volatile**". Programs and data are stored in **files**. Files are stored **even when the computer is switched off**.

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

Unit 1-2-3 Units of Data Storage

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)
1 petabyte	= 1000 terabytes (or 1000 x 1000 x 1000 x 1000 x 1000 bytes)

Unit 1-2-5 Data Storage: Compression and File Types

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 data. Compressed files 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** 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 a 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 a 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 a an uncompressed executable program file .
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Knowledge Organiser / Recap

Part 4: Networks

Unit 1.3.1 Types of Networks

A **stand-alone** computer is a computer that is not connected to any other computer or device. Stand-alone means a device is not networked. All resources and data that a standalone computer uses are **local** (directly connected).

A **network** is a **collection** of two or more computer devices that are **connected** together. Networked devices can share resources, programs and data e.g. **printers, databases of information**, collections of **documents**. A networked device can access resources **remotely** using one or more communication links.

A **Local Area Network (LAN)** covers **one single site** (which may include a small number of buildings that are close together). The distances between devices in a LAN are usually quite small. Devices are often very close together, in the same room or building.

A **Wide Area Network (WAN)** covers a much larger physical area than a LAN. A Wide Area Network can **link devices together over long distances**. Devices may be many miles apart on different physical sites. A WAN can cover a whole city, a county, a country or many countries. **Supermarkets, banks, County Councils, the police and the NHS** all have their own Wide Area Networks.

A **Peer-To-Peer network** is a very small and simple network. It is usually used in a home or by a small business. In a Peer-to-Peer network, no single device is in control of the network. They are all equally important. Peer-to-peer networks are ideal for simple sharing, such as sharing files between devices or sharing a printer. Peer-to-Peer networks often use **Wi-Fi** connections or direct **Bluetooth** connections between devices. They are simple to set up.

Some networks are **Client-Server networks**. This means that some devices on the network provide important services or resources to other devices.

A **server** is a networked device that provides a service or resource when requested by another device. A server may control access to a resource. It may refuse permission to certain devices that ask for access.

A **client** is a networked device that requests to use services or resources from one or more servers on a network.

Unit 1.3.1 Network Hardware

Network Interface Controller (NIC) This is computer **circuitry** that allows the device to **transmit and receive data from other networked devices**. It is installed in a computer device so that the device can be connected to a network. It may be built directly into a motherboard, or can be a separate circuit-board that plugs into an expansion slot..



Hub A **hub** is a device that **passes data to all devices on a network**, even those that the data is not intended for. This leads to a lot of unwanted data traffic on the network.

Switch A **switch** is a device that passes data to the one device on a network that the data is intended to reach. A switch results in less network traffic than using a hub, so it results in faster network performance.



Wi-Fi access point A **Wi-Fi access point** can be used to connect devices to your Local Area Network without cables. You can connect smartphones, tablets, laptops and desktop computers. Wi-fi signals can usually travel through walls and floors, but they are slower than data transmissions that use cables.



Router A **router** is a device that allows you to **join networks to other networks**, allowing data packets to pass between them. A router **examines the address of each data packet to determine where it should be sent next**.

Unit 1.3.1 Factors that affect the performance of a network

Distance between devices. The further away devices are from each other, the longer it may take for data to be transmitted between them. Electrical data signals travelling over a copper cable weaken over long distances.

Number of devices trying to use the network. If many devices attempt to use a network resource (such as a server or a particular file) then the network might experience delays. A server may not be able to cope with the demands placed upon it, causing "time out" errors and retries.

Bandwidth available. If the amount of data being sent by one or more devices uses up all of the available bandwidth, other devices will not be able to transmit their data. Without enough bandwidth, the network may be slow because devices are kept waiting to communicate.

Radio interference, obstacles, physical problems. Radio signals from other devices may interfere with data being transmitted. If more than one Wi-Fi access point is **transmitting using the same range of frequencies ("channel")** then their data transmissions may be **corrupted**, meaning they might need to repeat their transmission many times.



Trees, thick concrete structures or steel can **block** wireless signals, leading to poor network performance. Devices may need to transmit their data repeatedly until it is successfully received, or they may lose a critical connection altogether.

Communication links may become damaged or broken, meaning that data cannot be transmitted using the most efficient route, or perhaps cannot be transmitted at all.

Reliability of hardware and software components. An essential service may **fail** or "**fall over**", meaning that other parts of the network cannot operate normally. This could be due to a program crash, causing delays while the program is fixed or restarted. It could also be due to a failed hardware component, such as a broken hard-disk drive or a network card. In some organisations, the computer network is "**mission critical**", meaning that the organisation cannot operate without it.

Unit 1.3.1 Transmission Media

Connections can be made between devices using different transmission mediums:

Copper cables



e.g. **twisted pair ethernet cables** or thicker shielded **coaxial cables**. Data is transmitted over copper cables using **electricity**. Copper cables allow relatively fast transmission but can be affected by other cables nearby, by **electrical interference** or **lightning strikes**. Copper cables can make it very easy to connect new devices and are very cheap. They can only be used over relatively short distances as the transmitted data signals weaken with distance e.g. up to 100m.

Fibre-optic cables



Strands of glass fibre that carry data as **light**, rather than electricity. Fibre-optic cables are expensive and technical to install, but can be used over very long distances, such as connecting countries together. They are often used as a backbone connection as part of the infrastructure of a network or the internet. Fibre-optic allows **extremely fast data transmission** and many people can share the use of the same cable due to its massive bandwidth. To connect the UK and USA, only approximately 25 cables are needed under the Atlantic Ocean for all of the internet traffic between the two countries.

Wi-Fi links



Data is sent and received using **radio signals** rather than using any cables. Wi-Fi is ideal for situations where it is difficult to install cables, such as in old buildings, and many devices can be configured to use a single **Wireless Access Point** device. Wi-Fi transmission is **slower** than using copper cables or fibre-optic. Wi-Fi data packets also need to be **encrypted** to protect them from **interception** by others.

Micro-wave links



These are slow radio links that allow data to travel over **long distances** e.g. to and from satellites in space. Micro-waves are useful where it would be very difficult to install a cable e.g. for a moving ship at sea. Micro-wave receiver dishes usually need to be lined up precisely to focus and receive data signals. Micro-wave transmitters and receivers are relatively expensive, but they can be used **anywhere on Earth**.

Bluetooth



Bluetooth is a particular kind of **very high-frequency radio link** that allows data to be exchanged between personal devices. It is relatively slow, but can be used for **wireless keyboards and mice, headphones and smartphone-to-computer file transfers**. Bluetooth devices are often **paired** together, exchanging setup information to make communication more secure and to stop unauthorised transfers.

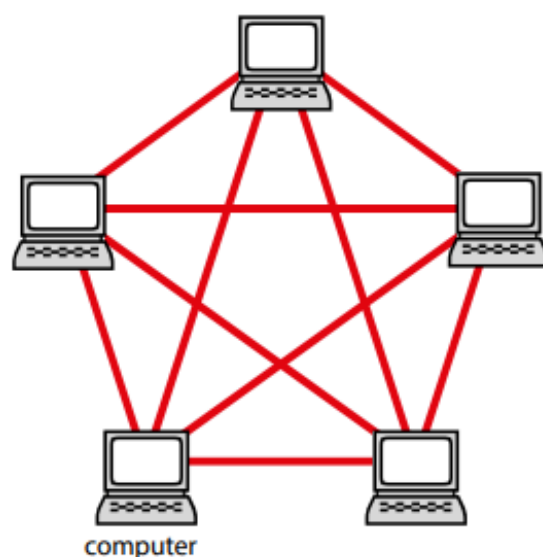


Tiverton High School Year 10 **J277 GCSE Computer Science** Knowledge Organiser / Recap Part 5: Network Topologies

Unit 1.3.1 Mesh Topologies

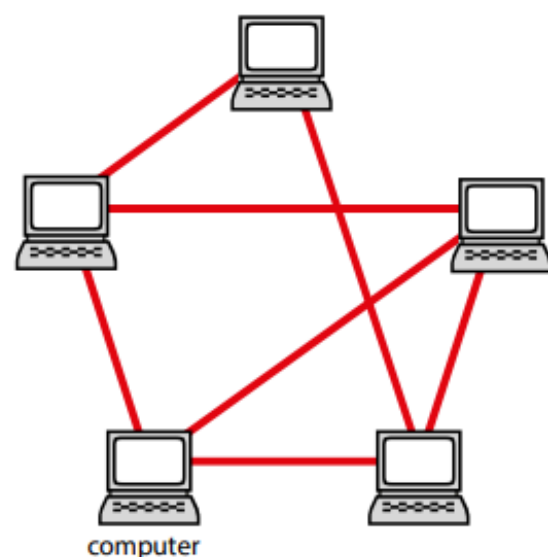
Full-Mesh Topology

Every single computer device in the network has a **direct connection to every other computer device**.



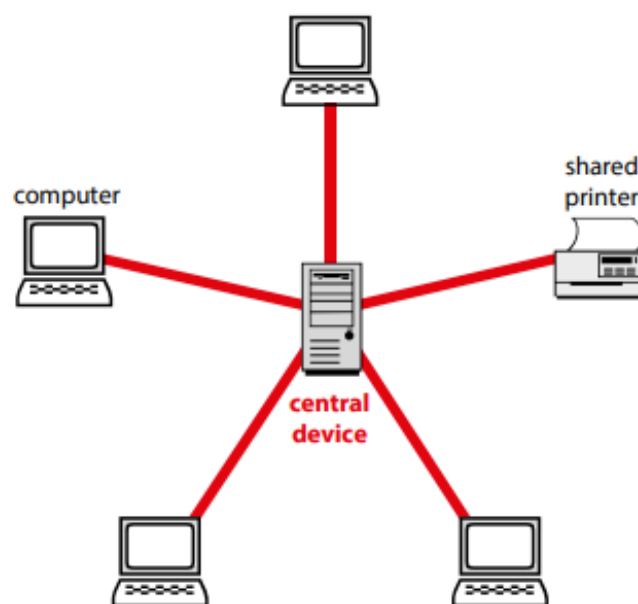
Partial-Mesh Topology

Every single computer device in the network is **connected to every other device**, either through a **direct** connection or an **indirect** connection.



Unit 1.3.1 Star Topology

Uses a **central device** to **control** all **data transmission** across the network between client devices



In a star network **each device has a single connection to a central computer device**.

The central device controls the operation of the network.

All communication between any client devices must pass through the central device.

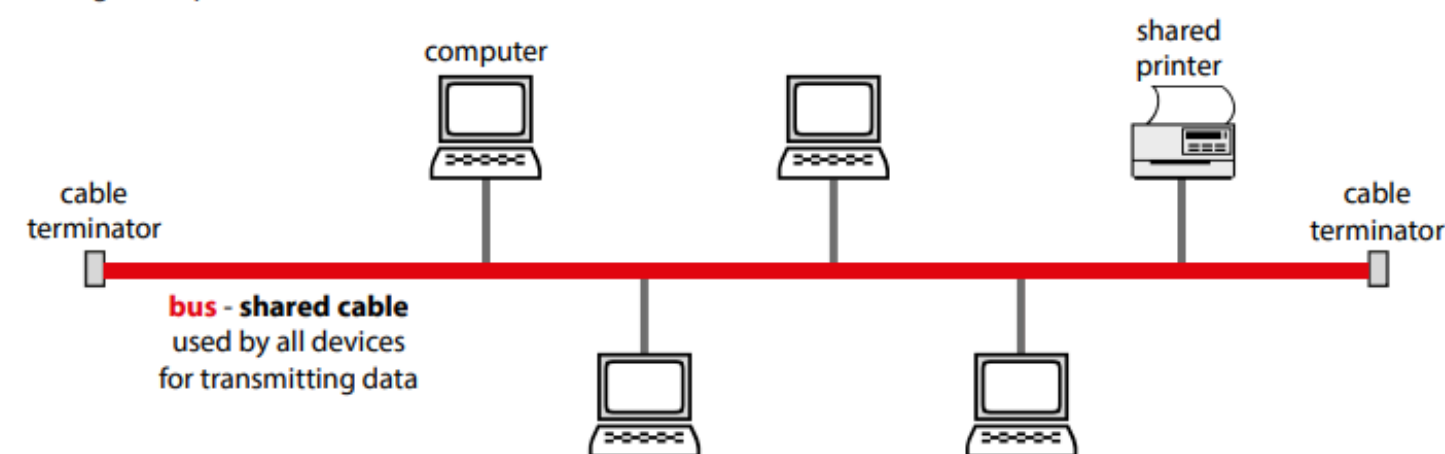
Communication between devices is fast because there are only two steps between any client devices on the network.

If the central device breaks down then the **whole** network will be affected: **none of the devices will be able to communicate with each other**.

Unit 1.3.1 Bus Topology

Uses the **Ethernet protocol** to control **data transmission** and **collision detection**.

No single computer or device is in control of the network.



All devices are connected together through a **shared communication cable**, called a **bus**.
All data that passes between devices **must** travel along the bus.
The data is delivered to **all** devices connected to the bus... they **all** get it!
It is only processed by the device that it was intended for... other devices **ignore** data that was not meant for them.

Only one device can send data across the shared bus cable at a time.

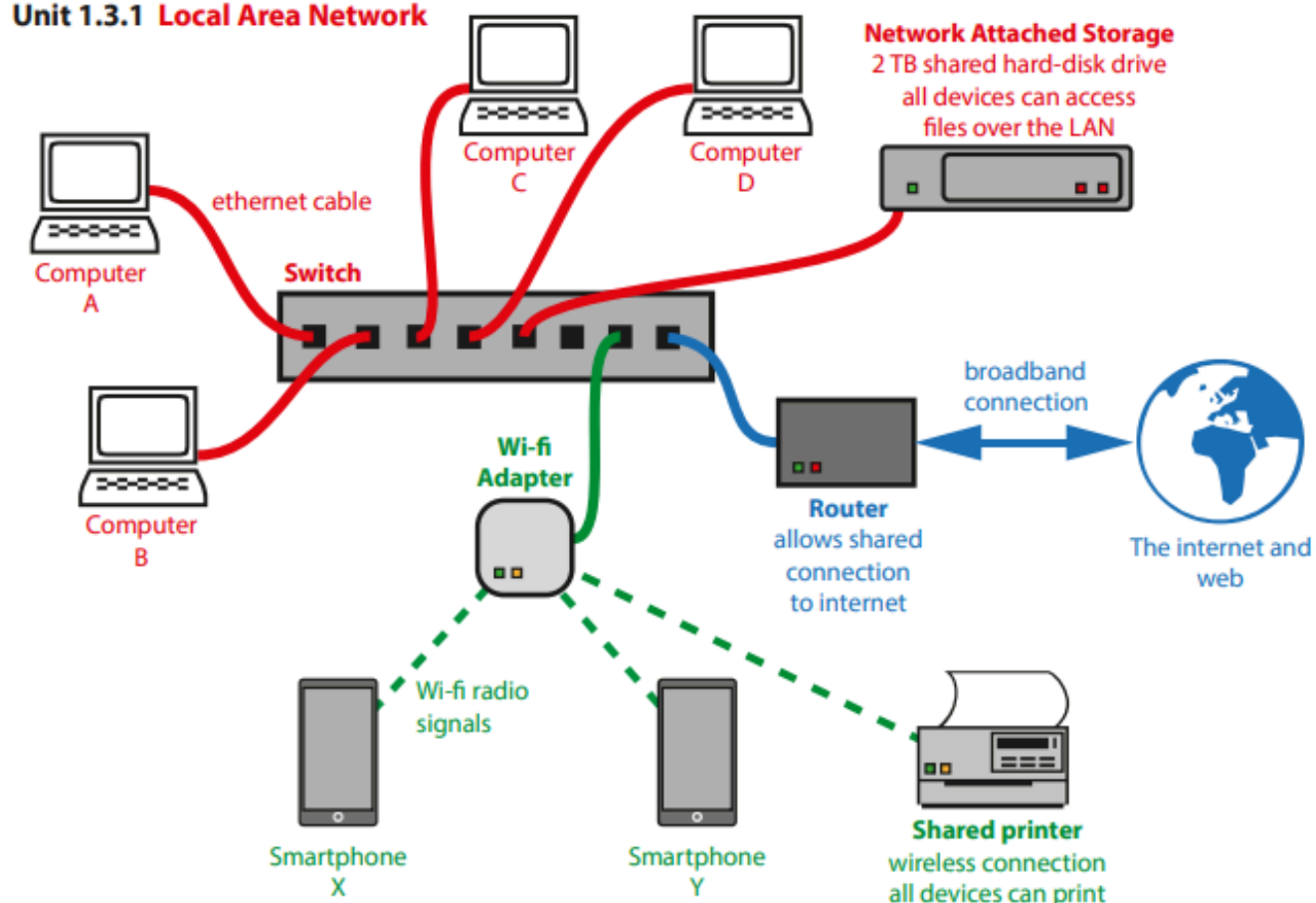
If two devices transmit data **at the same time** then the data will get mixed up - it will become **corrupted**.

When two devices send their data at the same time this is known as a **collision**.

To **detect** and **recover** from collisions, the **Ethernet protocol CSMA/CD** is used.

Bus networks are simple to build. They are also **reliable**: a problem with a single device is unlikely to affect the overall network. However, a problem with the bus may affect the **whole** network: if the bus cable breaks, none of the devices can communicate at all.

Unit 1.3.1 Local Area Network





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Part 6: Protocols, Addressing and the Internet

Unit 1.3.2 Data Packets and IP Addressing

Data is transmitted in short bursts called **data packets**. When transmitting large files, they are split into **sequences** of packets. Each packet travels across one or more **communication links** in a network

Data packets must be sent and received in a very **precise** way to ensure successful communication between devices. A **network protocol** is a **set of rules or conventions which control the communication between devices on a network**. **Protocols** provide **strict definitions** about the **structure** of data packets and **how** they should be sent. They also determine what to do when data packets have been **lost** or **corrupted** during transmission.

When receiving data, protocol software **puts the data packets back together in the correct order** to reconstruct the original data that was sent. The protocol **automatically detects errors** and **lost-packets**, requesting them to be re-sent.

Structure of a data packet

IP address of the sender	IP address of destination device	Sequence number	Total packets	Payload actual data that you want to send	Checksum to detect errors
124.63.0.5	182.45.0.60	3	10	Your password has been accepted.	38

Every device on a network has a unique **Internet Protocol address (IP address)**, which is **32 bits long**.

IP v4 addresses must consist of **4 numbers**, separated by a **dot**. Each part uses **8-bits**, allowing values between **0** and **255**.
Example IP v4 addresses: 168.0.192.1 255.70.12.65

IPv6 addresses use 128 bits, which means many more IP addresses are possible than when using 32 bit IPv4 addresses. An **IP v6 address** is represented using **eight groups of four hexadecimal digits**, each group representing **16 bits**. The groups are separated by **colon** symbols :
Example IP v6 address: 1805:0ca8:85f3:0000:0000:8b5a:0420:3741

IP addresses can be changed, but **every device on a network must have a different IP address**. If two devices have the **same** IP address it will be unclear which of them is meant to receive each particular data packet.

Unit 1.3.2 MAC Addressing

MAC address means **Media Access Control address**.

A MAC address **uniquely identifies a device on a network** by identifying the **network adapter** hardware that the device is using. It is a **unique code** which is built into the **Network Interface Controller (NIC)** hardware.

The MAC address is used to make sure that **devices never get mixed up** during network communications.

Each MAC address is made up of **48 binary digits**.
000101001101001011001110100101101101101001011001

...but they are usually written in **hexadecimal** (easier for humans to read and write down).
14-D2-CE-96-DA-59

MAC addresses cannot ever be changed because they are built into the hardware of each device when it is manufactured.

Because each MAC address is **unique**, no two hardware devices in the world have the **same** MAC address. Criminals can be traced using MAC addresses - the MAC address proves which device was used when breaking the law.

Units 1.3.1 and 1.3.2 The internet

"Internet" means "Inter-Networking" – communication **BETWEEN** networks.

The Internet is a way of **connecting networks together**. It joins Local Area Networks and Wide Area Networks from many different countries. To connect a network to the internet, most people connect through an **Internet Service Provider (ISP)**. An ISP provides a **gateway router** for your network to connect to.

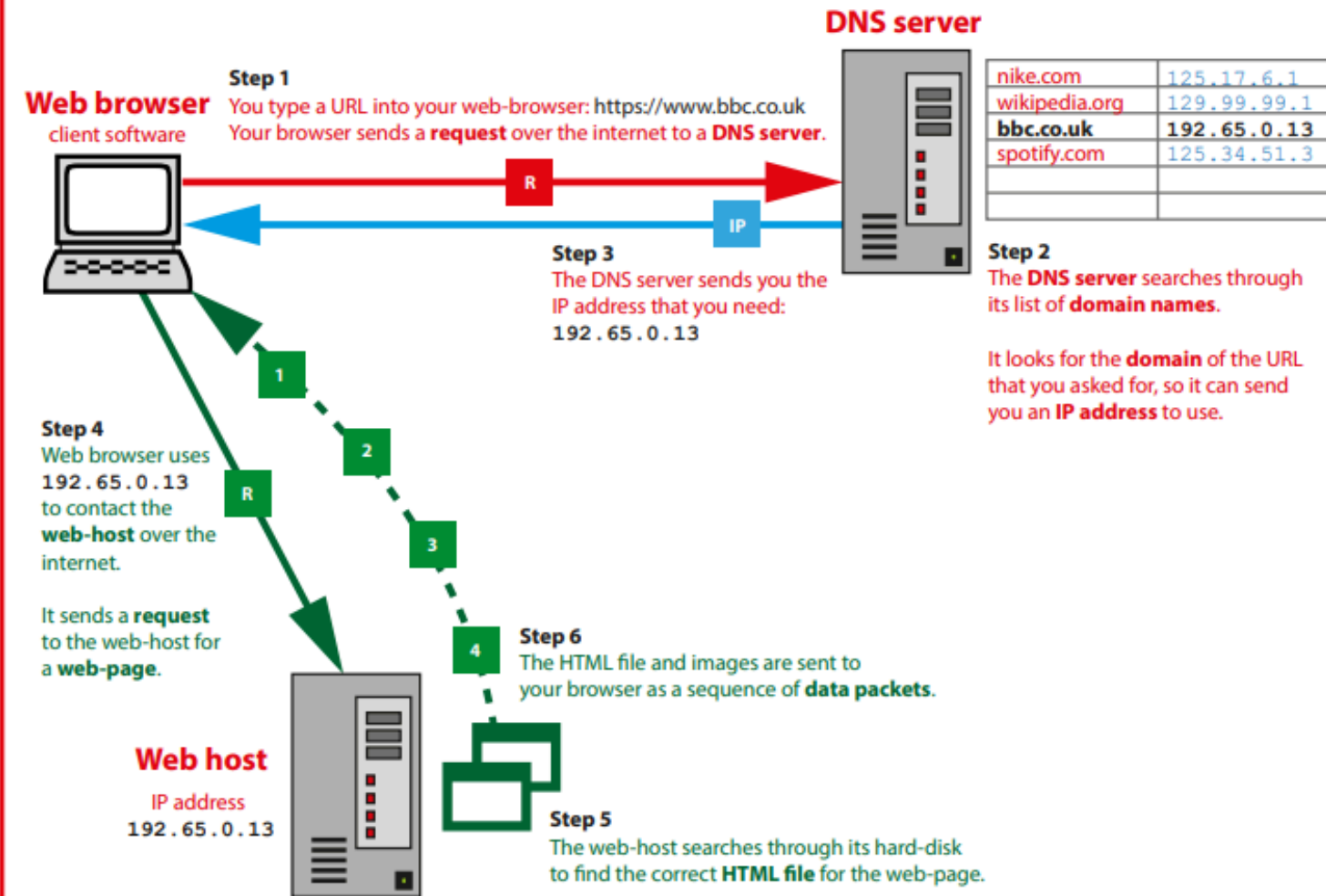
Packets can travel across the Internet using **different routes** to get to their destination. **Backbone internet routers** receive data packets. Each router examines the destination IP address that shows where the packet is trying to get to. The router then decides which communications link to use and sends the packet on the next part of its journey, towards its intended destination.

This **packet switching** process needs to happen really quickly so that packets are not kept waiting. If a queue of packets waiting to be routed fills up and runs out of space, the router may no longer cope with the traffic, leading to slow network performance.

The internet uses **redundant links** to allow data packets to take different routes to their destination as **efficiently** as possible. Because of the redundant links, it is very difficult to block or censor parts of the internet - there are many routes through it between devices.

When communicating across the Internet, a **collection** of inter-related protocols needs to be used, called the **protocol stack**. The protocol stack defines all of the different processes and protocols that will be used to send and receive data.

Unit 1.3.1 Domain Name System (DNS)



The numbers in an IP address can be difficult for people to remember e.g. 255.70.12.65

We can use **text aliases** instead which are equivalent to the numbers e.g. [bbc.co.uk](https://www.bbc.co.uk)

Special computer servers on the Internet called Domain Name System (DNS) servers translate text domain names to IP addresses.



Year 10
Construction

Work hard. Be kind. Belong.

Constructing the Built Environment

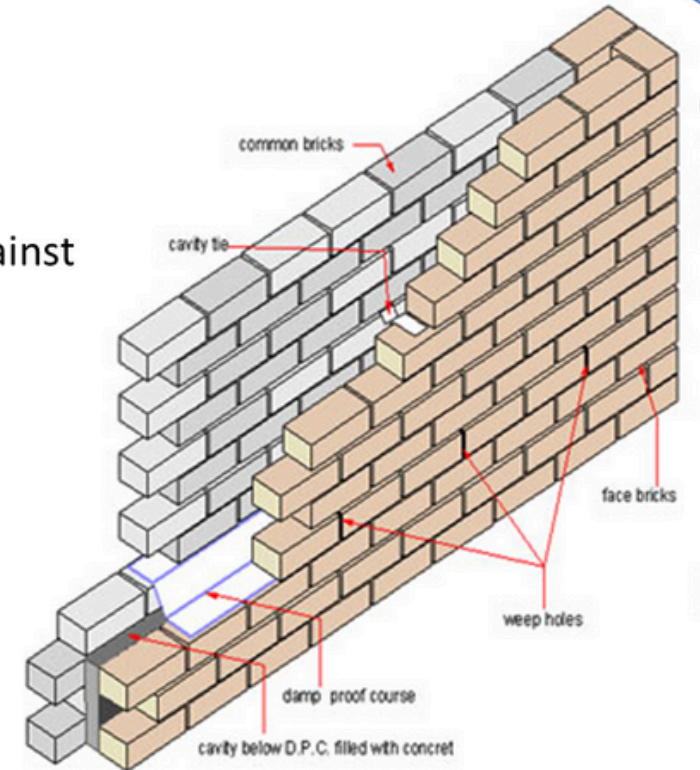
Cavity walls:

- Vertical components which support the roof
- To enclosure and protect against weather

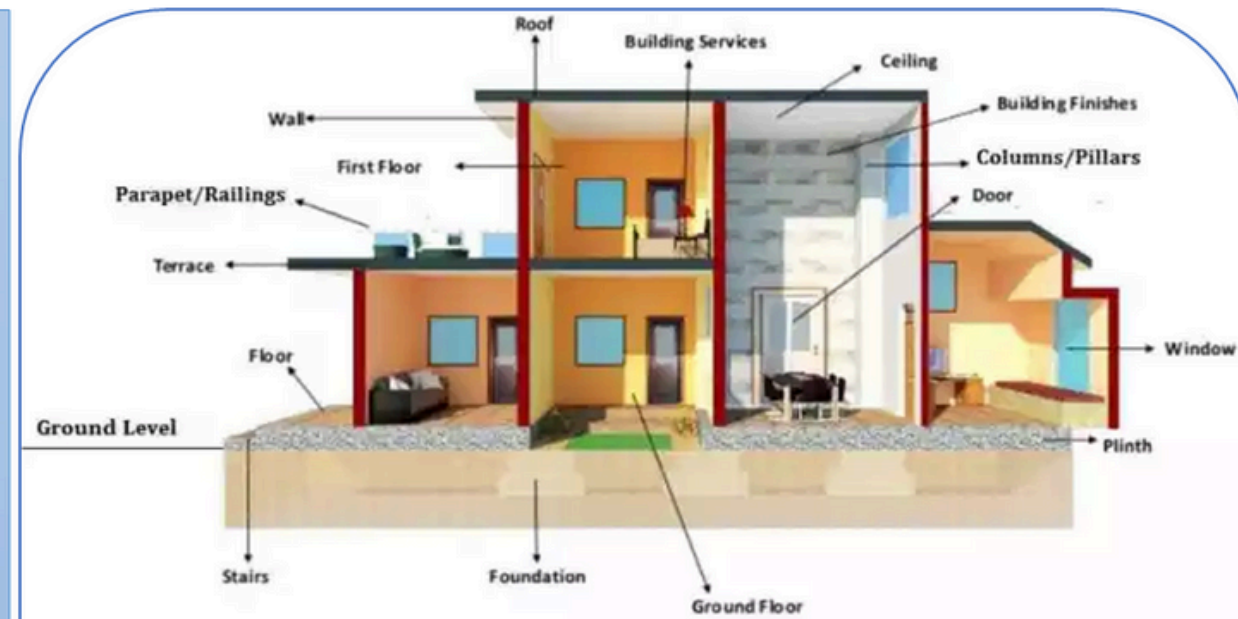
Materials:

stones,
bricks,
concrete block

[What is Cavity Wall Insulation? - YouTube](#)

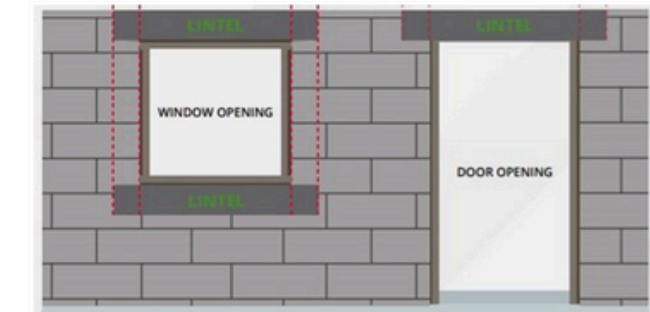


AC 1.1.1 Buildings and Structures



Building Component Parts: The floors, walls, doors/windows. These support, enclose and protect the building structure. [Essential Components of a Building](#)

- Lintels are constructed above wall openings.
- They support the weight of the wall over the opening.
- Made from reinforced concrete or a steel lintel bar

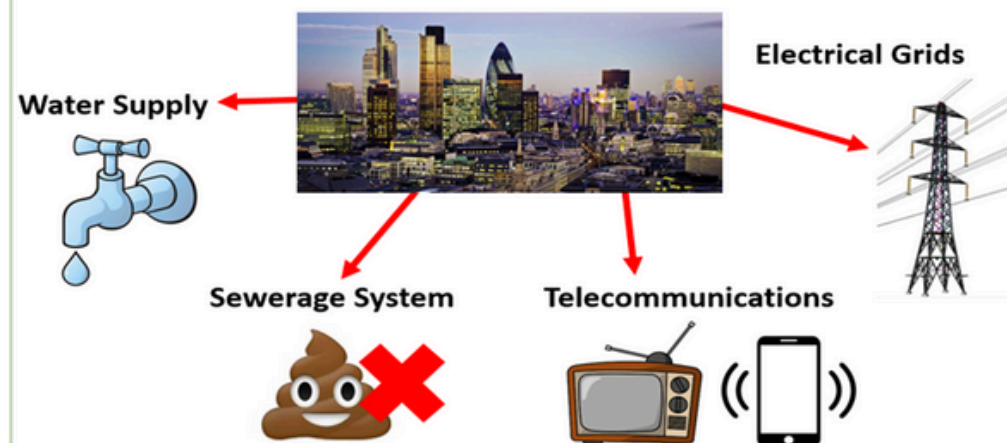


Openings: Are built into the walls for ventilation and access to the building (DOORS & WINDOWS)

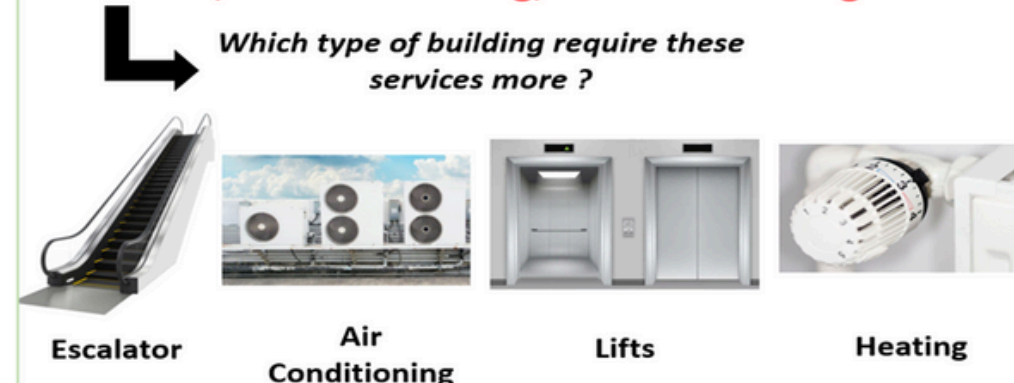
AC 1.1.2 Infrastructure and Civil Engineering products

Civil Engineering: Design and construction of built environment systems such as roads, bridges, railways, tunnels
[Civil Engineering](#)

A successful built environment needs basic facilities



Mechanical Services: Machines in buildings such as escalators, air conditioning, lifts and heating



Architect

Responsible for creating designs for new building and projects.

An Architect does:

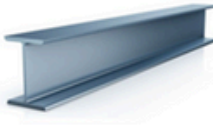
- Talks to clients to understand their needs
- Budget, safety and community requirements for a project
- Meeting building regulations, planning laws and environmental considerations
- Drawing detailed plans and blueprints using computer design programmes

AC 1.1.3 Building services engineering

Constructing the Built Environment

AC 1.2.2 Manufacturing

Steel: Is a type of hard, strong metal that is used in many different areas of construction

Structural Steel	Stainless Steel	Light-weight Mild Steel	Profiled Sheetting
Column and beam sections	Fixings and fastenings	Lintels, purlins and rails	Wall and roof cladding
			

Plastic- A man-made material that can be moulded into a shape while soft and set into a rigid form or slightly soft form

PVC is the most common type of plastic used in construction

Water and drainage pipes



Power sockets and trunking



Keywords: Hygienic, fire resistant, shaped easily

Cement: BINDING INGREDIENT IN CONCRETE AND MORTAR

A grey powder made of limestone and chemicals- it sets and hardens when combined with water



Mortar: Mixture of sand, cement and water to stick bricks together



CIOB



Chartered Institute of Building



RICS



Royal Institution of Chartered Surveyors

RIBA



Royal Institute of British Architects

AC 1.1.4 Professional and managerial roles and responsibilities associated with the built environment sector

AC 1.2.1 Raw material extraction

The Construction Industry extracts fossil fuels and uses them to power machinery and to produce materials

Source	How it is converted into energy	Advantages	Disadvantages
Coal	- Heat energy and hot gases convert water into steam which powers a turbine to create high-voltage electricity - Smaller amounts used as a domestic heat source	- Stable, large-scale and high-power electricity generation - Relatively cheap to extract and convert - Reliable	- Coal power plants emit pollution such as carbon dioxide, sulfur, mercury, selenium and arsenic - Technologies to reduce coal power plant emissions are expensive - Coal mining impacts significantly on the landscape
Oil	- Processed and split into petroleum products such as petrol, paraffin and diesel - In power plants oil is burnt to heat water and produce steam, which propels turbine blades to produce electricity	- Stable, large-scale and high-power electricity generation - Relatively cheap to extract and convert	- Oil power plants are highly polluting - Oil exploration impacts on the landscape - Oil extraction risks environmental disasters
Gas	- Burning gas can power turbines, with the waste heat powering a steam turbine - Natural gas is used in homes for heating or cooking - It has lower emissions than other fossil fuels – its combustion emits carbon dioxide at half the rate of coal	- Stable, large-scale and high-power electricity generation - Relatively cheap to convert and extract as ready-made fuel - Cleaner than coal or oil	Burning gases are highly polluting



THS

TIVERTON HIGH SCHOOL

Year 10
DT

Work hard. Be kind. Belong.

GCSE Design and Technology Knowledge Organiser

WJEC Eduqas

Design and Technology and Our World

Understand how design and technology impacts daily life, including sustainability, ethical issues, and cultural influences.

Smart Materials

Learn about materials that change properties in response to external stimuli such as temperature, light, or pressure.

Electronic Systems & Programmable Components

Explore inputs, processes, and outputs in systems. Understand microcontrollers and basic programming.

Mechanical Components & Devices

Study levers, linkages, cams, gears, and pulleys. Understand how motion is transferred and transformed.

Materials

Gain knowledge of papers, boards, timbers, metals, polymers, and textiles. Learn their properties and uses.

Understanding User Needs

Identify target users and consider their needs, wants, and values when designing.

Writing a Design Brief & Specification

Create clear and concise design briefs and specifications based on research and analysis.

Developing Ideas & Prototypes

Use sketches, models, and CAD to develop and refine design ideas. Test and evaluate prototypes.

Using Tools & Equipment

Safely use hand tools, machinery, and digital tools to make high-quality products.

Component 1: Written Exam (50%)

Design and Technology in the 21st Century. 2-hour exam covering technical principles and design evaluation.

Component 2: NEA (50%)

Design and Make Task. 35-hour project including research, design, making, and evaluation.

Assessment Objectives

AO1: Knowledge (15%)

AO2: Application (30%)

AO3: Design & Make (35%)

AO4: Evaluate (20%)

Useful Tools

- BBC Bitesize
- WJEC Past Papers
- Save My Exams
- Quizlet
- Adapt App

Revision Tips

- Use flashcards for key terms
- Practice past papers
- Create mind maps for each topic
- Revise little and often
- Use diagrams to visualise concepts



THS

TIVERTON HIGH SCHOOL

Year 9

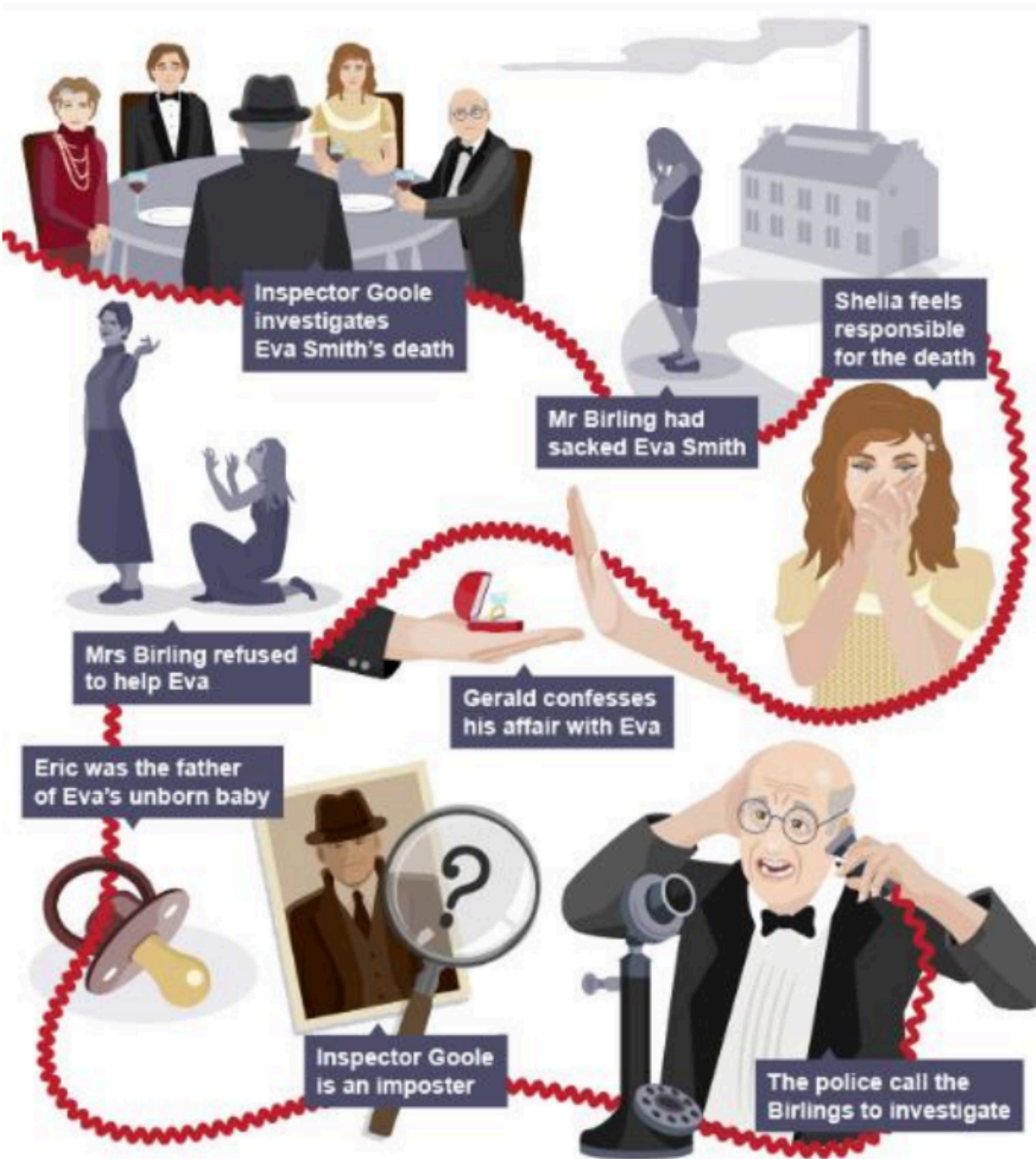
English

Work hard. Be kind. Belong.



English Literature – A Christmas Carol (45 minutes: 1 exploding extract)			
	Social Injustice	Redemption	Christmas
1 Stave	“Are there no prisons?...and the Union workhouses?” Scrooge to the charity collector. “it’s not fair. If I was to stop half a crown for it, you’d think yourself ill used” Scrooge about paying Bob for Christmas.	“I wear the chain I forged in life” Marley’s ghost. “Hard and sharp as flint... solitary as an oyster” description of Scrooge.	“A merry Christmas, uncle!” Fred, spreading Christmas cheer. “every idiot who goes about with ‘Merry Christmas’ on his lips, should be boiled with his own pudding” Scrooge to Fred.
2	“You... weigh everything by Gain” Belle when she “releases” Scrooge from their engagement. “This is the even-handed dealing of the world” Scrooge’s reasoning to Belle for pursuing wealth.	“A solitary child, neglected by his friends, is left there still” Ghost of CP’s description of Scrooge as a child. “I should like to say a word or two to my clerk just now” Scrooge.	“Yo ho my boys... no more work to-night!” Fezziwig to his employees. “In they all came... anyhow and anyhow.” guests to Fezziwig’s party – all welcome.
3	“This boy is Ignorance. This girl is Want. Beware of them both” Ghost of CP about the ugly, dirty children under his robes. “His wealth is of no use to him. He don’t do any good with it.” Fred’s description of Scrooge.	“such an odious, stingy, hard, unfeeling man as Mr. Scrooge” Mrs Cratchit’s description of Scrooge as he watches. “Oh no kind spirit! Say he will be spared” Scrooge pleads for Tiny Tim.	“Such a bustle ensued that you might have thought a goose the rarest of all birds.” The Cratchits are excited and grateful for their little feast. “he begged like a boy to stay” Scrooge watching Fred’s Christmas merriment.
4	“my little, little child!” cried Bob.” Bob Cratchit about Tiny Tim. “He frightened every one away from him when he was alive, to profit us when he was dead! Ha, ha, ha!” a thief as they examine their haul..	“This is a fearful place. In leaving it, I shall not leave its lesson, trust me” Scrooge is ready to learn. “Assure me that I yet may change these shadows you have shown me, by an altered life!” Scrooge wants to change things.	“the room above, which was lighted cheerfully and hung with Christmas” the Cratchits’ house, even after Tiny Tim’s death. “I will honour Christmas in my heart and try to keep it all the year.” Scrooge to the Ghost of CYTC.
5	“A merrier Christmas, Bob.. Than I have given you for many a year!” on raising BC’s salary. “A great many back payments are included in it, I assure you” Scrooge to the charity collector.	“to Tiny Tim, who did not die, he was a second father” Scrooge showing love and compassion. “Uncle Scrooge had... become so gay and light of heart” Scrooge’s character transformation.	“It’s I. Your uncle Scrooge. I have come to dinner.” Finally attending Christmas dinner – to their amazement. “I’ll send it to Bob Cratchit’s!” Scrooge sending the Turkey.

<u>Scrooge</u> Adjectives: miserly, cold-hearted, repentant, redeemed. Writer’s Intention: Dickens uses Scrooge to show what was wrong with wealthy Victorians. On his tour with the ghosts, he learns to take social responsibility and redeems himself. Dickens wanted his readers to do the same.	<u>Bob Cratchit</u> is Scrooge’s clerk. Adjectives: hard-working, kind and appreciative. Writer’s Intention: The Cratchits show that the poor were not lazy and immoral. They are victims of a society that needs change. The family demonstrate that love and kindness are free, but those in poverty need support to survive.	<u>Fred</u> is Scrooge’s nephew. Adjectives: warm, cheerful, patient and family-orientated. Writer’s Intention: Dickens uses Fred to model Christmas spirit when inviting Scrooge to dinner. Contrast with Scrooge, shows Scrooge’s cold heartedness and need for redemption.	<u>Marley’s Ghost</u> was Scrooge’s late business partner, Adjectives: remorseful, troubled and grave. Writer’s Intention: Dickens uses Marley’s Ghost to warn wealthy Victorians of the consequences of living a selfish and greedy existence: regret and eternal misery.	<u>Fezziwig</u> was Scrooge’s first employer, who throws a party on Christmas Eve for employees and locals. Adjectives: jolly, altruistic, inclusive. Writer’s Intentions: Dickens uses Fezziwig, to show what wealthy Victorians could and should be like, in contrast with Scrooge.	<u>Belle</u> was Scrooge’s fiancée who broke off their engagement due to his obsession with money. Adjectives: beautiful, gentle, unmaterialistic. Writer’s Intention: Dickens uses Belle to remind readers that greed and selfishness can cost us love and happiness, which money can’t buy.
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English Literature – An Inspector Calls (45 mins: 1 exploding extract)

Key Quotations

Mr Birling	Mrs Birling	Sheila	Eric	Gerald	Inspector
"community and all that nonsense" Mr B to Eric and Gerald.[1] "the Germans don't want war" to Gerald and Eric [1] "She had a lot to say – far too much – she had to go" Mr B to the Inspector. [1] "Now Sheila... you must understand that a lot of young men..." to Sheila, defending Gerald. [2] "There'll be a public scandal." to Eric, furious. [3] "[excitedly] By jingo! A fake!" to Gerald [3] "the famous younger generation who know it all" about Eric and Sheila [3]	"Men with important work to do sometimes have to spend nearly all their time and energy on their business." to Sheila [1] "I did nothing I'm ashamed of" to Inspector [2] "I used my influence to have it refused" To Inspector about Eva's request for help. [2] "As if a girl of that sort would ever refuse money!" to Inspector [2] "You're behaving like a hysterical child" to Sheila [2]	"Look – mummy – isn't it a beauty?" to Mrs B [1] "Except for last summer when you never came near me" Sheila to Gerald [1] "But these girls aren't cheap labour – they're people!" Sheila to Mr B [1] "I know I'm to blame – and I'm desperately sorry" to Inspector [2] "we all started like that – so confident, so pleased with ourselves" to Mrs B [2] "You don't seem to have learnt anything" to Mr B [3]	"Why shouldn't they try for higher wages?" to Mr B. [1] "I was in that state when a chap easily turns nasty" to the Inspector about his first night with Eva. [3] "You're not the kind of father a chap could go to when he's in trouble" to Mr B [3] "(nearly at breaking point)]Then- you killed her." to Mrs B when he finds out she refused Eva help. [3] "We all helped to kill her- and that's what matters." [3]	"(very much the well-bred young man-about-town)" Description [1] "I didn't feel about her as she felt about me" to Sheila, about Daisy. [2] "I'm rather more – upset – by this business than I probably appear to be" to the Inspector [2] "Everything's all right now, Sheila [holds up the ring]" [3]	"[a sharp ring of the front door bell]" interrupting Mr B's speech [1] "she died in misery and agony- hating life" to Gerald and Sheila [2] "(massively) Public men, Mr Birling, have responsibilities as well as privileges." to Mr B[2] "used her... as if she was an animal, a thing, not a person" to Eric [3] "We are members of one body." to the Birlings [3] "fire and blood and anguish" to the Birlings. [3]

Written in 1945 (Post the wars)– Set in 1912 (Pre the wars)

THEMES: SOCIAL RESPONSIBILITY – YOUTH V AGE – SOCIAL STATUS – GENDER INEQUALITY

Mr Birling

Adjectives: pompous, stubborn, social-climber
Writer's Intention: Used to highlight the danger of selfish capitalists who exploit workers for profits. His flawed views on WW1 and the Titanic warn against having the same irresponsible arrogance post WW2.

Mrs Birling

Adjectives: Cold, prejudiced, supercilious, callous.
Writer's intention: Mrs B ignores any signs of trouble in the family for the sake of appearances. Her charity work sounds impressive, but allows her to enjoy power. She feels above social responsibility.

Sheila

Adjectives: Spoilt, insecure, candid, ashamed.
Writer's intention: Sheila accepts the Inspector's message and responsibility for her actions with remorse, creating hope for the younger generation. Her socialist views contrast with her parents'.

Eric

Adjectives: Irresponsible, devastated, repentant, frustrated.
Writer's Intention: Priestley shows the danger of privileged, irresponsible young men. Like Sheila, he is genuinely appalled the consequences of his actions, as well as his parents' attitudes, which partially redeems him.

Gerald

Adjectives: "attractive", "well-bred",
Writer's intention: While Gerald's actions showed care for Eva, he did take advantage of her and left her broken-hearted without hope of life improving. His social status and charm seem to mitigate his behaviour.

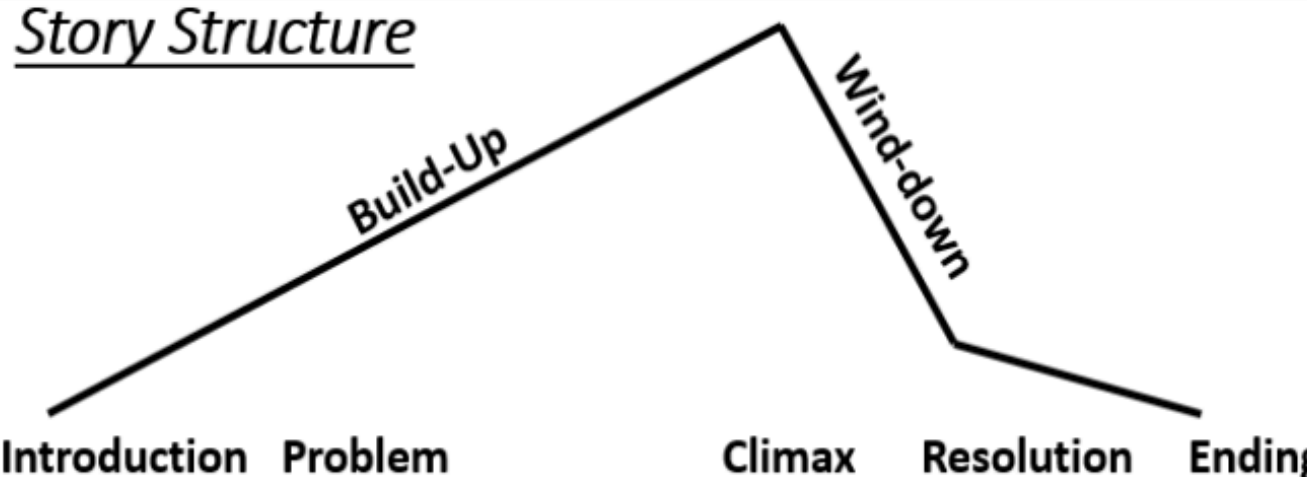
Eva Smith (Daisy Renton)

Adjectives: principled, destitute, helpless.
Writer's Intention: Eva highlights the plight of the working class, especially women and how they are often victims of circumstance and prejudice from their social superiors.

The Inspector

Adjectives: Brusque, assured, enigmatic, righteous.
Writer's Intention: Priestley's mouthpiece for his socialist message, warning his audience not to repeat the mistakes of past generations and to look after each other.

English Language GCSE: Reading Papers (Reading an extract and answering questions)		Component 1 Reading: <i>read an extract from a story. Answer 5 questions, including quotations and showing you can analyse language</i>		Component 2 Reading: <i>read two non-fiction texts, linked by theme, and answer 6 questions.</i>	
Component 1 (1hr 45mins)		Component 2 (2 hours)		Useful vocabulary when answering the fiction and non-fiction reading papers	
A: Unseen 20 th Century Literature Reading (40 marks worth 20%) B: Creative Prose Writing (40 marks worth 20%)		A: Unseen 19th and 21 st Century Non-Fiction Reading (40 marks worth 30%) B: Transactional writing (40 marks worth 30%)			
English Language: Assessment Objectives					
AO1	Identify and interpret explicit and implicit information and ideas	1	Use	It means...	In a sentence
	Select and synthesise evidence from different texts		Highlights	Makes something stand out	The writer highlights the character’s happiness by describing his beaming smile.
AO2	Explain comment on and analyse how writers use language and structure to achieve effects and influence readers, using relevant subject terminology to support their views	2	Reinforces	Strengthens or supports	The writer uses repetition to reinforce the importance of hand washing.
		3	Contributes to	Adds to	The use of short sentences contributes to the rising tension.
		4	Develops	Grows/unfolds	The writer develops a strong sense of fear as the character approaches the door.
		5	Reveals	Shows something new	The writer reveals the secret of the hero’s true identity at the very end of the story.
AO3	Compare writers' ideas and perspectives, as well as how these are conveyed, across two or more texts	6	Demonstrates	Gives an example	The use of exclamation marks demonstrates the writer’s enthusiasm .
		7	Ensures	Makes sure	The writer repeats the information to ensure that the reader is left in no doubt.
AO4	Evaluate texts critically and support this with appropriate textual references	8	Portrays	Describes	At the start of the extract, the writer portrays this character as shy.
		9	Initially	At first	Initially , we are shocked at the character’s behaviour until we understand why they did this.
		10	Surprisingly	Unexpected	Surprisingly , the author withholds this information until the end.
		11	Contrasts	Shows a strong difference	The writer contrasts the behaviour of the two boys in this extract, revealing their differences.
AO5	Communicate clearly, effectively and imaginatively, selecting and adapting tone, style and register for different forms, purposes and audiences	12	Ultimately	In the end, to sum up	Ultimately , we are left satisfied with the outcome of the story.
		13	Ironic	Saying the opposite of what you mean, often to create humour.	The writer creates an ironic tone by pretending that everyone is happy when they are really not.
AO6	Organise information and ideas, using structural and grammatical features to support coherences and cohesion of texts	14	Humorous	Funny	The writer includes a humorous anecdote to engage the reader.
		15	Sarcastic	Saying the opposite of what you mean to mock or show you disagree.	The writer is clearly sarcastic when he says “everything is perfect” after describing the poor conditions.
		16	Cautious	Careful	After being misled by the character, the reader is cautious about believing his later claims.
		17	Courteous	Polite	The speaker is courteous as he ignores subjects which might offend the audience.
AO6	Use a range of vocabulary and sentence structures for clarity, purpose and effect, with accurate spelling and punctuation.	18	Nostalgic	Thinking about the past in a positive way	The writer evokes a nostalgic feeling when describing happy memories of a neglected playground.
		19	Detached	No emotion – separate from the event	The detached tone confirms that the writer was not upset by the events.
		20	Flattering	Praise and complement	The writer is clearly flattering the reader when he says he knows that they will understand what he is talking about.

1.Key Terms	English Language GCSE: Creative Writing (Writing a short story)		5. Building detail	8. Descriptive vocabulary	
1. Rising action: the part of the story where the plot becomes increasingly complicated. 2. Climax: the most dramatic, exciting part of a story. 3. Falling action: diminishing tension, leading towards a resolution. 4. Foreshadowing: hints at events to come. 5. Allusion: brief, indirect reference to a person, place, thing or idea of historical/cultural, literary/political significance. It does not describe in detail the person/thing. 6. Juxtaposition: two contrasting ideas put next to each to make the difference clear.	3. Varying your sentence starts		1. Sensory description What would you be able to hear? See? Feel? Smell? Taste? 2. SHOW don't tell He was bored slumped in his chair, endlessly tapping his pencil. 3. Vary your sentences for pace Short sentences slow the pace; long sentences increase the pace. 4. Try figurative language Metaphor, simile, personification 5. Use words with precise meaning Bad Ugly Confusing Evil Uninspiring Went Ran Slunk Ambled Crept	Radiant Happy/beautiful	
				Gaudy Unpleasantly bright	
				Nauseating Makes you feel sick	
				Agonised Couldn't decide – painfully undecided.	
				Acrid Strong, bitter – causes a burning feeling.	
		Rancid Tastes or smells unpleasant as it's not fresh – rotting.			
		Uncontrollable Can't stop – cannot control			
		Hurled Threw with forced			
		Aromatic A pleasant smell			
		Deviously Cunning			
		Console Comfort someone			
		Engulfed Covered			
		Jabber Chat annoyingly			
		Indecisively Cannot decide			
		Avoid Don't do something on purpose.			
		Loomed Tower over threateningly.			
		Infinitely Much more			
		Indifferently Don't care			
		Unapologetically Not sorry			
		Haughtily Stuck up – looks down on people.			
2. Typical titles	It is important that your story idea matches the title you choose. Example: Write about a time when...(eg you were scared/ surprised/ at a birthday party...) Write a story that starts/ends...(I had to change my mind/ she wasn't there...) A statement (eg The Storm, The Stranger, The Test)		6. Hook your reader		
	• Hook: a way in to the story. A way to grab the reader's interest – it can be one line. • Development: something changes – maybe a problem - that complicates the story and builds towards the climax. • Climax: a dramatic or eventful moment. • Resolution: the tidying-up of loose ends, pulling the threads of the story together. Remember to have a strong final sentence.		• Use ambiguous pronouns or articles: it, she, the, I , he, she, they, it etc. • Begin in the middle of the action • Open with dialogue • Mention an unusual event • Address the reader • Make a claim or state a moral • Set the scene in an intriguing way		
	<u>Story Structure</u>		• 7. Endings • Circular structure – link back to the start of your story. • A reveal – make sure there are hints along the way! • 'Almost' cliff hanger – hint at what happens...leave the reader to fill in the detail. • A moral message – what has your character learnt?		

1. Text types	English Language GCSE: Transactional Writing (Writing a piece of non-fiction writing)		6. Varying your sentence starts	7. Key vocabulary	
You will be asked to write two of the following, adapting your writing according to the PALL: - Formal letter - Informal letter - Report - Review - Article - Speech - Guide	3. Creating an informal tone		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.	Instead of... strongly annoyed happy/ excited dangerous unsure/ suspicious not good enough confused don't like approve of Fight/ argue stupid horrible/stressful wanted to important/ relevant sure Think something but they're wrong	Use... vehemently exasperated thrilled perilous sceptical inadequate perplexed loathe applaud quarrel ill-considered harrowing compelled pertinent convinced illusion
	4. Creating a formal tone			8.Planning your writing	
	1. Ethos: to make yourself appear trustworthy, unbiased and credible, to your reader. 2. Pathos: persuade your audience by appealing to their emotions 3. Antithesis: something that is the direct opposite of something else, e.g. love is the antithesis of selfishness. 4. Anaphora: repetition of a word or phrase at the beginning of successive clauses. 5. Anadiplosis: repeating the final word or phrase from one clause at the beginning of the next, eg, when I give, I give myself. 6. Perspective: a way of looking at something, a viewpoint. 7. Logic: convince your audience through reason, facts and statistics.	An epidemic prevalent in our society is... A pertinent example of this is...of this would be... Understandably, many are under the illusion that... It has been noted that... Unfortunately, many are under the impression that... Although it may initially appear that.... This appeals to their/my sense of.... Despite this, I remain convinced that... Indeed, this may further add weight to the argument that...			
5. Persuasive devices					
Anecdote e.g. <i>That reminds me of a time when I...</i> Alliteration e.g. <i>Tenacious, terrific teens.</i> Pronouns e.g. <i>I, you, he, she, we</i> Facts e.g. <i>Football keeps you fit.</i> Opinions e.g. <i>Xbox is the best games console.</i> Rhetorical Questions e.g. <i>How would you feel if...?</i> Repetition e.g. <i>Monopoly is fun, fun fun!</i> Emotive Language e.g. <i>I was isolated and alone.</i> Exaggeration e.g. <i>YouTube is taking over the world.</i> Statistics e.g. <i>89% of people agree with this statement.</i> Threes e.g. <i>Cadets is exciting, challenging and rewarding.</i>					
2.Key Terms					

	Macbeth	A Christmas Carol	An Inspector Calls
Language	Symbolism: Blood - symbol of guilt, especially blood on hands as guilt for murder. Milk is a symbol of innocence. Pathetic fallacy: natural events foreshadow future bad events, “thunder and lightning” associated with witches. Persuasive devices: LMB persuades MB to kill Duncan, using rhetorical questions, emotive language, imperative verbs, inclusive pronouns. Metaphor: Animal imagery often represents emotions, e.g. “O, full of scorpions is my mind, dear wife!” Euphemisms: a mild word as a substitute, eg. “deed,” “it,” “the business,” “assassination: to show their inability to admit to their terrible crimes. Motifs: a symbol that is repeated throughout the play, e.g. blood, crown, hands, sleep, animals.	Symbolism: Marley’s chains represent what he valued in life, and his regrets in death – “cash boxes, ledgers” etc. Pathetic Fallacy: Cold weather, “cold and frost” represents Scrooge’s cold heart. Conversational Narrative Voice: Used for opinions on characters. Creates relationship with reader. Similes: :”Solitary as an oyster” (stave 1), “as light as a feather” (stave 5). Personification: “Innocence and Want,” neglected children, represent problems of Victorian society. Description: highly descriptive language creating vivid images of character, place and setting.	Symbolism: The Inspector’s photograph represents revelation and judgement. Inspector Goole is a moralistic figure, representing Priestley’s own views. Anaphora: Emphatic repetition at the beginning of sentences, “We don't live alone. We are members of one body. We are responsible for each other.” Makes the message memorable and persuasive. Slang: Younger generation use informal language like “squiffy” (Sheila/Eric), “chump” (Sheila), “tart” (Eric) which signals their youth. Realistic dialogue: plain language with less imagery adds to the realism: “But you're partly to blame. Just as your father is.”
Structure	Acts/Scenes: Enables a variety of settings. The number and length of scenes affects the pace of the play. Cyclical structure: Play begins with death of a traitor, and ends with Macbeth, now a traitor, being killed. Verse: (witches = trochaic tetrameter and riddles), blank verse (unrhyming), iambic pentameter (five feet in each line creating _ / rhythm), prose (Porter) Foreshadowing: bloody battle-murders/hearing voice-insomnia/Macduff’s suspicions-his opposition	Staves: each stave (‘chapter’) describes a new stage in Scrooge’s journey of redemption. A musical term, adding to the idea of the story as a festive carol. Foreshadowing: Tension builds in Stave 4 as the reader realises first that the unfortunate dead man is Scrooge.	Acts: Each act begins as the previous ended, creating a sense of realism. Cliffhangers: Each act ends with a character under suspicion and facing interrogation, raising the audience’s tension. Climax: Eric is revealed as the father of Eva’s baby. Twist: After questioning the Inspector’s identity, the phone call at the end comes as a surprise.
Form	Morality play: The audience is taught a lesson to learn from in life. E.g. MB allows himself to be influenced by the witches/his wife, ultimately leading to his downfall. Tragedy: A serious play where someone of high rank experiences a reversal of fortune (good to bad), resulting in the audience’s pity/fear.	Allegory: ACC is a story used to deliver a moral message about real-world issues. The narration “Once upon a time...” suggests a morality tale. Ghost Story: Traditional, popular in festive season. Novella: A longer text than a short story but shorter than a traditional novel.	Morality play: AIC teaches the audience lessons based on 7 deadly sins. The audience is led to question their own behaviour. Crime thriller: Action centres around the suicide of Eva Smith. It turns out that every character is a potential suspect, even the audience.
Dramatic devices	Asides: The audience accesses a character’s mental thoughts and observations through brief asides. “I fear thou play’dst most foully for’t.” Soliloquies: A more extended aside. Characters often justify important decisions and expose internal conflict, e.g. A1Sc7, MB justifies his decision not to kill Duncan. Dramatic irony: E.g. the gentlewoman/Dr work out LMB’s involvement with dark deeds through her sleepwalking. Foil: a character who contrasts with another character; typically, a character who contrasts with the protagonist to highlight difference, e.g. Banquo and Macbeth.	Foil: a character who contrasts with another character; typically, a character who contrasts with the protagonist to highlight difference, e.g. Cratchit and Scrooge, Fezziwig and Scrooge.	Stage directions: Priestley’s instructions on lighting, setting or how characters should behave/deliver lines. These have a huge impact on our perception of characters. Setting: Constant setting in real time. Dramatic irony: E.g. we realise Eric is the father of Eva’s child before Mrs B. Interruptions: Deliberately placed to raise tension, e.g. the “sharp ring of the front doorbell.” Dramatic pauses: We anticipate characters’ responses. Tension builds.

English Literature – Macbeth (1 hour exam: 20 mins extract. 40 minutes essay)

Key Quotations

Act 1

“Fair is foul and foul is fair” The Witches, chanting (A1, S1).

“Unseamed him from the nave to the chaps” Captain describing Macbeth’s brutal combat. (A1,S2)

“He seems rapt withal” Banquo noticing Macbeth’s reaction to the prophecies. (A1, S3)

“He was a gentleman on whom I built an absolute trust” Duncan about the traitor Thane of Cawdor (A1, S4)

“O worthiest cousin” Duncan to Macbeth after his promotion (A1, S4)

“I do fear thy nature—it is too full o’ th’ milk of human kindness” Lady Macbeth (A1, S5)

“Come you spirits...unsex me here” Lady Macbeth (A1, S5)

“When you durst do it, then you were a man” Lady Macbeth manipulating her husband into killing Duncan. (A1, S7)

Act 2

“My bosom franchised and allegiance clear” Banquo hints to Macbeth he will always act morally. (A2, S1)

“Is this a dagger I see before me?” Macbeth’s vision before killing Duncan. (A2, S1)

“Will all great Neptune’s ocean wash this blood clean from my hand?” Macbeth’s guilt having just killed Duncan (A2, S3)

“A little water clears us of this deed” LM dismisses the impact of guilt. (A2,S3)

“O horror horror horror” Macduff discovers Duncan’s body. (A2, S4)

Act 3

“I fear thou played’st most foully for ’t.” Banquo’s suspicions about Macbeth (A3, S1)

“Nought’s had, all’s spent, where our desire is got without content” LM is unhappy as queen (A3, S2)

“We have scotch’d the snake, not kill’d it!” Macbeth feels the threat to the throne is alive in Banquo/his son (A3, S2)

“O, full of scorpions is my mind, dear wife!” Macbeth’s torment at the idea of losing the crown (A3, S2)

“Thou canst not say I did it, never shake thy gory locks at me!” Macbeth’s fear and outrage at being haunted by Banquo’s ghost (A3, S4)

“Are you a man?” LM uses her previous tactic to try to calm Macbeth. (A3, S4)

“Blood will have blood” Macbeth fears the consequences of his actions. (A3, S4)

Act 4

“Beware Macduff” the witches’ apparition warns Macbeth. (A4, S1)

“None of women born shall harm Macbeth” another apparition from the witches gives Macbeth confidence (A4, S1)

“give to th’ edge o’ th’ sword his wife, his babes” Macbeth orders the murders of Macduff’s family. (A4, S1)

“all my pretty chickens and their dam at one fell swoop?” Macduff is devastated and in disbelief that his family are gone (A4, S3)

“Let’s make us medicines of our great revenge!” Malcolm encourages Macduff to use his devastation to destroy Macbeth. (A4, S3)

Act 5

“Out damned spot!” LM has visions of blood on her hands as she sleepwalks. (A5, S1)

“who would have thought the old man to have so much blood in him?” LM is is disturbed by all the killings triggered by Duncan’s death. (A5, S1)

“Our castle’s strength will laugh a siege to scorn!” Macbeth is over-confident about the battle. (A5, S5)

“Out, out, brief candle!” Macbeth mourns the loss of LM (A5, S5)

“Life’s but a walking shadow” Macbeth remarks on the futility of life.

“Macduff was from his mother’s womb untimely ripped!” Macduff before beheading Macbeth (A5, S10)

Macbeth

Adjectives: violent, easily-influenced, guilty, paranoid, tyrannical, arrogant
Writer’s Intention: Shakespeare uses Macbeth to show how loyal men can be corrupted by ambition and supernatural evils. His death warns of the inevitable fate of those who challenge the king’s authority.

Lady Macbeth

Adjectives: Ambitious, manipulative, discontent, disturbed.
Writer’s Intentions: Lady Macbeth could show the dangers of strong women with ambition, especially those who call upon supernatural help. She also shows the maddening effect of guilt.

The Witches

Adjectives: Ominous, meddlesome, evil.
Writer’s Intention: They represent the danger of being influenced by the supernatural.

King Duncan

Adjectives: Warm, appreciative, naïve.
Writer’s Intention: Duncan’s weakness is putting his trust in valiant yet corruptible men like Macbeth and the previous Thane of Cawdor.

Macduff

Adjectives: suspicious, loyal, patriotic, devastated, motivated, heroic.
Writer’s Intentions: Macduff passionately fights for Scotland and to avenge his family. He follows his morals rather than fearing the wrath of Macbeth. Although he’s a hero, he pays a heavy price.

Banquo

Adjectives: wary, loyal, suspicious.
Writer’s Intention: Banquo distrusts the witches and doesn’t act on their prophecies like Macbeth, displaying better judgement. Banquo’s death shows Macbeth’s total corruption when he arranges the murder of his best friend and innocent child to protect himself. Banquo’s ghost distresses Macbeth, displaying his guilt.

THEMES: AMBITION – SUPERNATURAL – GUILT – LOYALTY – POWERFUL WOMEN – APPEARANCE V REALITY

1. The Exam (1 hour)	English Literature GCSE: Unseen Poetry		4. Analytical language	
Both unseen poems are printed on the paper. Spend 20mins analysing poem a, then 40mins comparing both poems. You are guided as to how to approach the comparison: You should compare: • what the poems are about and how they are organised; [SEP] • the ideas the poets may have wanted us to think about; [SEP] • the poets' choice of words, phrases and images and the effects they create; • how you respond to the poems.	3. Poetic techniques: language and structure		Instead of...	Use...
	Technique	Definition	shows	demonstrates portrays illustrates
	Alliteration	The repetition of initial consonant sounds		
	Anaphora	The repetition of the same word or phrase at beginning of a succession of lines.	suggests	implies connotes signifies
	Enjambment	A line that is not end-stopped by punctuation; it runs over into the next line to complete its idea/sense.		
	Metaphor	Describe something by comparing it with something else, usually using "is" or "was" to make the link.	draws attention to	accentuates clarifies reveals
	Caesura	Using terminal punctuation (?!), mid-line, to create a simple sentence or 'cut through' the flow of thought to draw attention to something	5. Connectives	
	Sibilance	Repeated sibilant consonant sounds (s,sh), creating a soft "whispering" effect or sometimes anger/frustration.	Comparing	Contrasting
	Juxtaposition	The deliberate placement of two ideas/words together for a specific effect.	1. Likewise 2. In the same way 3. Equally	1. Conversely 2. On the other hand 3. However,
	Oxymoron	Juxtaposing two contradictory/unexpected ideas or words next to one another.	Explaining	Alternative Interpretations
2. Structuring your response STRUCTURE for part (a) Introduction – What is the poem about? (link to the given theme). Pick at least 5 quotations to talk about (e.g. imagery, language, tone, mood, structure, start/finish of poem) Conclusion/personal response – overall, how successfully does the poet present their ideas? Can you relate? STRUCTURE for part (b) - comparison 1. Introduction: Poem B is also about _____ (link to Poem A) but _____ (one difference e.g. perspective, tone, attitude, structure etc.) Then explain the ideas of poem B, showing your understanding of the poem as a whole. 2. Analysis: Both poems _____ (compare presentation of ideas, e.g. start with, end with, language, mood, etc.) Or Poem A _____ whereas Poem B _____. Aim to make 5 points of comparison, including evidence to support your views and the impact on the reader. 3. Conclusion (Evaluate) – Which of the poems do you think is more successful in presenting that theme?	Onomatopoeia	The use of words to imitate the sounds they describe.	1. In addition... 2. As well as this... 3. Moreover...	1. Although... 2. In contrast... 3. Contrarily... 4. Alternatively...
	Pathetic Fallacy	Reflects the mood or atmosphere of a given scene, using a description of weather or nature that makes it seem human.	6. Challenge yourself	
	Repetition	Using the same/similar words or phrases to draw attention to them, exaggerate or create rhythm.	✓ Detailed analysis, and comparison, of language, structure and form ✓ Precise subject terminology ✓ Show that you can "speculate about meanings and ideas" by using one of the following in your analysis: <u>Perhaps</u> the poet... <u>Alternatively</u>, this <u>could</u> mean... ✓ Evaluate the impact on you, the reader	
	Rhyme	Correspondence of sound between words or the endings of words.		
	Sensory Imagery	Descriptions that help one or more of our senses to understand what an experience or object is like.		
	Simile	Draw a comparison using the words "like" or "as" to show the similarity.		
	Personification	Describing an inanimate object as if it has human qualities.		
	Volta	The turning point, significant shift in the poem – in the content or tone		



Year 10

Food, nutrition and health

Work hard. Be kind. Belong.

FOOD, NUTRITION AND HEALTH

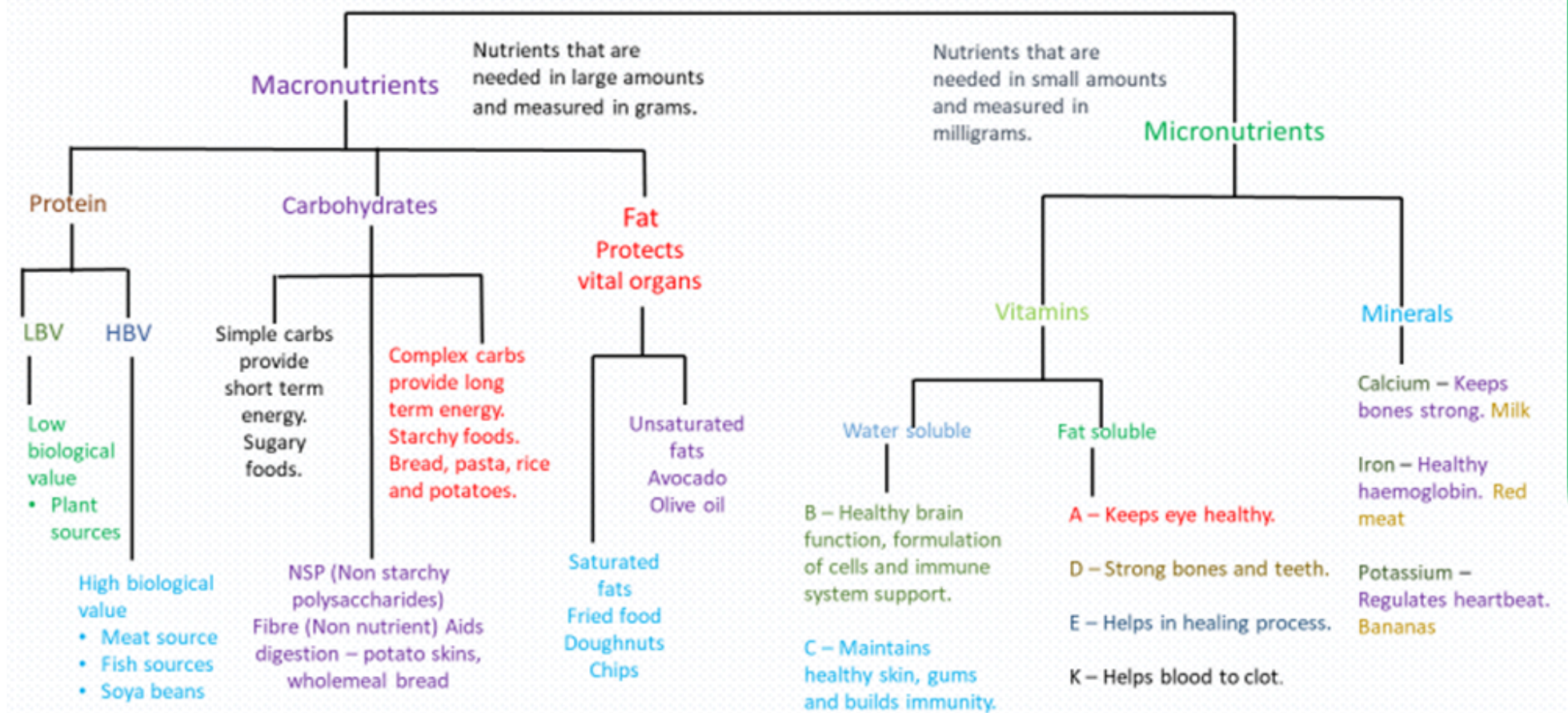
The 5 main nutrients are:
Carbohydrate (Sugar, Starch, Fibre)
Fat
Protein
Vitamins (A, B, C, D, E, K)
Minerals (Iron, Sodium, Flouride, Calcium)

Macro Nutrients: **Carbohydrate, Fat, Protein**
Micro Nutrients: **Vitamins and Minerals**

Non Nutrients:
FIBRE – **Vegetables, wholemeal flours/ pasta – aids digestion**
WATER - **Water, juice, fruit, vegetables - hydration of all cells**



Nutrients



Nutrients

Protein

Is a **macronutrient**. It is formed from chains of **amino acids**. 8 amino acids need to be provided by the diet in adults and are called **essential amino acids**. Children require 2 more (10). Protein is used for specific functions in the body: **growth, repair, maintenance and is a secondary energy source.**



BIOLOGICAL VALUE

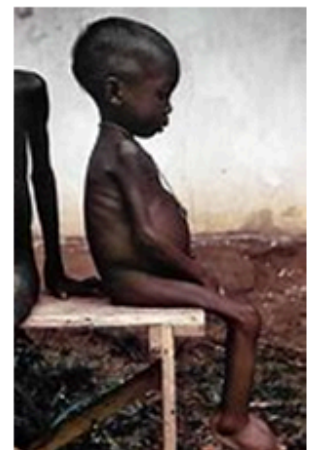
The biological value of protein means the amount of essential amino acids present. **Animal protein sources** contain **all the essential amino acids** required by the body (**HBV high biological value**). Soya is a plant and is the only exception being HBV too. **Proteins from plant sources** are of **low biological value LBV** and lack some essential amino acids (except soya). Vegetarians can combine LBV proteins to ensure they get all the essential ones (**protein complementation**)

PROTEIN EXCESS AND DEFICIENCIES

Protein is a third source of energy. In developing countries KWASHIORKOR (malnutrition) occurs. More protein is required in -babies and children for growth - adolescents for growth spurts -pregnant women (baby) -nursing mothers (lactation).

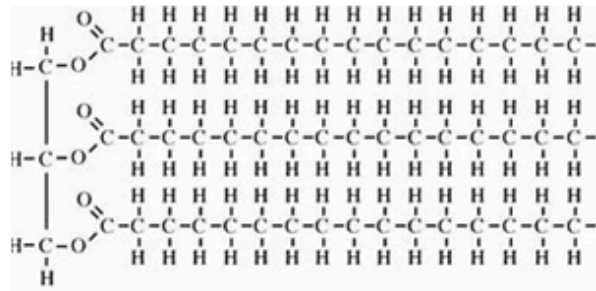
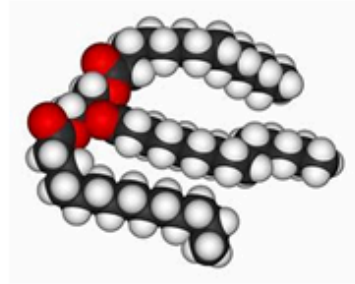
Symptoms of kwashiorkor can include:

Odema – fluid build up and swelling
loss of muscle mass
an enlarged tummy ("pot belly")
regular infections, or more serious or long-lasting infections
red, inflamed patches of skin that darken and peel or split open
dry, brittle hair that falls out easily and may lose its colour
failure to grow in height
tiredness or irritability
ridged or cracked nails



Fat

Is a **macronutrient** made up of **fatty acids and glycerol**. The structure of fatty acids influences their effect on health and cooking choice. **Fat soluble vitamins A,D,E and K** are found in foods high in fat. Fat provides energy, it protects the bodies major organs, insulates the body and provides the fat soluble vitamins.



TYPES OF FAT

Saturated Fat

meats, butter, dairy products

solid at room temperature

increase levels of "bad" cholesterol (low-density lipoprotein)

low-density lipoprotein clogs arteries

Unsaturated Fat

vegetable oils

liquid at room temperature

increase levels of "good" cholesterol (high-density lipoprotein)

high-density lipoprotein, or HDL, "grabs" LDL and escorts it to the liver where LDL is broken down and eventually removed from the body

What they do to the body

Trans fats (also known as partially hydrogenated oils) are created by adding hydrogen to liquid vegetable oil, giving them longer shelf life and making them more suitable for frying and other uses. They also raise bad (LDL) cholesterol levels while lowering good (HDL cholesterol).

Good cholesterol
High-density lipoproteins (HDL) pick up excess cholesterol and transport it back to the body's liver for processing.

Bad cholesterol
Low-density lipoproteins (LDL) transport cholesterol throughout the body. As cholesterol builds up in the walls of the body's arteries, the arteries become narrow and hardened, reducing blood flow and leading to an increased chance of heart attack and stroke.

Where it comes from
Trans fats are created by hydrogenation, a chemical process that hardens vegetable oil. The more solid the fat, the more trans fat it contains.

Low trans fat				
Vegetable oil	Semi-liquid margarine	Soft margarine	Stick margarine	Shortening

Sources: The Mayo Clinic; American Heart Association; U.S. Food and Drug Administration; McClatchy-Tribune

FAT EXCESS AND DEFICIENCIES

Fat provides the body with energy – 9kcal per gram. Foods that contain fat are therefore energy dense. If the energy is not burned off through physical exercise it is stored under the skin. Too much fat can lead to **Obesity – BMI of over 30**. Too much saturated fat can also lead to **coronary heart disease**.

A deficiency of fat in the diet is rare but if carbohydrate is also decreased fat will be lost, the body will chill quickly, the body will bruise easily due to no protection and the body will lack vitamins A,D,E and

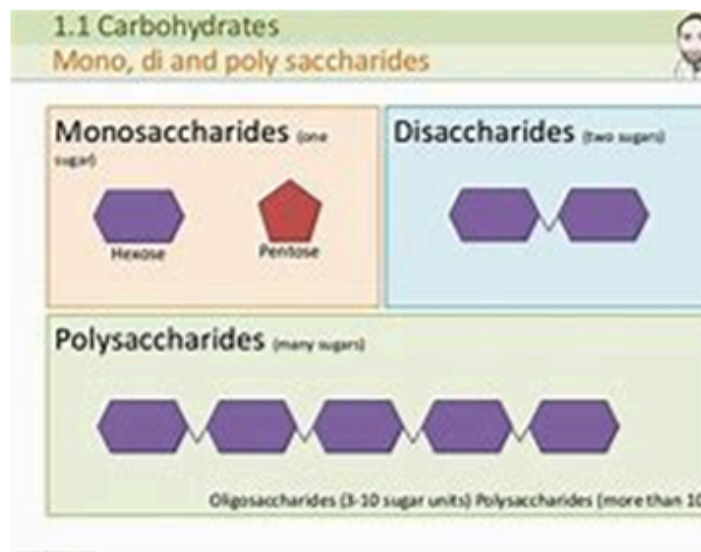
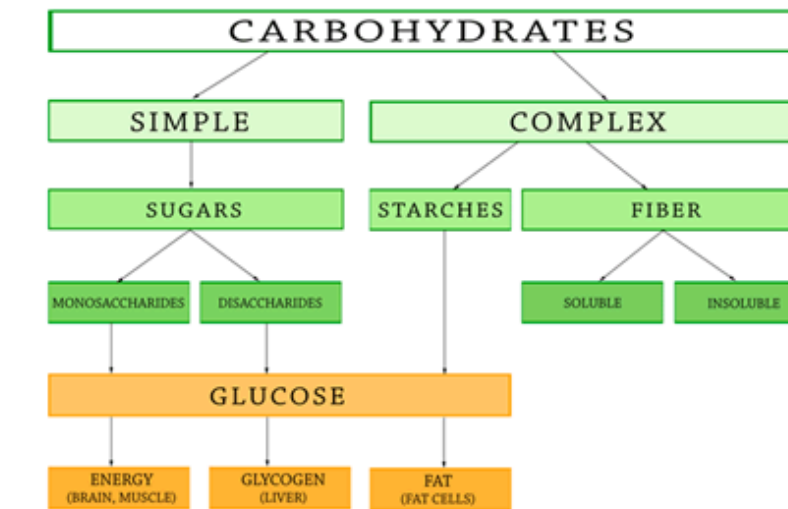
Carbohydrate

Is a **macronutrient**. Carbohydrate is needed by all mammals. It is made by green plants during photosynthesis. **Dietary fibre** is a form of carbohydrate (it is a non –nutrient).

TYPES OF CARBOHYDRATE

Monosaccharides and disaccharides – these are sugars that provide quick release energy. Free sugars –sugars added to food. Processed sugars.

Polysaccharides are complex carbohydrates – these are know as starch that provide slow release energy.



CARBOHYDRATE EXCESS AND DEFICIENCIES

If the diet contains more carbohydrate than the body needs it will converted into fat and stored in the body. Again the storing of this over time could lead to **obesity**.

Too much sugar can put stress on the pancreas and **type 2 diabetes** can be the result. Sugar can also lead to **tooth decay**

Types of Carbohydrates

① Starches

- most common type of carb in human diet
- consisting of a large number of glucose

Usually found in:



② Sugars

- also referred to as simple or fast-acting carbohydrate
- can be naturally-occurring or added



③ Fibre

- also referred to as simple or fast-acting carbohydrate
- can be naturally-occurring or added



Vitamins and Minerals

Are **Micronutrients**. They are **chemical substances** that are found naturally occurring in foods. Vitamins and minerals **promote health and help prevent disease**. Each vitamin is given a chemical name and a letter. **Vitamins A, C and E are antioxidants** these prevent chemicals from air, water etc reacting with the oxygen in our bodies and creating free radicals which can be damaging to our bodies.

E

IN 5 MINUTES News and events – visually

Eat your vitamins and minerals!

Vitamin/mineral	Other name	Good for	Deficiency causes	Daily intake	Get it from
A	Retinol	Eyesight, bone growth, reproduction, appetite and taste, regulating the immune system	Night-blindness	Men: 900 mcg (one millionth of a gram) Women: 700 mcg	Liver, cod liver oil, carrots, green leafy vegetables, egg yolks, enriched margarine, milk products, yellow fruits
B₁	Thiamine	Nervous system, digestion, muscles, heart, alcohol-damaged nerve tissues	Tingling in fingers and toes, confusion, difficulties in maintaining balance, loss of appetite, exhaustion and weakened powers of concentration	Men: 1.2 mg Women: 1.1 mg	Liver, yeast, egg yolk, cereal, red meat, nuts, wheat germ
B₂	Riboflavin	Growth, skin, nails, hair, eyesight, breakdown of protein, fat and carbohydrates	Itchy irritated eyes, itchy mucous membranes (nose, mouth, throat) and cracked corners of lips	Men: 1.3 mg Women: 1.1 mg	Milk, liver, yeast, cheese, green leafy vegetables, fish
B₆	Pyridoxine	Preventing skin conditions, nerve problems, helping the body absorb protein and carbohydrates	Skin inflammation	1.3 mg (seniors and pregnant women should aim higher)	Fish, bananas, chicken, pork, whole grains, dried beans
B₉	Folic Acid	Production of red blood cells, essential in first three months of pregnancy to prevent spina bifida, cleft palate or cleft lip	Tiredness due to anemia and red tongue	400 mcg (pregnant women should aim for 600 mcg)	Carrots, yeast, liver, egg, yolks, melon, apricots, pumpkin, avocado, beans, rye and whole wheat, green leafy vegetables
B₁₂	Cobalamin	Making red blood and the formation of the nerves	Tiredness and fatigue, tingling and numbness in hands/feet, memory problems and anemia	2.4 mcg	Eggs, shellfish, poultry, meat, liver, milk, cheese, fortified cereal
C	Ascorbic acid	Immune defence system, protection from viruses and bacteria, healing wounds, reducing cholesterol, cell lifespan and preventing scurvy	Tiredness, bleeding gums and slow-healing wounds	Men: 90 mg Women: 75 mg	Citrus fruits, kiwi fruit, berries, tomatoes, cauliflower, potatoes, green leafy vegetables, peppers
D	None	Strong bones and teeth	Unhealthy teeth, weakening of bones, rickets in children	600 IU (international units)	Sunlight (our bodies manufacture vitamin D when sun contacts skin), cod liver oil, sardines, herring, salmon, tuna, milk, milk products
E	Tocopherol	Fighting toxins, protecting cells from damage, supporting immune function, DNA repair and metabolic processes	Weak muscles and fertility problems	15 mg	Nuts, soya beans, vegetable oil, broccoli, sprouts, spinach, whole meal products, eggs
Ca	Calcium	Strong bones and teeth, nerve function, muscle contraction, blood clotting	Poor teeth and brittle bones	1,000 mg	Milk, cheese, butter, yogurt, green leafy vegetables
Fe	Iron	Red blood cells and muscle function, white blood cells and the immune system	Tiredness, irritability, difficulties concentrating	Men: 8 mg Women: 18 mg (Vegetarians need double)	Lean red meat, oily fish, egg yolks, green leafy vegetables, nuts, whole grains, whole wheat
Mg	Magnesium	Converting energy from food, cell repair, building strong bones, teeth and muscles and regulating body temperature	Muscle spasms, and has been associated with heart disease, diabetes, high blood pressure and weak bones	Men 19-30: 400 mg; 31+: 420 mg Women 19-30: 310 mg; 31+: 320	Green leafy vegetables, whole grains, nuts
Zn	Zinc	Immune system, the breakdown of protein, fat and carbohydrates	Lesions on skin, eyes and in throat, loss of taste and smell, hair loss, diarrhea, slow healing of wounds and growth problems in children	Men: 11 mg Women: 8 mg	Meat, shellfish, milk, brown rice, whole grains

Nutritional needs and health

As we age our nutritional needs change due to a number of reasons.

YOUNG CHILDREN – growth spurt – require more protein, calcium and vitamin D. Teething – calcium, fluoride and Vit D, developing immune system, fewer sugary sweets and drinks to prevent overweight and tooth decay.

TEENAGERS –Calcium and vitamin D for growth spurts and bones, iron to prevent anaemia, eat regularly for energy, fewer sweets and sugary drinks to prevent obesity.

ADULTS AND THE ELDERLY – more dietary fibre to prevent obesity, diabetes and cancers, more vitamin D and calcium for bones, fewer sugars snacks and drinks, elderly need less energy and energy dense foods, more iron to prevent anaemia and maintain healthy red blood cells, less salt add more water to reduce hypertension.

When we plan a meal there are a large number of points to consider:

Portion size and costing when planning a meal.
Eating the correct portion size ensures that individuals nutritional ad energy needs are met. Must stay within the family budget.

1. Physical Activity Level – the amount of energy needed to perform daily tasks.
2. Healthy eating –a balanced and varied diet.
3. Lifestyle – the way people live.
4. Food availability – the amount and variety of food available.
5. Seasonality – availability of foods.
6. Cost of food –the price of food products.
7. Income –disposable income is the amount of money a family can spend on rent and food.
8. Preferences – some prefer sweet or savoury.
9. Enjoyment – eat certain foods for enjoyment.
10. Time available to prepare food – busy
11. Time of day – breakfast, lunch and dinner.
12. Celebration – plays an important part for special

F

FURTHER CONSIDERATIONS

G

Diet concerns

1. **Hypertension**—condition in which blood pressure is too high. Due to obesity, smoking .
2. **Iron deficiency anaemia**—condition caused by a lack of iron in the diet.
3. **Obesity**—Condition in which fat is stored by the body in large amounts.
4. **Coronary heart disease**—condition in which blood vessels in the heart are narrowed by cholesterol plaque build-up.
5. **Type 2 diabetes**—chronic condition in which blood sugar levels are abnormally high.
6. **Skeletal disorders**—group of diseases of the skeletal system caused by a deficiency of micronutrients.
7. **Energy**—is the number of calories you need to consumer every day to maintain function and body mass.
8. **Energy needs**—depend on sex, age, height, weight, occupation, lifestyle, body composition.

BMR—basal metabolic rate.

PAL—physical activity level

BMR x PAL = total energy expenditure (TEE)

BMI—body mass index.

Religion

1. Rastafarians—eat i-tal (clean, natural and pure), coconut oil, herbal tea, fruit and veg. Don't eat pork, salt, milk coffee, alcohol.
2. Buddhists—eat a vegetarian diet, don't eat meat and alcohol.
3. Muslims—eat halal food only, don't eat pork, alcohol, fish and shellfish, without scales.
4. Jews—eat kosher food, don't eat shellfish, pork, meat with diary.
5. Hindus—eat milk, main vegetarian, don't eat beef and alcohol.
6. Sikhs—eat a vegetarian diet,, don't eat alcohol, kosher, halal, beef.
7. Christians—eat generally everything, don't eat meat on a Friday.

Ethical beliefs

May be based on – animals suffering, how food is made or how food production affects the environment.

1. **Fair-trade**—global movement focused on ensuring fair working conditions, prices and wages to farmers and workers in developing countries.
2. **Animal welfare**—Movement focused on ensuring the well-being of animals and humane conditions for rearing animals.
3. **Organic foods** - Plants and animals are grown and reared in the most natural way possible.
4. **GM foods**—Plants or animals in which DNA has been altered.
5. **Local produce**—local food fresher, tastier, cheaper, fewer food miles and lower carbon emissions.
6. **Food miles**—Distance from a farm to the plate.
7. **Carbon footprint**—amount of carbon dioxide and other greenhouse gases emitted during the production of the food.
8. **Greenhouse gases** - carbon dioxide, water vapour, nitrous oxide, ozone .

Medical Conditions

1. **Food intolerances**—reaction of the digestive tract to a food ingredient.
2. **Most common intolerances**—lactose, gluten (in wheat, barley, rye and oats)
3. **Symptoms and diet**—cause bloating, stomach cramps or diarrhoea.
4. **Food allergy**—reaction of the immune system to a food ingredient.
5. **Most common allergens**—nuts, eggs, milk, wheat, fish and shellfish.
6. **Symptoms and diet**—can cause a severe, life threatening reaction.
7. **Anaphylactic shock**—must avoid the food.



Cooking of food and heat transfer

Why do we cook food?

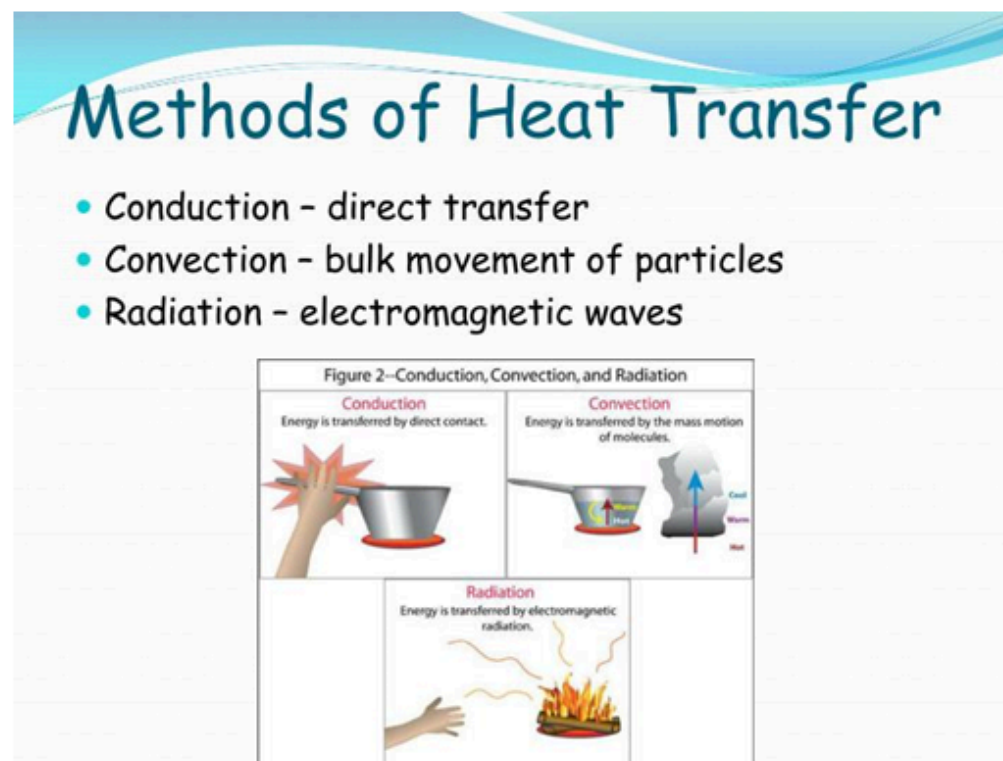
1. **Making it safe** – heat kills bacteria, inactivates harmful enzymes and toxins.
2. **To develop flavours** – water evaporation, adding sugar – caramelisation and other reactions add flavour.
3. **To improve texture** – makes food easier to eat.
4. **To improve shelf life** – cooking kills microorganisms which could spoil the food.
5. **To increase variety** – one product may be cooked in many different ways.

H

How does cooking affect food?

1. Appearance – meats shrink, cakes rise, eggs become solid, sauces thicken, rice and pasta increase in size.
2. Colour- Foods become golden or brown, red and green vegetable may lose colour.
3. Flavour– ay become sweeter, more pronounced, rich.
4. Texture– eggs set, vegetables and meats soften, chips become crunchy, bread becomes crispy, custard becomes creamy, sauces thicken.
5. Smell –is more pronounced because essential oils fill the air and are more easily detected by the olfactory system.
6. Maillard reaction –high temperatures, sugar and protein react with each other producing brown compounds what affect the colour, taste and smell of food. E.g.. Browning of onions

Heat transfer



I

Cooking Methods

Oil based cooking methods

1. Deep fat frying –foods become golden and crunchy, but their nutritional value is poor. (loss of vitamins, high fat content)
2. Shallow frying –seals the surface of food and helps to obtain crunchy top and juicy interior.
3. Stir frying –low fat. Helps to preserve nutritional value of food.

Water based cooking methods

1. Steaming – Helps preserve nutritional value of food. Low in fat.
2. Boiling – May cause vitamin loss. Low in fat.
3. Simmering- long time required. Causes vitamin loss.
4. Blanching –prevents enzymic browning and oxidation, preserves nutritional value.
5. Poaching –ideal for preparing delicate ingredients.
6. Braising – long time required. Causes vitamin loss.

J

Dry cooking methods

1. Baking -long time required. Causes vitamin loss. Palatability is improved (cakes and other baked goods become sponge like and often have crispy top).
2. Roasting -Helps to reduce amount of fat in food. Long time required. Decreases vitamin content. Helps to obtain a crispy skin or surface.
3. Grilling –may create harmful substances. Usually low in fat.
4. Dry-frying –Reduces amount of fat n food. Nutritional value is preserved.

Sensory evaluation

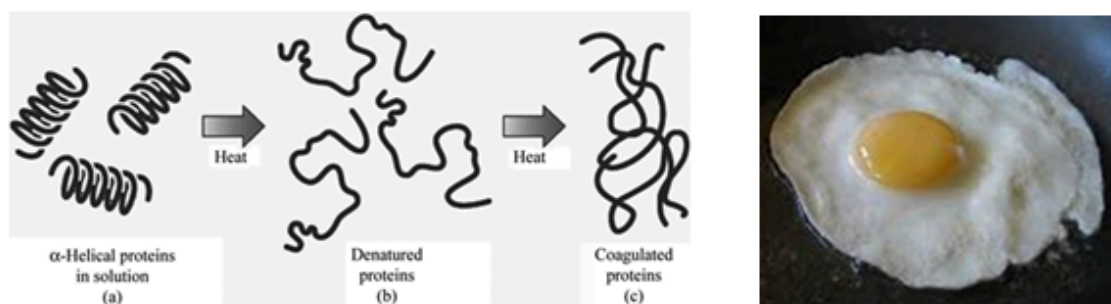
1. Smell –Olfactory system responds to aroma stimuli and sends information to the brain.
2. Touch –helpful in judging the texture, consistency and mouthfeel of the food.
3. Eyesight –important when presenting food, more appertising, colourful, neat and decorated.
4. Hearing –crunchiness and crispiness indicates its freshness.
5. Taste –taste buds located on the tongue. 5 tastes –sweet, sour, salty, bitter and umami

K

Protein

- Denaturation** –damage of the protein's structure caused by:
 - Heat – during cooking, proteins vibrate resulting in hydrogen bonds being broken.
 - Acid –hydrogen atoms from the acid bind with nitrogen from the protein, preventing it from forming hydrogen bonds within protein molecules, and so it cannot form a 3D structure.
 - Mechanical action – during whisking, protein uncoils and exposes hydrophobic areas, which stick together and form a foam.

2. Coagulation –aggregation (heating) of protein particles into larger lumps, causing it to set. Eg setting of egg.



3. Syneresis –leakage of water from overcooked (over-coagulated) proteins. Usually associated with eggs.

4. Gluten formation –complex, net-like protein built of glutenin and gliadin. Proteins from wheat, rye, barley and oats. Net traps and hold air bubbles during proving and baking. Glutenin+gliadin+water= gluten net, soft springy texture.

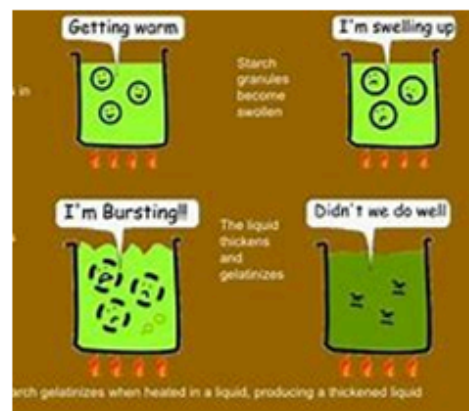
5. Foam formation –air bubbles trapped in a liquid (e.g. egg white). Whisking makes proteins unravel and denature.



L

Carbohydrate

- Gelatinisation** –happens when starch granules absorb water, swell and break during heating, causing mixture to thicken and form a gel when cooled. Starch+water+heat= gelatinisation



M

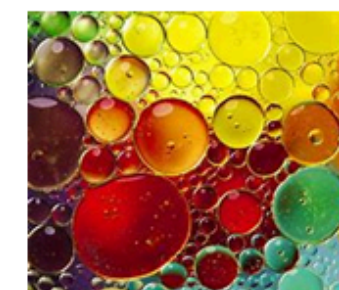
- Dextrinisation** –happens when starch chains break down into shorter chains of dextrin's, during the process, molecules of water evaporate and carbon is left to give brown colour, occurs during baking and toasting bread and other baked goods. Starch+heat=dextrinisation

- Caramelisation** –happens when sugar is heated to a very high temp, causing it to liquidise and form a thick, brown syrup, during the process, water evaporates and carbon is left to create a brown or black colour, occurs during roasting of vegetables, making caramel and fudge etc. Sugar+heat=caramelisation

ENZYMIC BROWNING –discolouration of fruits and vegetables as a result of oxygen reacting with enzymes and plant cell substances. Slow down –lower temp, adding heat and acid, removing the oxygen. Oxidation –substances react with oxygen changing the appearance, smell and nutritional value of food.

Fats and Oils

- Shortening** –when fat particles surround starch to produce a waterproof layer. Prevents gluten formation.
- Aeration** –trapping air bubbles in a fat mixture, e.g. cream or butter, to improve its texture.
- Plasticity** –ability of fat to be easily spreadable and melt at various temperatures. Depends on the length of the fatty acid chain.
- Melting point** - temp when fat turns to oil.
- Emulsion** –stable mixture of oil and water. Water-in-oil emulsion –butter Oil-in-water emulsion -milk. Emulsifiers-used bind together molecules into a stable emulsion. E.g. lecithin from egg yolk used to make mayonnaise.



N

Raising Agents

- MECHANICAL** –methods of trapping air bubbles to mixtures or between layers. Whisking, beating, folding, rubbing-in, sieving, creaming.
- BIOLOGICAL** –yeast is a single-celled fungus used in the production of baked goods, cheese, wine and beer. YEAST+SUGAR+WARMTH+LIQUID- CARBON DIOXIDE+ALCOHOL/ACID.
- CHEMICAL** –bicarbonate of soda and baking powder. CO₂ bubbles form and cause the batter to rise, while proteins set and structure becomes stable.

O

FOOD SAFETY

Food spoilage and contamination

Food spoilage may be caused by many various microorganisms – bacteria, yeast and moulds – as well as by enzymes naturally present in the food products.

Microorganisms

Tiny organisms visible only under a microscope e.g. bacteria, yeast and mould. To grow and multiply they need:

1. Warmth – ideally a temperature between 5°C and 63°C.
2. Water – microorganisms grow better in moist conditions.
3. Food – ideally protein, but sometimes also sugar.
4. Time – the longer the time, the more time microorganisms have to multiply.

DANGER ZONE – 5°C – 63°C. Bacteria growth above and below these temperatures is slower.

Growth controlled – by storing food in proper conditions, freezing and refrigerating food, cooking food before eating, not refreezing food once it has been defrosted.

Enzymes

Enzymes - Biologically active protein-based molecules.

Catalysts – speed up the rate of chemical reactions. Enzymes are necessary for fruit to ripen. Enzymic browning – darkening of fruit and vegetables caused by enzymes and should be avoided to preserve nutritional value of food.

Browning can be stopped by:

- a) Blanching – food put into boiling water then immediately plunged into cold water or ice.
- b) Use of acids – use of lemon juice or vinegar. Acid denatures and deactivates enzymes, because they are built of protein

Key Terms

1. **Shelf life** – period of time during which food can be safely stored and eaten.
2. **Food poisoning** – illness caused by eating contaminated food or drinking contaminated water.
3. **First in, first out** – Rule which says that the oldest foods should be eaten first.
4. **Vacuum packing** – Packaging food in airtight foil bags to remove oxygen and prevent spoilage.
5. **Food covering** – prevents from light, air, oxygen and dust, protects from pests and rodents, tainting.
6. **Perishable foods** – have a fairly short shelf life and need to be stored in the fridge. Raw and cooked meat, especially minced, raw and cooked poultry, raw and cooked fish and shellfish, milk and dairy, eggs, vegetables and fruit.
7. **Insulated cold bag** – used to transport high-risk foods and maintain their low temperature.
8. **Best before** – applied to food quality (look, flavour and colour) and it's relatively safe to eat the food after that date: it is used on dry, frozen or tinned foods and eggs.
9. **Use by** – applies to food safety so it might be harmful to eat a food after that date: used on fresh foods such as milk and dairy.
10. **Ambient storage** – storing at room temperature usually around 20°C.
11. **British Lion Scheme** – food safety mark which guarantees that eggs are produced in the UK and that all the hens have been vaccinated against salmonella

Cross-contamination

Is when bacteria, toxins or food particles are transferred to a food product.

Caused by: • Waste food and rubbish • Pests and rodents • The cooks hand • Work surfaces and equipment • Other contaminated foods, including high-risk foods.

Food Allergies

Anaphylactic shock – is a life-threatening reaction of the immune system to an allergen. Most common allergens – nuts, fish and seafood, milk and eggs.

Food Poisoning

Food poisoning – is a disease caused by eating spoiled or contaminated food. Such food may contain certain microorganisms, toxins or enzymes.

Pathogenic bacteria – microorganisms which cause disease.

Carrier – a person who carries a pathogen but shows no symptoms of a disease.

TYPES

Campylobacter – raw poultry and unpasteurised milk.

E. Coli – undercooked beef, unwashed vegetables, dirty hands.

Salmonella – raw eggs, meat and poultry, unpasteurised milk.

Listeria – ready-to-eat foods, unpasteurised milk, dirty hands.

Staphylococcus aureus – salads, ham, eggs, tuna, poultry, cream, hands of an infected person

SYMPTOMS OF FOOD POISONING



Use in food production

BACTERIA

1. **FOOD SPOILAGE** –Clostridium botulinum produces a toxin which causes meat bulge. Most bacteria do not cause visible signs of spoilage.
2. **USE IN FOOD MANUFACTURING** – cheese used a starter culture LACTOBACILLUS to give a balanced aroma taste and texture. Yoghurts – starter culture, probiotics – health benefits.
3. **WHY DOES THIS WORK?** Bacteria ferment lactose from milk into lactic acid, giving food a sour taste and coagulates the protein. Causes yoghurt to become thicker.

T

YEAST

1. **FOOD SPOILAGE** ferments sugar in juices and beverages, making them sour, fizzy and foamy.
2. **USE IN FOOD MANUFACTURING** Bread, doughnuts and other baked goods use yeast to help them rise.
3. **WHY DOES THIS WORK?** Yeast ferments sugar in foods and produces carbon dioxide to help it rise. It also creates fizz in some alcoholic drinks.

MOULD

1. **FOOD SPOILAGE** Creates a green, white or black coating on food products such as bread, grapes, tomatoes and jams.
2. **USE IN FOOD MANUFACTURING** Blue cheeses, such as Stilton, have a mould called Penicillium added to give them a distinctive texture, taste and aroma.
3. **WHY DOES THIS WORK?** Mould breaks down polysaccharides into shorter chains, which changes the taste of the food.

ENZYMES

1. **FOOD SPOILAGE** Turn bananas, apples, potatoes and other foods brown.
2. **USE IN FOOD MANUFACTURING** Rennet is an enzyme used in cheese production to coagulate milk.
3. **WHY DOES THIS WORK?** Enzymes react with oxygen and turn yellow pigments in food into brown melanin

Principles of food safety

Be safe

PERSONAL HYGIENE

- Always wash hands before and after cooking and dry with disposable paper towels.
- Avoid touching your face or hair
- Tie your hair back and cover with a hairnet.
- Avoid cooking when you're ill.
- Change clothes and use an apron.
- Cover any wounds with a waterproof plaster.
- Do not wear rings or other jewellery when cooking.

SEPARATE FOODS

- Separate raw and cooked foods both when preparing and storing food.
- Cover prepared food and store in closed containers.
- Use dedicated, colour-coded utensils.
- Wash dishes straightway in hot water to avoid pests and cross-contamination.

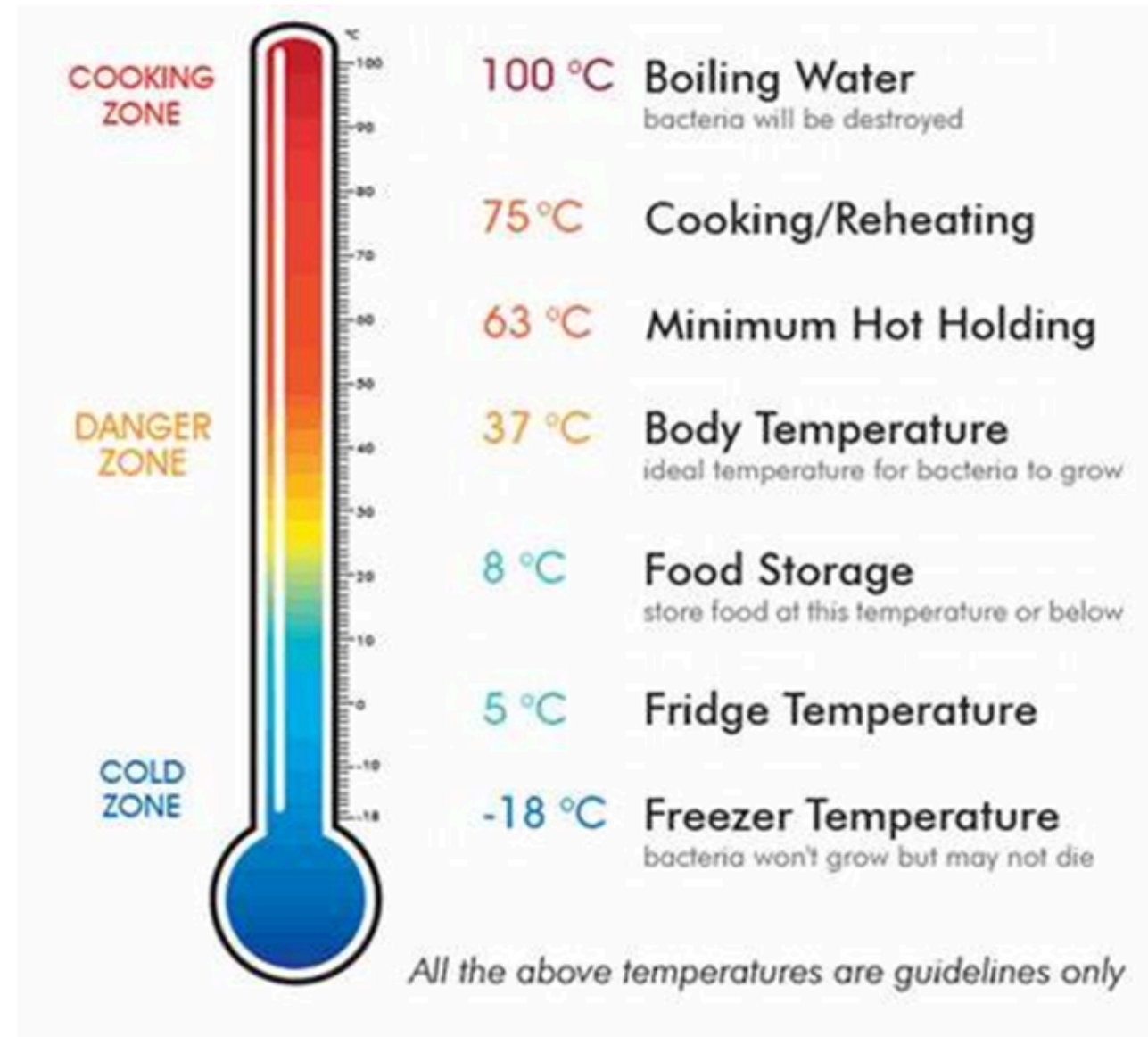
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WORK SURFACES

- Clean thoroughly after dealing with high-risk foods.
- Use soapy hot water or antibacterial spray to clean any spills.
- Use a clean kitchen towel or disposable paper towels.

TEMPERATURE CONTROL

- Make sure the temperature inside food reaches 75°C both when cooking and reheating.
- Make sure the temperature of served food is above 63°C.
- Do not put hot food straight into the fridge – let it cool for 90 minutes.
- Ensure correct cooking time to avoid cold spots.
- Defrost thoroughly to avoid cold spots

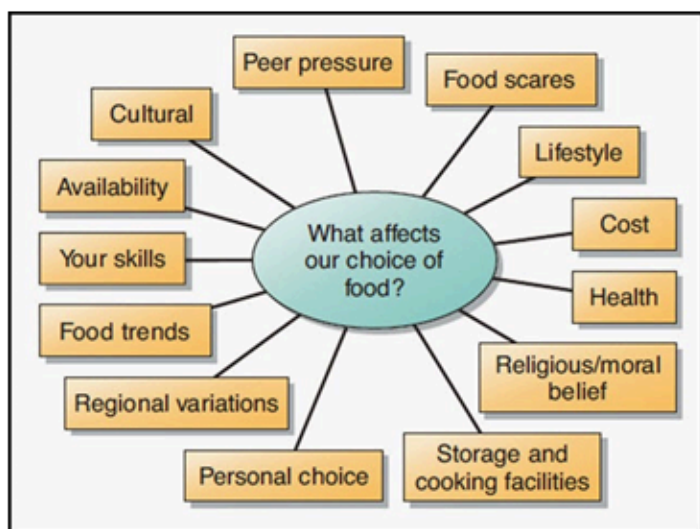


U



FOOD CHOICE

Factors affecting food choice



Target Market

A target market is a set of consumers a product is aimed at e.g. teenager, OAP, vegetarian, luxury

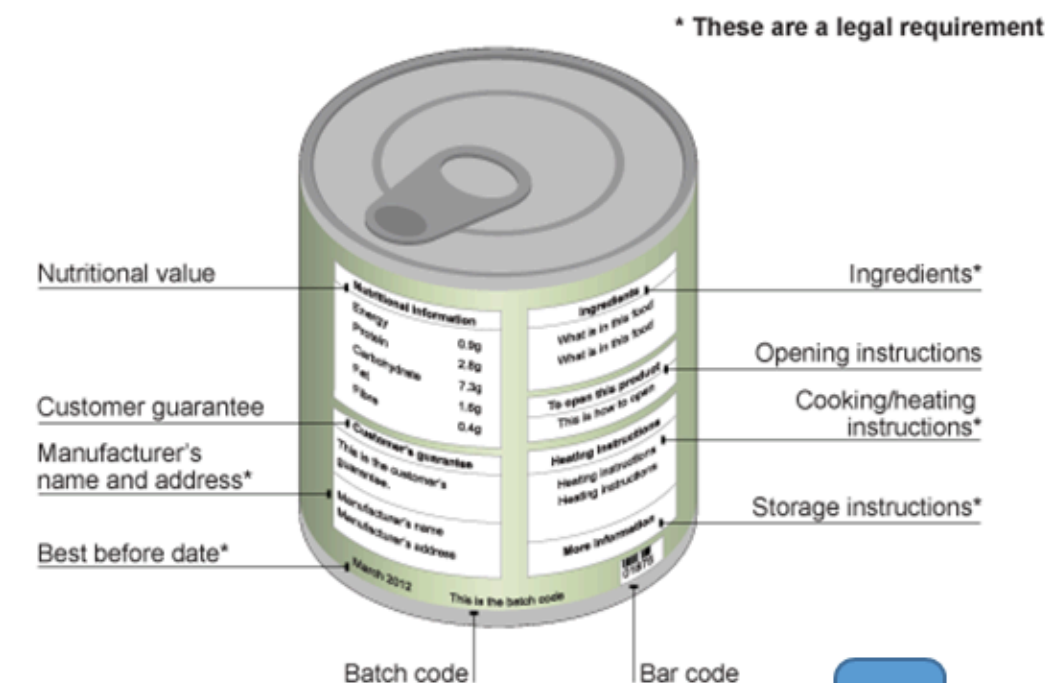
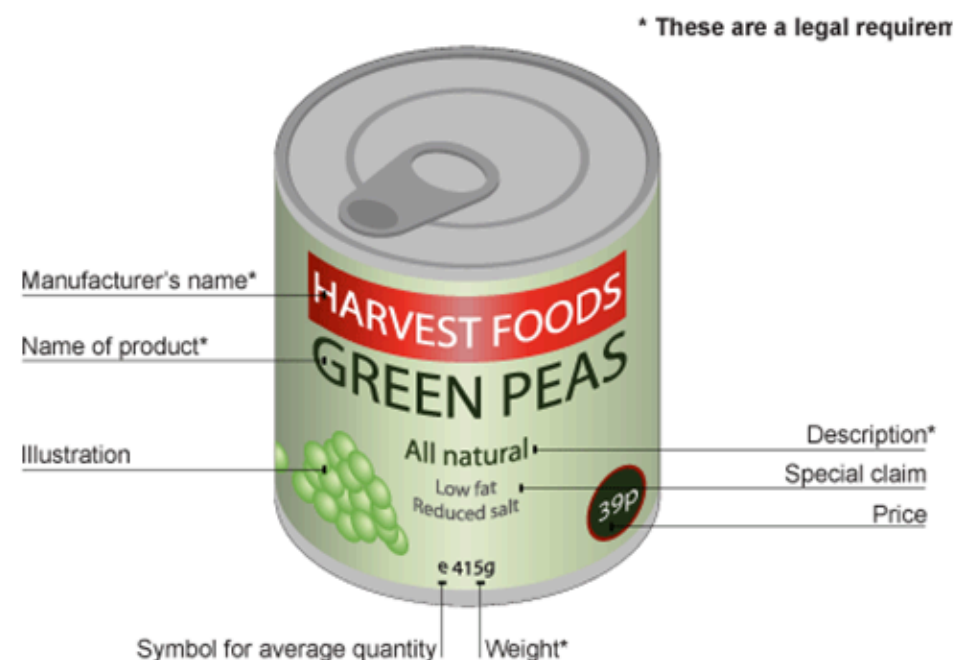
Food labels give consumers a wide range of information. Some is mandatory (required by law) some is not.

Slogans, adverts, colour, phrases are all carefully chosen to influence our food choice

Nutrition should be a key consideration when choosing food

W

Food Labelling



Y

Each grilled burger (94g) contains

Energy	Fat	Saturates	Sugars	Salt
924kJ 220 kcal	13g	5.9g	0.8g	0.7g
11%	19%	30%	<1%	12%

of an adult's reference intake

Typical values (as sold) per 100g: Energy 966kJ / 230kcal

British and international cuisines

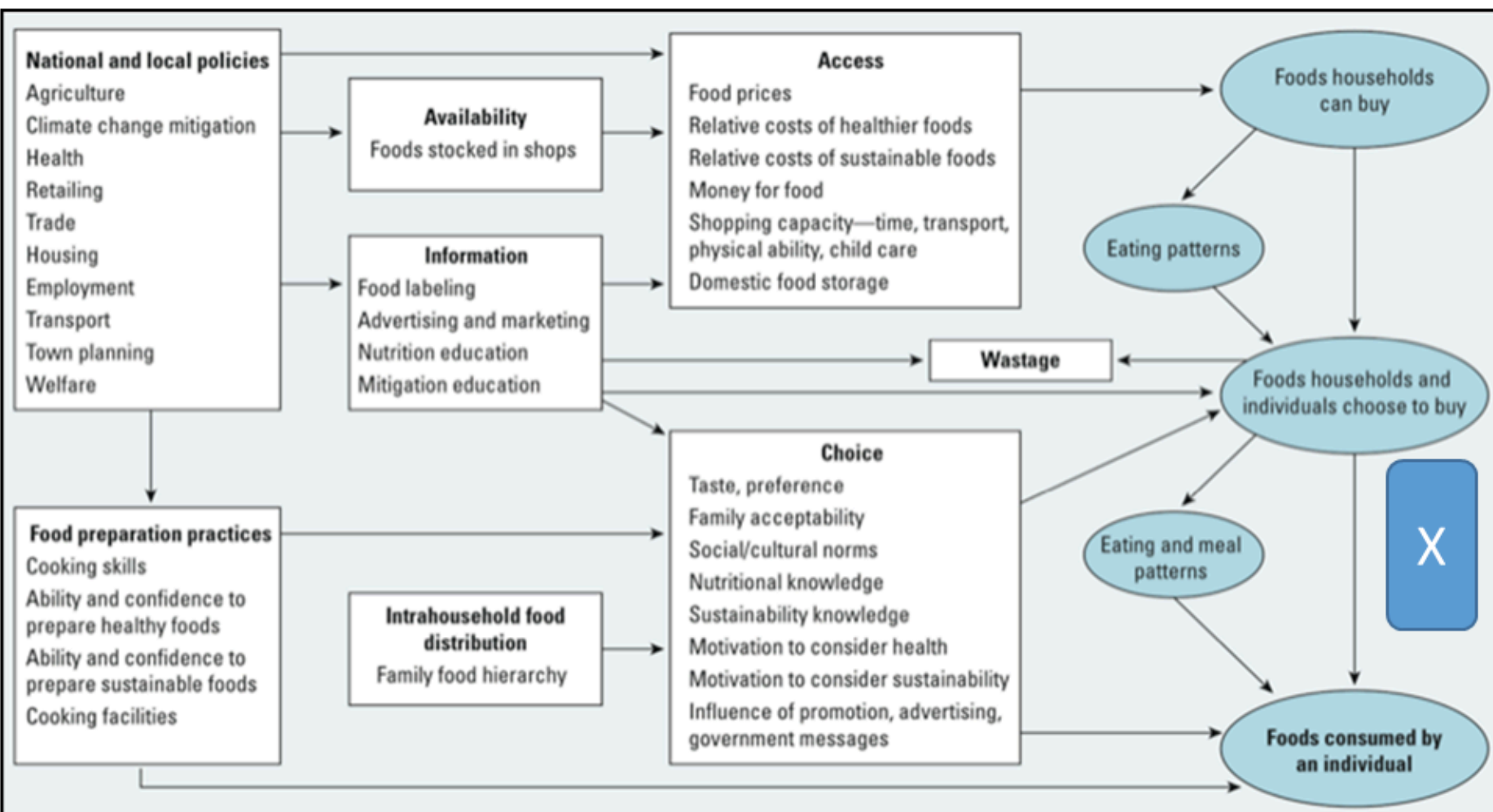
British Foods

1. England - Cornish pasty, Yorkshire pudding, fish and chips, English breakfast, sandwiches, roast dinner, beer and cider.
2. Wales – Cawl/ broth, welsh rarebit, Glamorgan sausage, welsh cakes, bara brith, laver bread.
3. Northern Ireland – colcannon, soda bread, black pudding, Irish stew, oatmeal, Irish cream, whiskey and beer.
4. Scotland – porridge, scotch broth, Dunlop cheese, kippers, haggis, scotch pie, oat cakes

International Cuisine

1. Mediterranean cuisine –olives and olive oil, grapes, wine, fish, seafood, tomatoes, aubergines, courgettes.
2. Chinese – noodle, rice, pork, duck, chicken, Chinese cabbage, water chestnuts, bamboo shoots, mushrooms, bean sprouts, soy sauce
3. Japanese – rice, soya, fish, seafood, noodles, seaweed, eggs, seasonal foods, green tea, wasabi.
4. India –rice, lentils, chickpeas, beans, coconut milk, ghee butter, paneer cheese.

Z



FOOD PROVENANCE

Environmental impact and sustainability

Food sources

Where and how food is made depends on climate, soil quality, availability of water, resources, availability of land, size of population. Religion, ethical beliefs. Food can be:

1. Grown— orchards, fields, polytunnels.
2. Reared— sheds, barns, fish farms
3. Gathered— in forests, near the roads
4. Caught — open spaces and forests oceans and seas.

a

Farming Types

1. **Organic farming** — • No chemicals • Little or no use of pesticides • No artificial fertilisers • No herbicides • No GM feed or seeds • Antibiotics are only used when necessary • Crop rotation may be applied to preserve soil quality • Animal welfare standards are kept.
2. **Intensive farming** — • Chemicals such as pesticides, herbicides and artificial fertilisers are used to prevent crop failure. • Antibiotics are used to prevent diseases in livestock, not to cure them. • GM feed and seeds are used to obtain high — yield crops. • Animal welfare standards are often violated

b

Genetic Modification

Plant cells contain DNA. DNA built of tiny genes which encode all information about an organism. Cell-nucleus-chromosome-DNA-gene. Modern technologies — allow people to manipulate the DNA code. • cut out unwanted genes to avoid disease. • Modify the sequence of genes. • Paste new genes to add new features Genetically modified — when the DNA has been changed.

c

Fishing Types

1. Sustainable fishing —fishing in natural fisheries limited to certain period of time. Giving the shoal time to reproduce and restore itself. Policy set by the Marine Stewardship Council.

d

2. Fish farms

Advantages —protect the natural ecosystems, prevent overexploitation of fisheries, keep animal welfare standards, protect wild species diversity. Prevent by catch.

By catch —accidental catch of a sea organism which wasn't the primary goal of the fishing.

Disadvantages —fish tanks often overcrowded, fed low-quality feed affecting their flavour and nutritional value, might be fed antibiotics, increasing risk of antibiotic resistance.

Methods of fishing

Purse seining —use large nets to trap fish.

Longlining— use longline, fish attach to a hook on the line Bottom trawling — pulling a large net along the sea bottom.

Foods That Are GMOs

Want to avoid genetically modified foods?
Avoid non-organic / non-grass fed foods that are on this list.



For more information, visit NaturalRevolution.org

Points to consider - food production

1. Danger of carbon dioxide —production creates carbon dioxide. This creates a layer around the earth which reflects warmth back onto the earth. Average temp rises.
2. Carbon footprint — amount of CO2 and greenhouse gases emitted into the environment. By input, processing and output.
3. Global warming — rise in average temperature on earth due to extravagant release of greenhouse gases. CO2 layer —heat cannot escape —rise in temp —glaciers melt—fierce hurricanes, rainfall-crop failure —food shortage.
4. Greenhouse gases — vapour, CO2, nitrous oxide, methane, ozone, CFC's, absorb infrared radiation and trap heat.
5. Food miles —distance from the field to the plate.
6. Food production —direct and indirect effect on the environment by creating various pollutants and by causing deforestation.
7. Packaging —using fossil fuels to produce, tonnes thrown away, unrecycled creates pollution, animals, birds and fish swallow debris and die, some never decompose.
8. Fairtrade— foundation and ethical movement focused on supporting farmers and sustainability of food. Fair wages and prices, improved working condition, empowers local communities, education for all.
9. Food availability — climate change affects food availability. Droughts, flood causes crop failure. Therefore no plants to eat and no food for animals.
10. Food security — when all people, at any time, have access to nutritious, healthy food in sufficient amount.
11. Seasonal foods — foods which are characteristic of a given season when they ripen and are harvested.

e

Spring — sprouts, kale, lettuce, spring onion, radish

Summer — peas, berries, courgettes, cucumbers, apricots, cherries

Autumn — apples, pears, plums, aubergine, pumpkin, celery

Winter — potatoes, carrots, parsnips, beetroots, Brussel sprouts, onion.

Advantages —reduce food miles and carbon footprint, cheaper, higher in nutrients and tastier.

12. Food waste — due to buying or cooking too much, not eating before it goes off. Effect — waste of money, pollution, carbon footprint increased. Prevention — planning, only cook what's needed, store leftovers, prevent spoilage, make compost from left overs.

Primary Processing

Primary source – foods in their natural, raw state e.g. milk, wheat grains, apples.

Primary processing of food –doesn't significantly affect the natural values of food products. Sorting, trimming, discarding, washing, wrapping, draining, trussing, cutting, heat treatment, milling, deboning, skinning, deseeding.

FOR EXAMPLE

Making of flour – harvesting and transport to mill, separating from dirt etc, washing and drying, milling, sieving. Removal of bran. Bran –the outer layer of a grain.
Heat treatment of milk. • Pasteurisation – 72°C for 15 sec to kill pathogenic bacteria. • Ultra-heat-treatment – heated 135°C for 1-2 seconds, kill bacteria. • Microfiltration – milk pushed through very fine membranes. • Sterilisation – heated to 110°C for 30 mins. Nutrients + flavour affected. • Drying – condensed, then dried, fall in B vitamin levels.

Secondary Processing

Secondary source – goods that have been changed e.g. yoghurt, flour, jam

Secondary processing of food – affects natural features to obtain new food products. Smoking, irradiation, adding additives, fermentation, cooking/heating, drying and freeze-drying.

FOR EXAMPLE

The making of pasta – harvesting, milling, mixing, kneading, add flavourings and colourings, rolling, pasteurisation, cut into shapes, drying, packaging

Jam– harvesting, washing, crushing, adding water and sugar, simmering, pouring into jars.

The making of yoghurt – milk cows, transporting, pasteurisation and homogenisation, warming to 42°C, add starter culture, fermentation (ripening), cooling, add flavourings, packaging. Starter cultures – probiotic bacteria begin the fermentation process. Fermentation– changing lactose into lactic acid by adding bacteria. Change in pH leads to coagulation and thickens mix.

Making of cheese – milking, transportation, pasteurisation, homogenisation, add starter culture, fermentation, add rennet, cutting curd, pressing, add salt, pressing, ageing. Rennet– enzyme which coagulates milk and increases curdling. Whey: liquid by-product of cheese production.

f

Fortification

During processing many food products lose their nutritional value.

The main function of food fortification is to:

- Restore the nutritional value of foods
- Improve the nutritional value of foods
- Make food more suitable for certain groups of consumers
- Prevent diseases caused by malnutrition.

Fortification required by law:

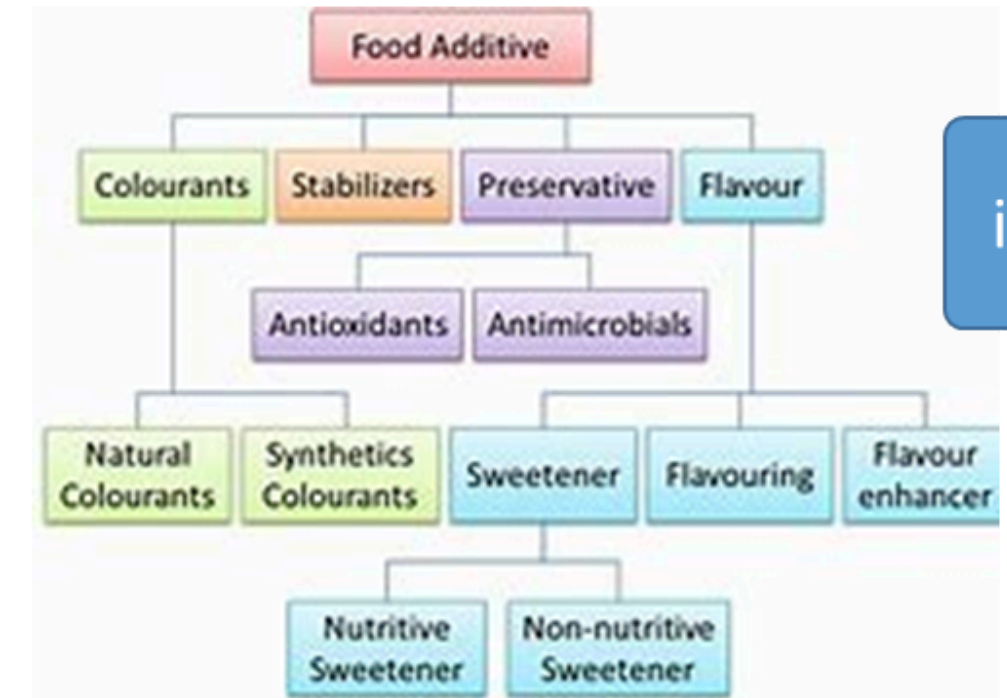
Wheat flour and bread –
Thiamine –prevent beri beri, help release energy from food. Niacin to prevent pellagra, calcium to prevent rickets and osteoporosis, iron to prevent iron deficiency and anaemia.

Vegetable fat spreads. VitA –prevent growth and eyesight issues eg. Night blindness, VitD– prevent rickets and osteoporosis. Semi-skimmed and skimmed milk. VitA – prevent growth and eyesight issues e.g. night blindness.

h

Additives

These are natural or synthetic (man made) chemical substitutes added to food during manufacturing



i

Food additives

Additive	Examples	Food	Benefit	Health hazard
Antioxidants	Ascorbic acid (vitamin C)	Fruit, meat	Stop food reacting with O ₂ (which spoil taste, change color)	
Colourings			Improve appearance of food	
	Sunset yellow	Drinks, sweets	Give yellow/orange colour	-cause hyperactivity in children -trigger asthma
	Caramel	Sweet, drinks, soups	Give brown color	
Flavouring	Monosodium glutamate	Processed food, Chinese food	Enhance taste of food	
	vanillin	Desert, chocolate	Give vanilla taste	
Preservatives			Give food longer life	
	Sulfur dioxide	Fruit juice, dried fruit	-Kill bacteria -Preserve vitamin C	Destroy vitamin B ₁
	Sodium nitrate	Meat products (sausages)	Stops growth of harmful bacteria	May cause cancer
Emulsifier	Lecithin	Powdered milk	Stop oil and H ₂ O separating out into different layers	



THS

TIVERTON HIGH SCHOOL

Year 10

French

Work hard. Be kind. Belong.

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 Jouer (to play)	Ir verbs Finir (to finish)	RE verbs Vendre (to sell)
Remove last 2 letters from each infinitive to make the verb stem and then add the following endings .		
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 To have	Être To be	Faire To do/make	Aller To go
J'ai	Je suis	Je fais	Je vais
Tu as	Tu es	Tu fais	Tu vas
Il/elle/on a	Il/elle/on est	Il/elle/ on fait	Il/elle va
Nous avons	Nous sommes	Nous faisons	Nous allons
Vous avez	Vous êtes	Vous faites	Vous allez
Ils/elles ont	Ils/elles sont	Ils/elles font	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 To be able to	Devoir To have to
These verbs are always followed by an infinitive verb .	
Je peux	Je dois
Tu peux	Tu dois
Il/elle/on peut	Il/elle/on doit
Nous pouvons	Nous devons
Vous pouvez	Vous devez
Ils/elles peuvent	Ils/elles doivent

faire

aller

Example sentence

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

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 avoir	Add a past participle	Take a bit of être	Add a past participle
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	 These past participles need agreements
	Écouté (listened)		
	Mangé (ate)		
	Fait (did/made)		
	Lu (read)		
	Vu (saw)		
	Bu (drank)		

Take a bit of aller	Add an infinitive
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 infinitive to the pronoun E.g: jouer	Add an these conditional tense endings
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: Aller-----ir être-----ser 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> Jouer au rugby	<u>Faire du + sport</u> Faire du canoe-Kayak
<u>Jouer + à la + ball sport</u> Jouer à la pétanque	<u>Faire de la + sport</u> Faire de la natation
<u>Jouer + aux</u> Jouer aux boules	<u>Faire de l' + sport</u> Faire de l'équitation
	<u>Faire des + sport</u> 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 <i>funny</i>	Passionnant <i>exciting</i>	Génial <i>great</i>	Ennuyeux <i>boring</i>	Nul <i>rubbish</i>
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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> Au terrain de foot Au centre sportif	<u>À la</u> À la piscine À la bibliothèque
<u>En</u> En ville En ligne	<u>Sur</u> Sur l'internet Sur mon portable Sur WhatsApp
<u>Dans</u> Dans ma chambre Dans un café	<u>Chez</u> Chez moi / nous Chez elle / lui

Sequencers V4

D'abord Ensuite	<i>firstly</i> <i>next</i>	puis finalement	<i>then</i> <i>finally</i>
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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 On doit Il faut	porter un uniforme scolaire arriver à l'heure utiliser les portables harcéler les autres
On ne peut pas On ne doit pas Il ne faut pas	porter des bijoux avoir du maquillage 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 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

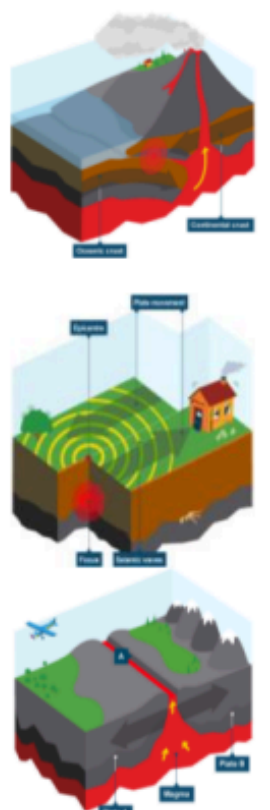
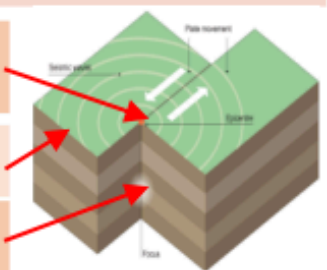
G2: Key verbs

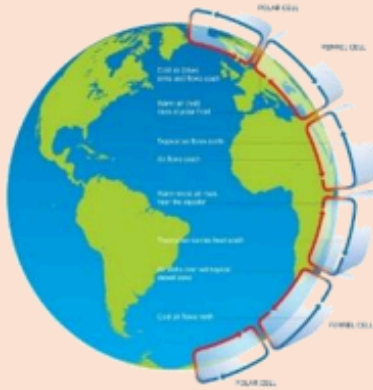
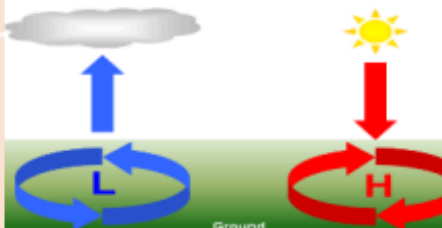
voir	<i>to see</i>
regarder	<i>to watch</i>
jouer	<i>to play</i>
se dérouler	<i>to take place</i>
conseiller	<i>to advise</i>
recommander	<i>to recommend</i>



Year 10
Geography

Work hard. Be kind. Belong.

The structure of the Earth		Volcanic Hazards		Managing Volcanic Eruptions	
					
The Crust	Varies in thickness (5-10km) beneath the ocean. Made up of several large plates.	Ash cloud	Small pieces of pulverised rock and glass which are thrown into the atmosphere.	Warning signs	Monitoring techniques
The Mantle	Widest layer (2900km thick). The heat and pressure means the rock is in a liquid state that is in a state of convection.	Gas	Sulphur dioxide, water vapour and carbon dioxide come out of the volcano.	Small earthquakes are caused as magma rises up.	Seismometers are used to detect earthquakes.
The Inner and outer Core	Hottest section (5000 degrees). Mostly made of iron and nickel and is 4x denser than the crust. Inner section is solid whereas outer layer is liquid.	Lahar	A volcanic mudflow which usually runs down a valley side on the volcano.	Temperatures around the volcano rise as activity increases.	Thermal imaging and satellite cameras can be used to detect heat around a volcano.
		Pyroclastic flow	A fast moving current of super-heated gas and ash (1000°C). They travel at 450mph.	When a volcano is close to erupting it starts to release gases.	Gas samples may be taken and chemical sensors used to measure sulphur levels.
		Volcanic bomb	A thick (viscous) lava fragment that is ejected from the volcano.	Preparation	
Convection Currents		LIC -CS: Nepal Earthquake 2015		Creating an exclusion zone around the volcano.	Being ready and able to evacuate residents.
The crust is divided into tectonic plates which are moving due to convection currents in the mantle.				Having an emergency supply of basic provisions, such as food	Trained emergency services and a good communication system.
1	Radioactive decay of some of the elements in the core and mantle generate a lot of heat.	Causes On a destructive plate margin, involving the Indo Australian and Eurasian plates. The <u>magnitude 7.9 earthquake</u> was <u>50 miles</u> to the north west of Nepal's capital Kathmandu. The plates are colliding at about 45mm per year. .		Earthquake Management	
2	When lower parts of the mantle molten rock (Magma) heat up they become less dense and slowly rise .	Effects 9000 people died and 8 million affected. Many emotionally affected . 3 million homeless . 7000 schools destroyed Avalanche on Mt Everest killed at least 19 people along with landslides			
3	As they move towards the top they cool down, become more dense and slowly sink .	Management Search and rescue teams inc. helicopters for those trapped on Mt Everest. Hall a million tents . 300 000 people migrated to Kathmandu. June 2015 International conference to discuss rebuilding.		PREDICTING	
4	These circular movements of semi-molten rock are convection currents	Unit 1a		Methods include:	
5	Convection currents create drag on the base of the tectonic plates and this causes them to move.	The Challenges of Natural Hazards		- Satellite surveying (tracks changes in the earth's surface) - Laser reflector (surveys movement across fault lines) - Radon gas sensor (radon gas is released when plates move so this finds that) - Seismometer - Water table level (water levels fluctuate before an earthquake). - Scientists also use seismic records to predict when the next event will occur.	
Types of Plate Margins		What is a Natural Hazard		PROTECTION	
Destructive Plate Margin		A natural hazard is a natural process which could cause death, injury or disruption to humans, property and possessions.		You can't stop earthquakes, so earthquake-prone regions follow these three methods to reduce potential damage:	
When the denser plate subducts beneath the other, friction causes it to melt and become molten magma . The magma forces its ways up to the surface to form a volcano. This margin is also responsible for devastating earthquakes .		Geological Hazard	Meteorological Hazard	- Building earthquake-resistant buildings - Raising public awareness - Improving earthquake prediction	
Constructive Plate Margin		These are hazards caused by land and tectonic processes.		HIC - CS: Chile 2010	
Here two plates are moving apart causing new magma to reach the surface through the gap. Volcanoes formed along this crack cause a submarine mountain range such as those in the Mid Atlantic Ridge .		Causes of Earthquakes			
Conservative Plate Margin		Earthquakes are caused when two plates become locked causing friction to build up. From this stress , the pressure will eventually be released, triggering the plates to move into a new position. This movement causes energy in the form of seismic waves , to travel from the focus towards the epicentre . As a result, the crust vibrates triggering an earthquake.		Causes Formed on a destructive plate boundary involving the Nazca and South American plate. The <u>magnitude was 8.8</u> on the Richter scale. The earthquake struck just of <u>the coast of Chile</u> causing a tsunami warning to be issued.	
A conservative plate boundary occurs where plates slide past each other in opposite directions, or in the same direction but at different speeds. This is responsible for earthquakes such as the ones happening along the San Andreas Fault, USA.		The point directly above the focus, where the seismic waves reach first, is called the EPICENTRE .		Effects Around 500 people killed. 12 000 injured and 800 000 people affected. 220 000 homes and 4500 schools destroyed. Cost of US\$30 billion . 1500 km of roads destroyed. Several coastal towns devastated by tsunami waves .	
		SEISMIC WAVES (energy waves) travel out from the focus.		Management Emergency services quick to act. Temporary repairs happened within 24 hours . Power restored to 90% of homes in 10 days. Housing reconstruction plan to help 200 000 homes affected. Strong copper economy rebuilt without foreign aid.	
		The point at which pressure is released is called the FOCUS .			

Global pattern of air circulation			Changing pattern of Tropical Storms		Case Study: Somerset Levels 2014	
Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth.			Scientist believe that global warming is having an impact on the frequency and strength of tropical storms. This may be due to an increase in ocean temperatures.		 Causes Wettest January on record (since 1910) caused by a succession of depressions over the Atlantic Ocean. 350mm rain fell in Jan and Feb 100mm more than average. High tides and storm surges in the Bristol Channel. Rivers had not been dredged in 20 years.	
Hadley cell	Largest cell which extends from the Equator to between 30° to 40° north & south .		Management of Tropical Storms 		Effect - Over 600 house flooded. - Many people cut off from supplies. - Cost of the flood £10 million 1000 livestock evacuated. - Floodwater heavily contaminated with pollutants. - Local roads and railway blocked.	
Ferrel cell	Middle cell where air flows poleward between 60° & 70° latitude.		Protection Preparing for a tropical storm may involve construction projects that will improve protection.	Aid Aid involves assisting after the storm, commonly in LIDs.	Management - Villages cut off were accessed by boats. £20 million flood action planned by Somerset County Council – To include: 8Km of river Tone and Parret dredged; Road levels raised; River banks raised; by 2024 consideration will be given to a tidal barrage at Bridgewater.	
Polar cell	Smallest & weakness cell that occurs from the poles to the Ferrel cell.		Development The scale of the impacts depends on the whether the country has the resources cope with the storm.	Planning Involves getting people and the emergency services ready to deal with the impacts.		
Distribution of Tropical Storms.		High and Low Pressure		What is Climate Change? 		
They are known by many names, including hurricanes (North America), cyclones (India) and typhoons (Japan and East Asia). They all occur in a band that lies roughly 5-15° either side of the Equator.		Low Pressure Caused by hot air rising. Causes stormy, cloudy weather.	High Pressure Caused by cold air sinking. Causes clear and calm weather.	Prediction Constant monitoring can help to give advanced warning of a tropical storm	Education Teaching people about what to do in a tropical storm.	
				Primary Effects of Tropical Storms  - The intense winds of tropical storms can destroy whole communities, buildings and communication networks. - As well as their own destructive energy, the winds can generate abnormally high waves called storm surges. - Sometimes the most destructive elements of a storm are these subsequent high seas and flooding they cause to coastal areas.		
Formation of Tropical Storms		Secondary Effects of Tropical Storms		Enhanced Greenhouse Effect 		
1	The sun's rays heats large areas of ocean in the summer and autumn. This causes warm, moist air to rise over the particular spots		- People are left homeless, which can cause distress, poverty and ill health due to lack of shelter. Shortage of clean water and lack of proper sanitation makes it easier for diseases to spread. Businesses are damaged or destroyed causing employment. - Shortage of food as crops are damaged.		Recently there has been an increase in humans burning fossil fuels for energy. These fuels (gas, coal and oil) emit greenhouse gases . This is making the Earth's atmosphere thicker, therefore trapping more solar radiation and causing less to be reflected . As a result, the Earth is becoming warmer.	
2	Once the temperature is 27° , the rising warm moist air leads to a low pressure . This eventually turns into a thunderstorm. This causes air to be sucked in from the trade winds .		Case Study: Typhoon Haiyan 2013 		Evidence of natural change	
3	With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to spin .		Causes Started as a tropical depression on 2nd November 2013 and gained strength. Became a Category 5 " super typhoon " and made landfall on the Pacific islands of the Philippines.		Orbital Changes Some argue that climate change is linked to how the Earth orbits the Sun, and the way it wobbles and tilts as it does it.	Sun Spots Dark spots on the Sun are called Sun spots. They increase the amount of energy Earth receives from the Sun.
4	When the storm begins to spin faster than 74mph , a tropical storm (such as a hurricane) is officially born.		Effects - Almost 6,500 deaths. 130,000 homes destroyed. - Water and sewage systems destroyed had caused diseases. Emotional grief for dead.		Volcanic Eruptions Volcanoes release large amounts of dust containing gases . These can block sunlight and results in cooler temperatures.	
5	With the tropical storm growing in power, more cool air sinks in the centre of the storm, creating calm, clear condition called the eye of the storm .		Management - The UN raised £190m in aid. - USA & UK sent helicopter carrier ships deliver aid remote areas. Education on typhoon preparedness.		Managing Climate Change 	
6	When the tropical storm hits land, it loses its energy source (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'.				Carbon Capture This involves new technology designed to reduce climate change.	Planting Trees Planting trees increase the amount of carbon is absorbed from atmosphere.
			International Agreements Countries aim to cut emissions by signing international deals and by setting targets.			Renewable Energy Replacing fossil fuels based energy with clean/natural sources of energy.



THS

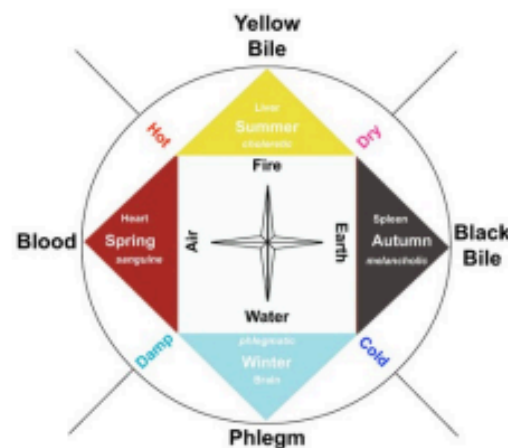
TIVERTON HIGH SCHOOL

Year 10 History

Work hard. Be kind. Belong.

Key Question 1: Causes of illness and disease c.500-present day

Medieval (Up to 1500)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
<u>Four Main Causes</u> Poverty Warfare Famine Accidental death What did medieval people believe caused illness? • God • Bad smells • Supernatural • Four Humours, out of balance • Everyday life: childbirth, infant mortality, illness and early death viewed as inevitable Lack of hygiene, lack of clean water and sanitation in towns, no refuse collection. BLACK DEATH 1348, Bubonic and Pneumonic plague	Lack of hygiene, lack of clean water and sanitation in towns, no refuse collection. Regular outbreaks of plague; Great Plague of 1665 was a particularly big outbreak. Beginning to make the link between dirt and disease. More measures to keep people segregated with the plague, belief it was caused by cats and dogs Plague doctor outfit: beak: bad smells (miasma) caused plague and the waxy cloak was to make the 'venomous atoms' slide off. They were talking about germs but without knowing what they were or being able to see them...some improvement from believing it was God doing it...but many people still believed in Four Humours and God...	New industrial towns were grim places to live, dominated by overcrowding and lack of clean water and sanitation. Industrialisation Contagious diseases spread due to overcrowding (typhoid, typhus, scarlet fever, tuberculosis) (Typhus caused by lice and ticks) New industrial hazards: Phossy jaw in match factories, machinery highly dangerous and caused injuries. Cholera: First big outbreak 1831. Waterborne disease, originated in India and spread along trade routes like the Black Death did. Typhoid: spread by contaminated water, food and faeces (poo!) Even Prince Albert died of it in 1861. 20th Century: Spanish flu after WW1; 20-40 million people worldwide died, 280,000 in the UK mostly young men and women AIDS: First identified 1981, caused by a virus. By 2014 est. 40 million died of it, 40 million living with it (Spread by: unprotected sex, hypodermic needles, contaminated blood)



The Four Humours



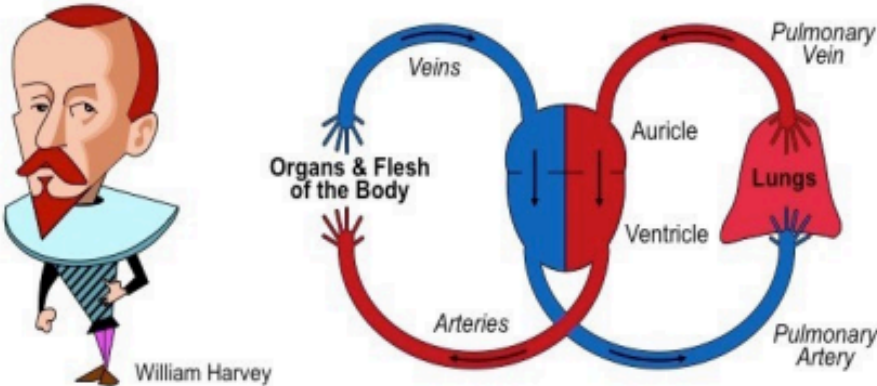
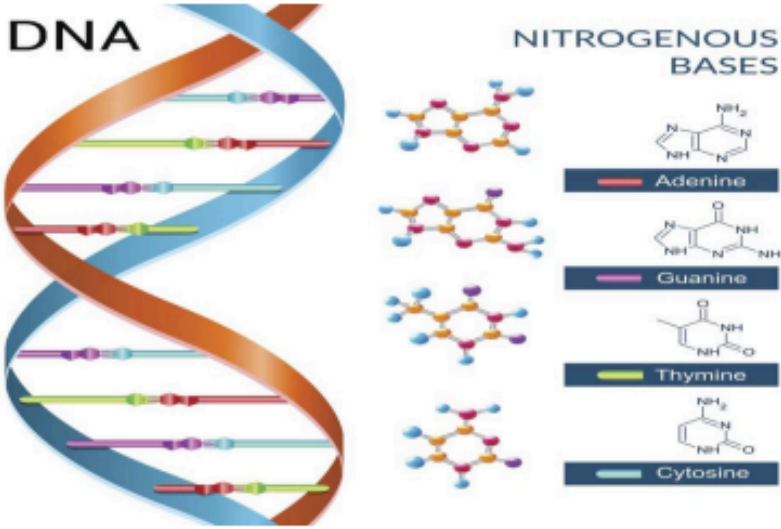
Key Question 2: Attempts to prevent illness and disease c.500-present day

Medieval (Up to 1500)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
Hippocrates (and his ideas were followed by Galen and into Medieval times) believed keeping your humours balanced prevented disease (exercise, rest, diet) Romans believed in clean water (aqueducts) and cleanliness but these abilities and ideas were lost when Romans left. The Church: Prevent illness and disease by living a Christian life and pray hard for forgiveness of sins (flagellants during Black Death) Black Death: other attempts to prevent: Fast, Far, Late (actually spread it), avoid bathing as it opened the pores to the disease, avoid sex! Drinking vinegar and wine, bathing in urine. More realistic: King Edward III ordered the streets to be cleared of filth believing smells spread disease, avoiding the sick (boarding up houses, red cross on door) Alchemy, soothsayers, doctors: Alchemists distilled vinegar thinking the 'medicine' they created would prevent disease ("Elixir of Life"). Medicines containing poisons were used to make you sick, believed this prevented disease. Wise women: collect plants, herbs, make and sell charms to prevent the spread of disease. Apothecaries made medicines too.	"Prevention is better than cure": From late 18th century-early 19th century, a time for 'fads' like vegetarianism, giving up alcohol, fresh air and exercise became fashionable. Cold Water treatments: 'Taking the waters' at spa towns like Bath and Harrogate, visiting the seaside. Drinking cold water to flush out impurities. Many deaths from 'child bed fever'. Alexander Gordon 1795 recommended hand washing and clean clothes between delivering babies but was criticised by other doctors (until Germ Theory proved him right...) Cause of scurvy (lack of Vit C) amongst sailors found in 1753. Prevented by drinking lime juice. Inoculation: Mary Wortley Montagu 1721 Edward Jenner, 1796: The first vaccination to prevent smallpox. Vaccination made compulsory by government in 1852.  	Dr John Snow proved cholera was water-borne in 1854 (and stopped an epidemic by taking the handle off the Broad Street water pump...you know this!!) 19th century vaccines (2, 3 and 4): 1880 Chicken cholera, 1881 Anthrax, 1885 Rabies (Pasteur) More vaccines introduced since WW2. Polio 1955 Measles 1963 MMR 1988 Hepatitis 1994 Anti-malaria tablets if travelling abroad etc Infant Mortality Rate has fallen from 170 per 1000 in 1900 to 4 or 5 per 1000 today. Due to improvements in immunisation but also reducing poverty, school dinners, trained midwives and school nurses, etc Debate over MMR, 1998: Dr Andrew Wakefield suggested it might cause autism and there has been less uptake by concerned parents. Must vaccinate 95% of the population or an epidemic can break out.

Key Question 3. Attempts to treat illness and disease c.500-present day

Medieval (Up to 1500ish)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
Herbal medicines, sometimes written down in books, sometimes included prayers to say while picking the herbs, sometimes closely guarded family secrets passed down from mother to daughter, etc. FOR DOCTORS: Bleeding and purging (Four Humours) Urine diagnosis (Vademecum, 'Carry with Me', a urine chart for medieval doctors (smell it, look at colour, taste it!)) Zodiac chart: showed which parts of the body were connected to different star signs, when was the best time to use surgery or treat the patient. Only rich people could afford to consult a trained doctor (also called a 'physician') OTHERS: 'Quacks' or unlicensed doctors selling 'cures' to make money. Barber-surgeons: apprenticed and learnt on the job. Pull teeth, set broken bones, use leeches Apothecaries: made medicines	Much continued the same from Medieval times. Some doctors wrote in English not Latin in this period in an attempt to pass on more knowledge. Astronomy still used New ingredients which were discovered and supposed to heal were rhubarb and tobacco! (Some thought smoking a pipe of tobacco kept the plague away) More scientific approach to medicine, careful observation of patients. New studies of mental illness: 'melancholy' and midwifery. Greater belief in prevention and therefore not having to consult a doctor. <u>Dr Joseph Lister....Antiseptic Surgery...Modern Era 1865</u> 	Simpson and chloroform: Addressed the problem of pain in surgery, 1847 (Laughing gas 1799 and Ether 1846 tried prior to this) Queen Victoria used chloroform 1853 and it became acceptable. Black Period in Surgery 1847-1865 as doctors became more adventurous with operations leading to more deaths due to infection and blood loss. Joseph Lister, 1865, Antiseptic Surgery. Deaths related to infection dropped from nearly a half of all operations to one sixth. Aseptic Surgery (killing the germs before a patient is operated on) from late 19th century: steam sterilisers, protective clothing and rubber gloves. Marie Curie: worked on radiation and paved the way for treatments for cancer as well as mobile X-Ray machines in WW1. First 'Magic Bullet' Salvarsan 606, Paul Ehrlich, 1910, to treat syphilis, a serious STD Fleming (1928) and Florey and Chain (1940s) worked on penicillin, the first antibiotic. Christian Barnard: First successful heart transplant, 1967, paved the way for more transplant surgery. 20th century: chemotherapy: another treatment for cancer.

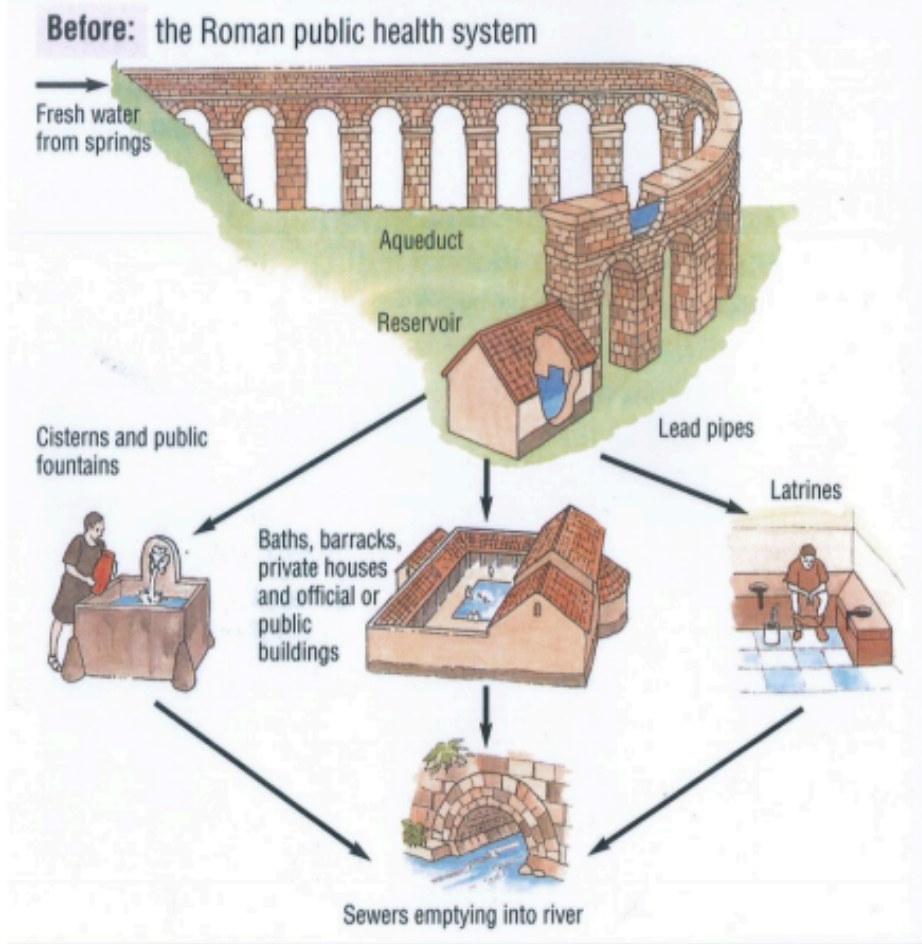
Key Question 4. Advances in Medical Knowledge c.500-present day

Medieval (Up to 1500ish)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
Key Ideas: (From Ancient Greece and Rome) Hippocrates: The Theory of the Four Humours (4 Humours in the body and if they were balanced you were healthy). Galen continued Hippocrates ideas. Also said dissection was important and improved knowledge of anatomy. Listened to a patient's pulse (still done today) These ideas dominated into Medieval times...about 1400 years! Alchemy: Early chemistry, trying to turn base metals into gold and find an 'Elixir of Life' to make you live forever! Astrology: Zodiac Chart/Star signs. Studied position of the stars before carrying out certain operations or bleeding.  Church: Set up universities to study medicine from	Renaissance... literally means rebirth (of interest in the ideas of Ancient Greece and Rome) A time of questioning of old ideas! Andreas Vesalius: Fabric of the Human Body 1543 Changed knowledge by correcting Galen on about 200 points (incl. human jaw bone and 'no holes in the septum of the heart') Ambroise Pare: Works on Surgery 1575. Developed ointment (rose oil, turpentine, egg yolk) to treat gunshot wounds instead of cauterising oil, and tied blood vessels with ligatures instead of cauterising them. William Harvey: On the Motion of the Heart, 1628, fully explained circulation of the blood.  William Harvey	Louis Pasteur: Germ Theory 1861. First person to establish link between germs and disease (Robert Koch: Science of Bacteriology. Discovered germs which caused TB (1883), cholera (1884) and later plague, pneumonia, blood poisoning etc. Dyes discovered to stain and then photograph germs. Paul Ehrlich was one of his students who improved his knowledge and developed first 'Magic Bullet'. New scientific knowledge could cure disease! Wilhelm Rontgen: X-Rays 1895. (paved the way for ultrasound, MRI and PET and CT scans.  DNA NITROGENOUS BASES - Adenine - Guanine - Thymine - Cytosine Watson and Crick: Discovered the structure of DNA in 1953. Paved the way for the fight against genetic diseases.

Key Question 5. Developments in patient care c.500-present day

Medieval (Up to 1500ish)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
The Church and monasteries: played a role in patient care though dominated by praying for the soul rather than actual treatments. Hospitals provided <i>hospitality</i> not treatments. Made patients comfortable. If they were seriously ill, not admitted, as interfered with the business of praying and religious services Infirmaries : Looked after the old and ‘infirm’. Leper hospitals for those with leprosy Almshouses: medieval equivalent of care homes for the old, but also helped widows and young children. 	Voluntary charities from mid 16th century as Henry VIII closed monasteries resulting in a drastic decrease in patient care. Royal hospitals set up in London (St Bartholomew’s, St Thomas’s etc) from royal funds Endowed voluntary hospitals outside London: local councils petitioned the King to ask for funds when the monasteries shut. Industrial Revolution lead to some individuals getting very rich and some like Thomas Guy a rich printer set up Guy’s Hospital in London In this period more hospital evolved into places where surgery took place, as well as looking after the poor sick, and dispense medicines. 	Big increase in the number of hospitals in the 19th century; increasing city populations required big general hospitals to be set up. (1800: 3000 patients in hospital, 1851: 7600) Specialist hospitals like maternity and ear, nose and throat set up, but conditions were poor. Florence Nightingale and the professionalisation of nursing: Became famous improving hospital conditions in the Crimean War. Reduced death rates On return to England, a public fund was set up and raised £50,000. FN set up an Nursing School in 1860 at St Thomas’s Hospital and wrote Notes on Nursing in 1859. in 1850 there were no trained nurses, by 1900: 68,000 Hospitals expected to be clean, have fresh air, warmth, light, appropriate diets Mary Seacole and Betsi Cadwaladr: both nurses in Crimean War who did hands-on work, using their own money. Government attitudes changed in early 20th century: welfare and social reforms to reduce poverty (Liberal gov 1906-1914), National Insurance Act 1911 Beveridge Report 1942: 5 Giants (Want, Squalor, Ignorance, Idleness, Disease) Lead to the NHS 1948: <u>First time the medicine of ordinary people changed: FREE FROM THE CRADLE TO THE GRAVE.</u> Increasing financial demands on the NHS since then: rebuilding of hospitals in the 1960s, increasing cost of caring for an ageing population, increasing need as medicine becomes more sophisticated.

Key Question 6. Developments in public health and welfare c.500-present day

Medieval (Up to 1500ish)	Early Modern 1500-1800 ish!	Modern 1800 to the present day
Very smelly towns and cities, no disposal of waste, night soil men removed human waste (poo!) from privies and dumped it into rivers...Shitebrook in Exeter! Attempts were made by councils to clear waste but often unsuccessful, latrines were often over rivers and likely to flood. Outbreaks of plague (Black Death) due to rats from 1348, often worst in summer months, between a third and a half of all people in Europe died.	Many outbreaks of plague through 16th/ 17th centuries, eg 1563, 1603, and the Great Plague of 1665 (80,000 dead in London) when attempts were made to clean up streets and 'kill mice and rats' (Aberdeen 1647) Henry VII (1485-1509) passed a law forbidding slaughterhouses from within town and city walls (butchers threw the entrails and muck into already polluted rivers) Henry VIII passed an act of parliament allowing towns to raise taxes to build sewers (1532) but few places did. Beginning to make the link between dirt and disease but cities growing fast and impossible to keep clean. After Great Fire of London 1666, act of parliament passed to rebuild London, widen streets and build with stone and tiles to reduce fire risk, etc, and 1690, an act to pave and clean the streets.	Industrialisation lead to rural to urban migration. Cities increased in size, leading to overcrowded living conditions for the urban poor. Government attitude of laissez-faire ('leave it alone') meaning in early 19th century they didn't get involved in public health. Average age of death in Manchester in 1842 was 17. Outbreaks of cholera from 1831 (52,000 dead in 1848) Edwin Chadwick: Convinced most people were poor due to poor health not idleness. Report 'On the Sanitary Conditions of the Labouring Population' 1842. John Snow proves cholera is in water in 1854. First Public Health Act 1848: Not compulsory. Councils could build sewers, provide clean water and clear refuse if they wanted to raise tax to do so. 1875 Second Public Health Act forced councils to do this = real breakthrough in PH. New sewers for London from 1858 (Bazalgette) Individual acts to improve health of workers from rich industrialists like Titus Salt 20th Century: Boer War identified problem that many volunteers were unfit to serve in the army. Infant Mortality Rate very high. Reports by Charles Booth (1889 London; 35% of people in 'abject poverty') and Seebohm Rowntree (1901 York; nearly half the population lived in poverty)
 Before: the Roman public health system Fresh water from springs Aqueduct Reservoir Cisterns and public fountains Baths, barracks, private houses and official or public buildings Lead pipes Latrines Sewers emptying into river	20th Century continued!! Clean Air Act 1956, New Towns like Harlow in 1960s, blocks of flats to clear slums 21st century: Government campaigns about unhealthy lifestyles, fitness drives and healthy eating (obesity epidemic)	Some improvement after WW1: Homes for Heroes (but only half of promised 500,000 new homes built) Some new council housing for rent but Great Depression slowed this. Destruction of WW2 meant new homes and slum clearance had to happen (Labour gov 1945-51 built 1 million houses)



THS

TIVERTON HIGH SCHOOL

Year 10

Maths

Work hard. Be kind. Belong.

Algebra - Foundation

Notation

$$ab = a \times b$$

$$a^2 = a \times a$$

$$(2a)^3 = 2a \times 2a \times 2a$$

$$(a + b)^2 = (a + b)(a + b)$$

Definitions

Expression – no equal signs e.g. $2x + 3$, $2y$, $(3x - 2)^2$

Equations – equal signs, can be solved, e.g. $y + 4 = 10$

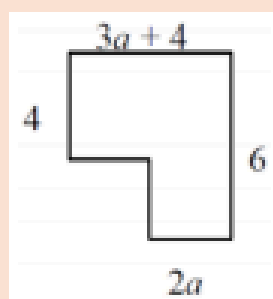
Identities – identical/equivalent to e.g. $2(y + 4) \equiv 2y + 8$

Formulae – equal signs, more than one unknown e.g. $A = \frac{1}{2}bh$

Simplifying expressions by collecting like terms

Always circle the sign IN FRONT of the term to avoid errors.

$$3x(-7b-x)+9b \equiv 2x+2b$$



Typical Exam Q: Create an expression for the perimeter of the shape by adding and collecting like terms.

If the perimeter is given as 20cm, for example, you can create an equation:

$$4 + 3a + 4 + 6 + 2a = 20$$

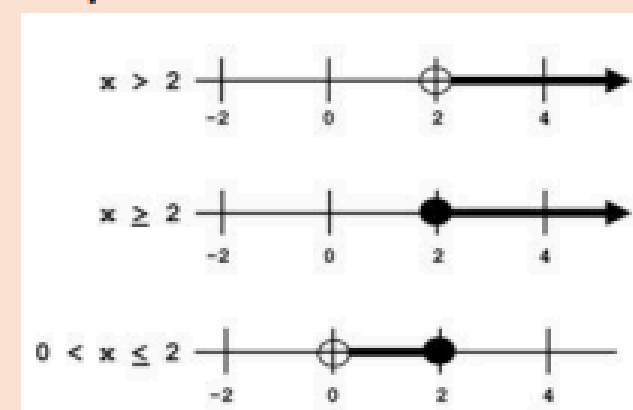
$$5a + 14 = 20$$

Simplifying expressions multiplication and division

$$2ma^2 \times 7ma = 14m^2a^3$$

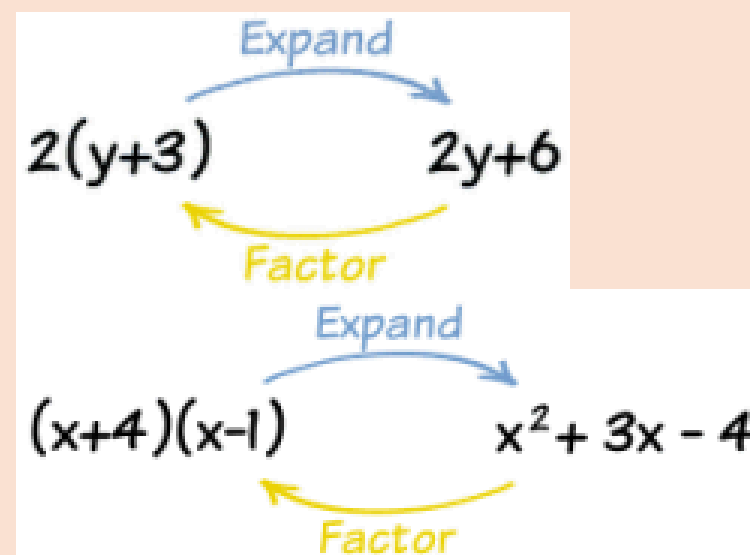
$$\frac{18b^6}{3ab^2} = \frac{6b^4}{a}$$

Inequalities



Open circle: $</>$
Closed circle: $\leq/\geq$

Factorising and expanding

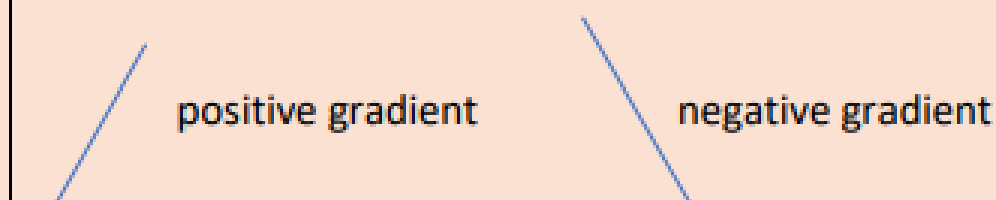


Straight line graphs

$$y = mx + c$$

$$m = \text{gradient}$$

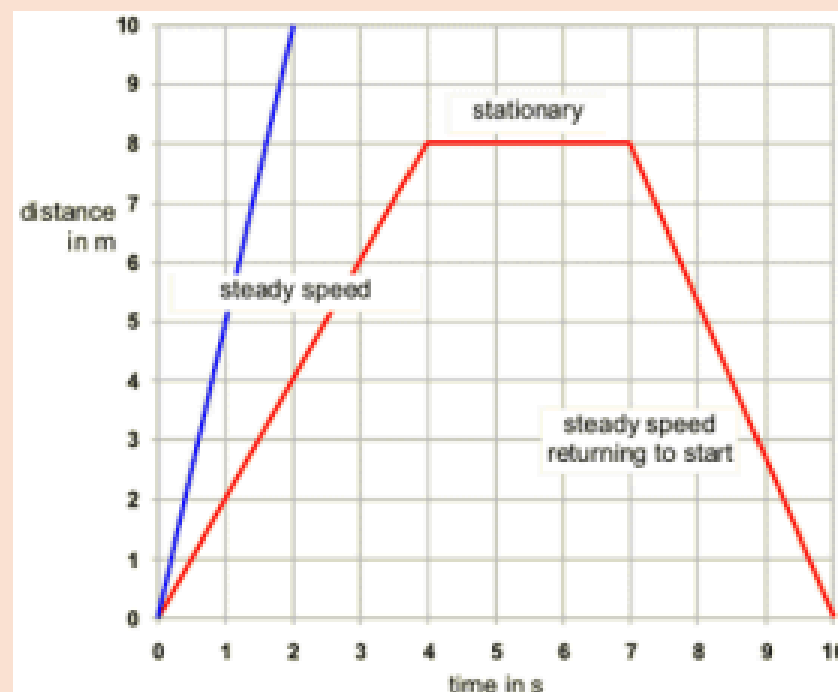
$$c = y - \text{intercept}$$



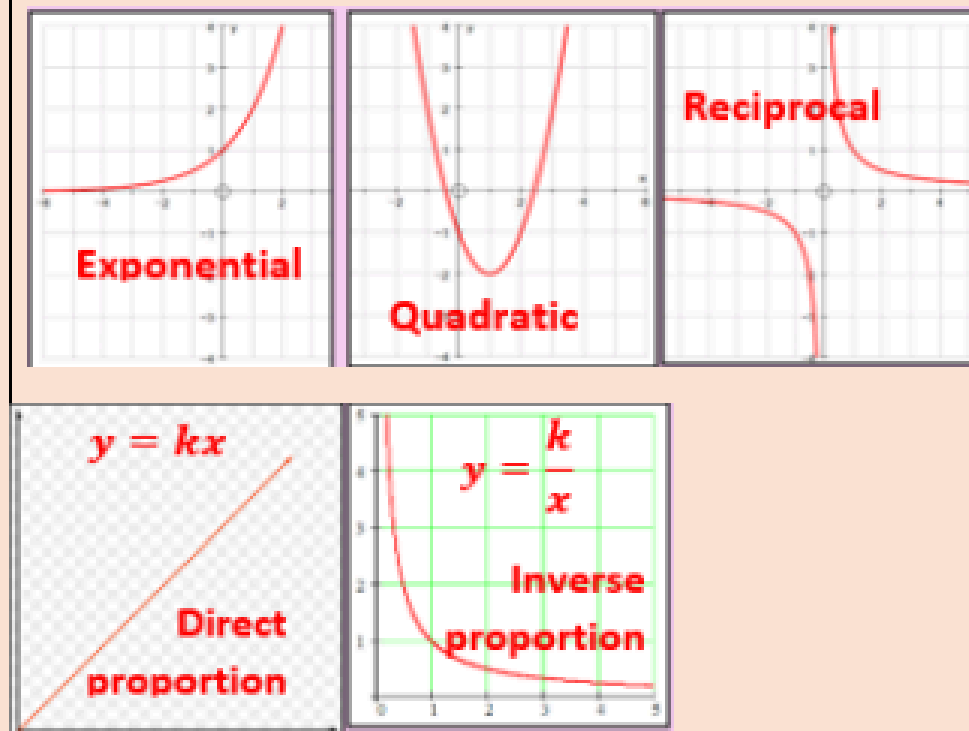
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in } y}{\text{change in } x}$$

Parallel lines – have equal gradients

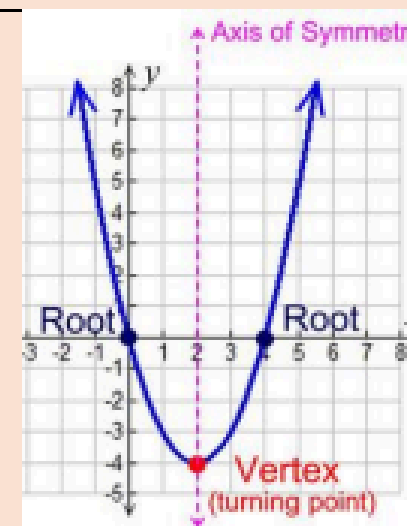
Distance / Time Graphs



Graphs that need to be recognised



Turning point and roots of a quadratic equation



Finding the nth term of a linear sequence

5, 7, 9, 11, 13,

- Find the common difference: 2
- This is the coefficient of n : $2n$
- Find the difference between the coefficient of n and the first term $5 - 2 = 3$
- Add this to the amount of n
 $2n + 3$

Geometry and Measures - Foundation

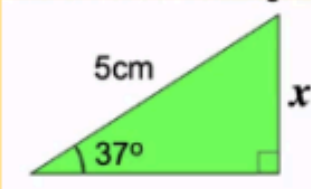
Trigonometry

$$S \frac{O}{H} C \frac{A}{H} T \frac{O}{A}$$

Example – finding a side:

$$\sin 37 = \frac{x}{5}$$

$$x = 5 \times \sin 37^\circ$$



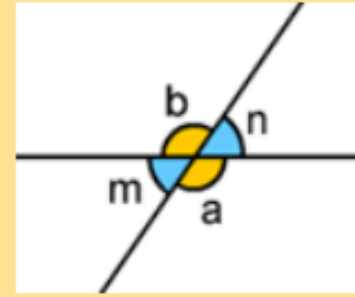
Example – finding a side:

$$\tan y = \frac{3.2}{7.1}$$

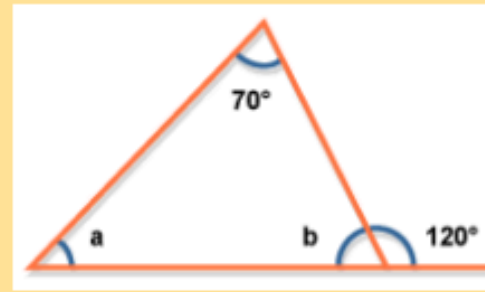
$$y = \tan^{-1} \left(\frac{3.2}{7.1} \right)$$



Angle Facts



Vertically opposite angles are equal: $a=b$ and $m=n$

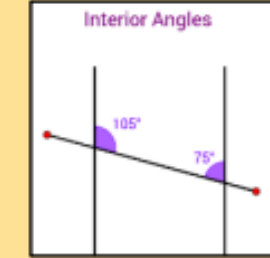
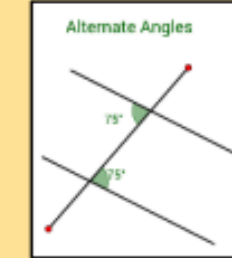
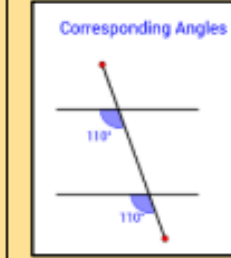


Angles in a triangle sum to 180° .

Angles on a straight line sum to 180° .

E.G: $b=60^\circ$ so $a = 50^\circ$

Angles in parallel lines



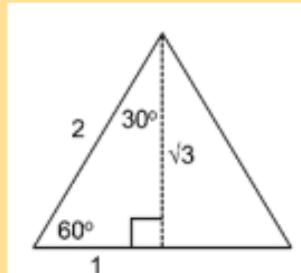
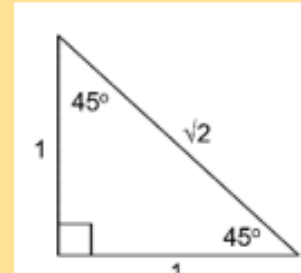
Corresponding angles are equal

Alternate angles are equal

Co-interior angles add to 180.

Exact Trig values

Angle (θ)	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
0°	0	1	0
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45°	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90°	1	0	undefined



Simple vector notation

$$\begin{pmatrix} a \\ b \end{pmatrix}$$

a : movement along the x-axis (left or right)

b : movement along the y-axis (up or down)

$-a$: movement left

$-b$: movement down

Operations with vectors

$$\begin{pmatrix} 2 \\ 6 \end{pmatrix} + \begin{pmatrix} 7 \\ -3 \end{pmatrix} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$$

$$\text{If } b = \begin{pmatrix} 4 \\ -2 \end{pmatrix}, \text{ then } 3b = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$$

Volume & surface area

Volume = area of cross section $\times$ length

Surface area = area of all the faces of a 3D shape

Learn the cylinder

$$V = \pi r^2 h$$

$$SA = 2\pi r^2 + \pi dl$$

Types of triangles

Right angled
Isosceles
Equilateral
Scalene

Types of quadrilaterals

Square
Rectangle
Parallelogram
Rhombus
Trapezium
Kite

Area of key shapes

Triangle: $A = \frac{b \times h}{2}$ (h = perpendicular height)

Parallelogram: $A = b \times h$ (h = perpendicular height)

Trapezium: $A = \left(\frac{a+b}{2} \right) \times h$ (add together the parallel sides, divide the total by 2, and then multiply by the perpendicular height between the parallel sides)

Angles in regular polygons

n = number of sides

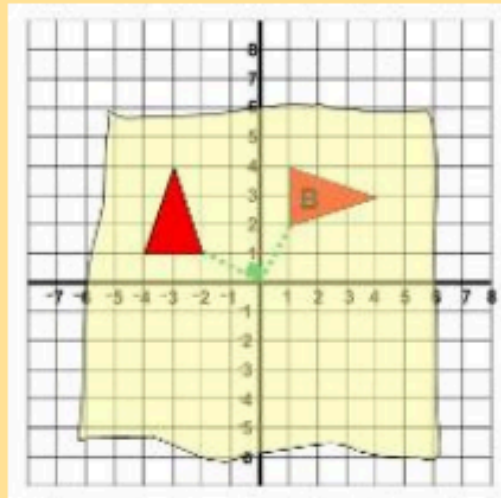
Interior angle + exterior angle = 180°

$$\text{Exterior angle} = \frac{360}{n}$$

$$n = \frac{360}{\text{Exterior angle}}$$



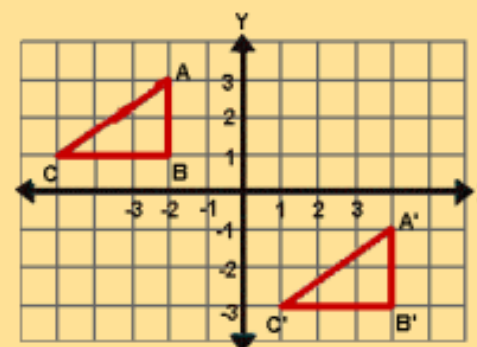
Transformations – rotation



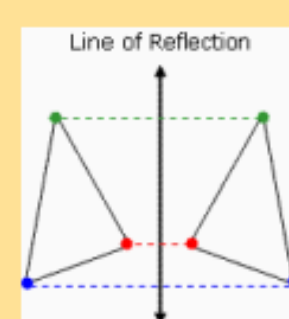
Always use tracing paper.
Describe:

1. It's a rotation
2. Size of rotation in degrees
3. Orientations: clockwise or anticlockwise
4. Centre of rotation given as a coordinate (x,y)

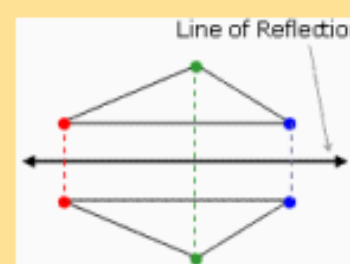
Transformations – translations and reflections



Translate triangle ABC to A'B'C' with the vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$

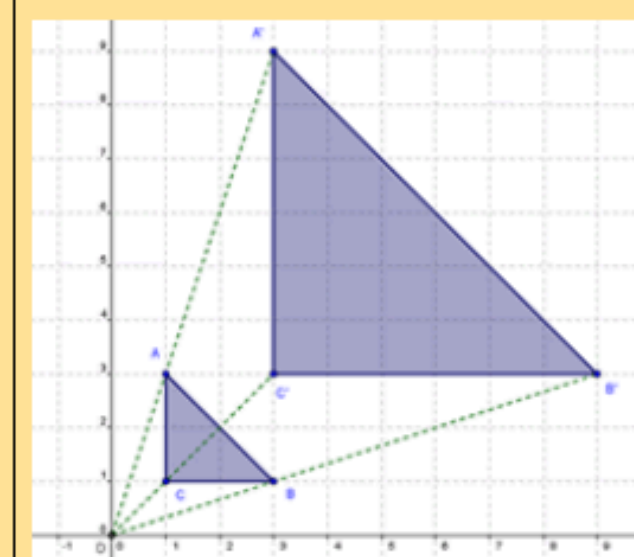


Reflection in the line $x=a$



Reflection in the line $y=a$

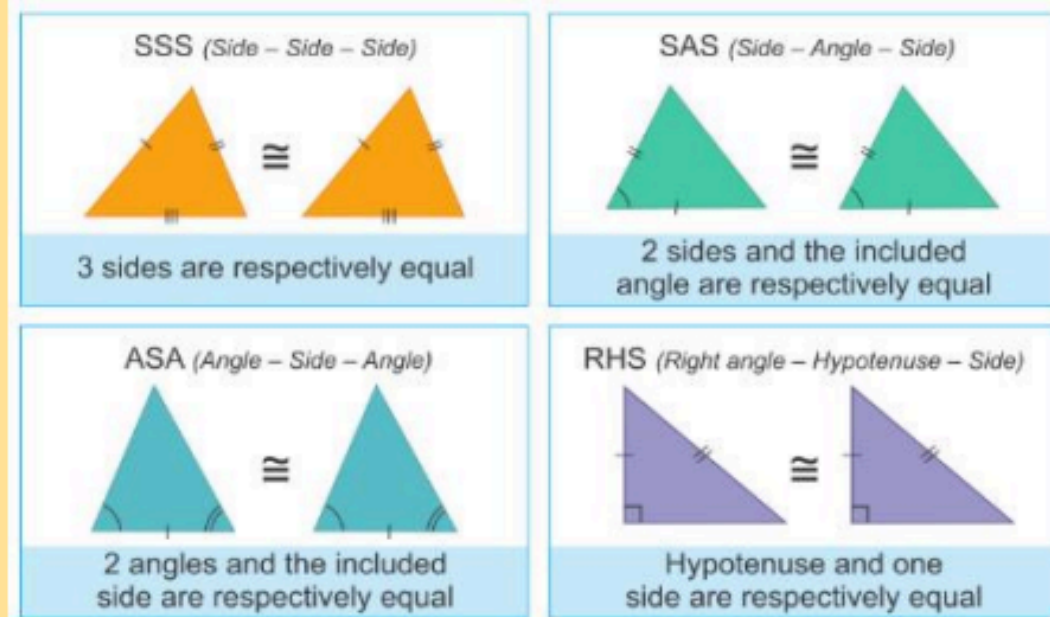
Transformations - enlargement



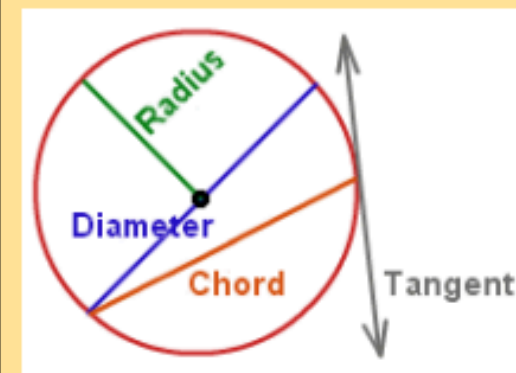
Describe:

1. It's an enlargement
2. The scale factor (if the image is smaller than the object the scale factor is fractional e.g. $\frac{1}{2}$)
3. The centre of enlargement given as a coordinate

Congruent triangles

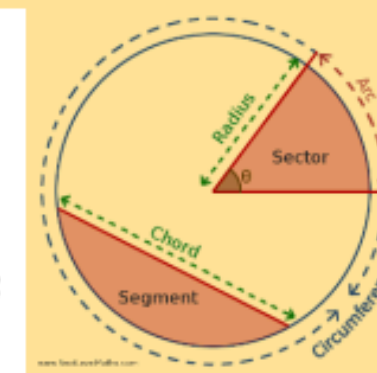


Circles



$$\text{Area} = \pi r^2$$

$$\text{Circumference} = \pi d$$



$$\text{Sector Area} = \frac{\theta}{360} \pi r^2$$

$$\text{Arc length} = \frac{\theta}{360} \pi d$$

Pythagoras' Theorem

$$a^2 + b^2 = c^2$$

Only applies to right angled triangles.

Can be used to find the height of an isosceles triangle

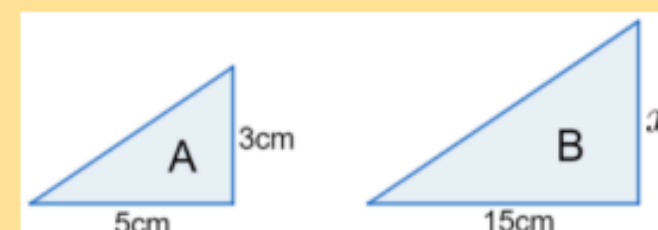


Can be used to find the length distance between two coordinates

Similar shapes

Same shape, different sides

The ratio of the lengths of corresponding sides are equal



$$\text{Length scale factor} = 15 \div 5 = 3$$

$$x = 3\text{cm} \times 3$$

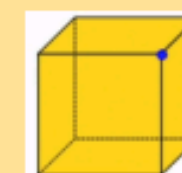
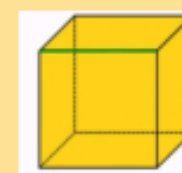
3D notation

Cube:

Faces: 6

Edges: 12

Vertices: 8



Square based pyramid:



$$F = 5, E = 8, V = 5$$

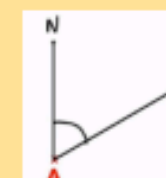
Bearings

Measure from the North

Measured in a clockwise direction

Written using 3 digits

Bearing of B from A (start at A)

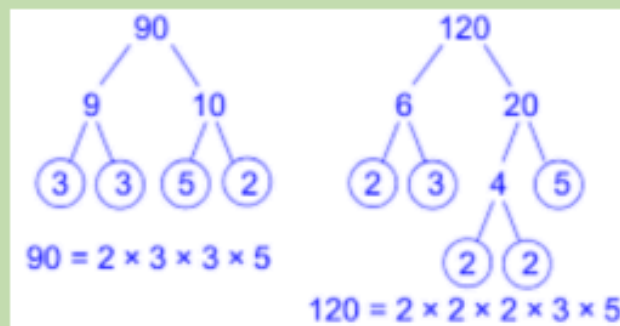
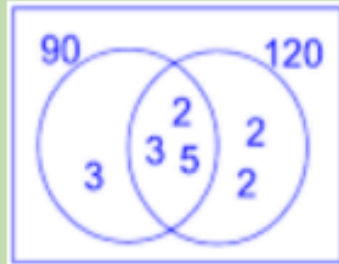


Bearing of A from B (start at B)



Number Ratio and Proportion - Foundation

Estimate Round each value to one significant figure	Simplifying Ratio Divide both sides by the highest common factor 	Percentages Finding percentages of an amount 1% ÷100 5% ÷20 20% ÷5 25% ÷4 50% ÷2 Multipliers: To find the multiplier for a percentage, divide by 100 Use multipliers on a calculator paper e.g. 35% of 370 = 0.35 x 370
Standard form $a \times 10^n$, where $1 \leq a < 10$		
Reciprocal Reciprocal of 7 is $\frac{1}{7}$, reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ etc	Simplifying Ratio 1:n Divide both sides by the highest factor of the left hand side 2m: 180cm 200cm: 180cm 2:1.8 1: 0.9	
Sequences Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21 Geometric Sequence: each term is multiplied but he same constant to get the next number. E.g. 3, 12, 48, 191, (x by 4 each time)		
Squares and Cubes Square numbers: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225 etc Cube numbers: 1, 8, 27, 64, 125, 216, 343, 512, etc	Fractions Add and Subtract – ensure the fractions have the same denominator before adding numerators $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$	Increasing and decreasing a given amount Calculator: <i>Orginal Amount x mutiplier = new amount</i> Non-calculator: find the increase or decrease and add to the original amount
Sharing in a given Ratio A Add the ratio parts D Divide the amount by the total parts A and M Multiply the ratio by the value of one part e.g. share £420 in the ratio 2:5 2 + 5 = 7 420 ÷ 7 = £60 2: 5 (x60) (x60) £120 : £300	Multiply – multiply numerators and denominators $\frac{4}{5} \times \frac{1}{3} = \frac{4}{15}$ Divide – take reciprocal of the second fraction and then multiply the new numerators and denominators $\frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \frac{3}{1} = \frac{12}{5} = 2\frac{2}{5}$	Finding percentage increase or decrease (profit/loss) $\frac{\text{value of increase/decrease}}{\text{Original}} \times 100$ Writing an amount as a percentage of the original $\frac{\text{Amount}}{\text{Original}} \times 100$ Reverse Percentage – finding the original amount $\text{Orginal Amount} = \frac{\text{New Amount}}{\text{multiplier}}$

Growth & Decay / Compound interest $original\ amount \times multiplier^{time}$ Where the multiplier is the percentage, increase or decrease from 100%, converted to a decimal. e.g. 30% decrease is 70% = 0.7 30% increase is 130% = 1.3	Dividing by decimals: 1. Write the calculation as a fraction 2. Form an equivalent fraction to makes integers (multiply by powers of 10) 3. Use short division (bus stop) to calculate e.g. $460 \div 0.4 = \frac{460}{0.4} = \frac{4600}{4} = 1150$	Conversions 10 millimetres = 1 centimetre 15 minutes = 0.25 hours 100 centimetres = 1 metre 30 minutes = 0.5 hours 1000 metres = 1 kilometre 45 minutes = 0.75 hours 1000cm³ = 1 litre 1000g = 1 kilogram 1000ml = 1 litre 1000kg = 1 tonne
Compound Units (rearrange as necessary) $Speed = \frac{Distance}{Time}$$Area = \frac{Force}{Pressure}$$Density = \frac{Mass}{Volume}$	Error Intervals least possible value $\leq x <$ greatest possible value e.g. A fence is 30 m long to the nearest 10 m. $25\text{ m} \leq l < 35\text{ m}$ Truncation Truncation is a method of approximating a decimal number by dropping all decimal places past a certain point without rounding. e.g. Truncate 3.14159265 to 4 decimal places. $= 3.1415$	Negative numbers Adding and subtracting: (vertical number lines help) $-3 - 5 = -8$ $-3 + 5 = 2$ $-3 - -5 = -3 + 5 = 2$ $-3 - +5 = -3 - 5 = -8$ $-3 + -5 = -3 - 5 = -8$ Multiplying and dividing: Different signs – answer will be negative $+ \times - = -$, $- \times + = -$ Same signs – answer will be positive $- \times - = +$
Ordering fractions Calc: use division to write each fraction as a decimal Non-calc: write fractions with common denominators	Order of operations Bracket Indices Division and Multiplication Addition and Subtraction	Rounding to significant figures Start from the first non-zero number and round as normal, but ensure the place value is correct e.g. 345,635 to 2SF = 350,000 0.0060821 to 3SF = 0.0608
Index Laws $a^n \times a^m = a^{n+m}$$a^n \div a^m = a^{n-m}$$(a^n)^m = a^{nm}$$a^0 = 1$$a^{-n} = \frac{1}{a^n}$$a^{\frac{n}{m}} = \sqrt[m]{a^n}$	Prime Factorisation 	HCF and LCM of 90 and 120 (Factor Tree & Venn Diagram) HCF is the product of common factors LCM is the product of common factors and remaining factors.  HCF: 2x3x5 LCM: 2³x3²x5

Averages

Mode: most common piece of data

Mean: Sum of the data $\div$ total frequency

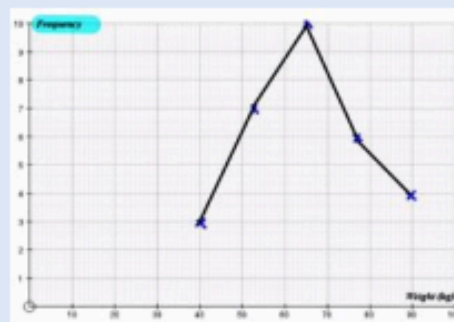
Median: order the data and find the middle value

Range: Highest value – lowest value

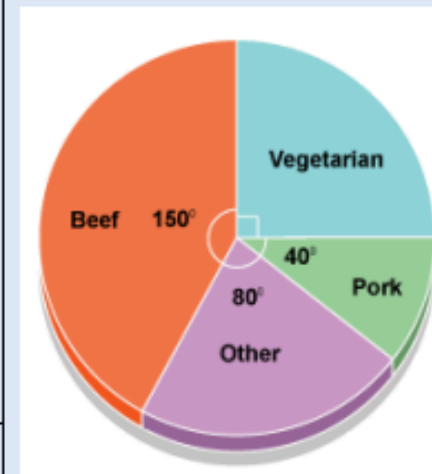
Frequency Polygons

1. Plot frequency at the mid-point
2. Join with straight lines

Weight w (kg)	Frequency
$30 \leq w < 50$	3
$50 \leq w < 55$	7
$55 \leq w < 75$	10
$75 \leq w < 80$	6
$80 \leq w < 100$	4



Reading and Drawing Pie Charts



Find the fraction of the total

1000 people were surveyed

$$\text{Beef: } \frac{150}{360} \times 1000$$

$$\text{Vegetarian: } \frac{90}{360} \times 1000$$

Hair colour	People
Blonde	8
Brown	12
Red	3
Grey	2
Black	6

Find the fraction of the full circle.

$$\text{Size of Blonde sector: } \frac{8}{31} \times 360^\circ$$

Averages from a frequency table

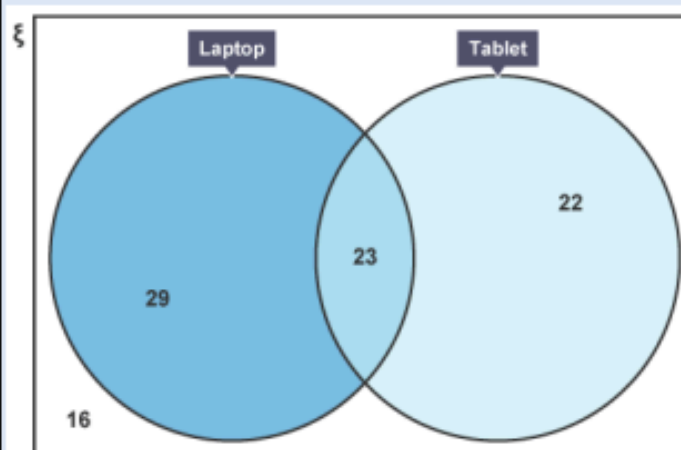
Mean: $\frac{\sum fw}{\sum f}$; where, w is the midpoint of the group.

Median group: find which group the $\frac{n+1}{2}$ th, value lies. Where, n is the total frequency.

E.G. in this table 51.5th value which lies in group $8 < w \leq 12$ (using the cumulative frequency)

Weight of box (w kg)	Frequency
$0 < w \leq 4$	11
$4 < w \leq 8$	16
$8 < w \leq 12$	29
$12 < w \leq 16$	26
$16 < w \leq 20$	20

Venn Diagrams



Information given:
90 pupils were surveyed
52 said they owned a laptop.
45 said they owned a tablet.
23 said they owned both.

Expected outcomes

Expected outcome = probability $\times$ number of trials

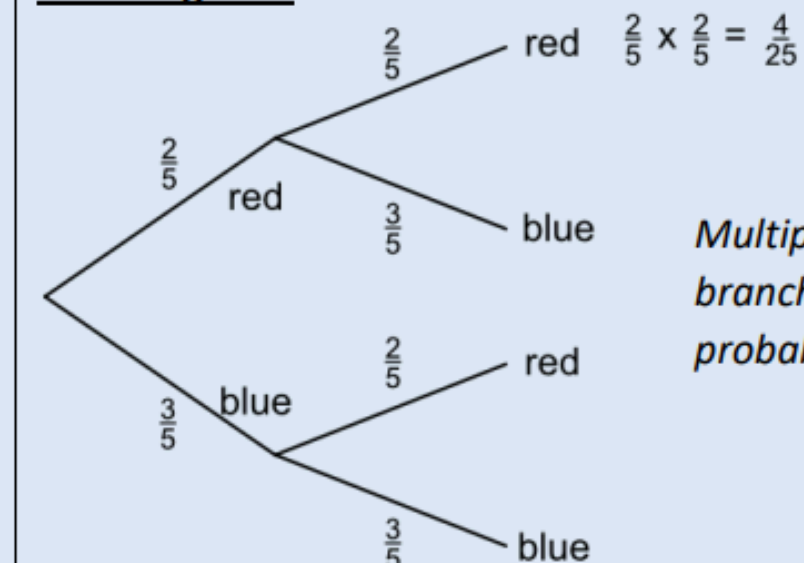
E.g. A biased spinner is spun 800 times. The probabilities of it landing on each colour is below. The probability of it landing on red is the same as the probability of it landing on green. How many times would you expect yellow to come up.

Result	Red	Green	Brown	Yellow
Probability		0.48	0.2	

$$P(Y) = (1 - 0.48 - 0.2) \div 2 = 0.32 \div 2 = 0.16$$

$$\text{Expected yellow} = 0.16 \times 800 = 128$$

Tree diagrams



Multiply along the branches to find each probability.

1. Probability that a red counter is picked both times $P(RR) = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$

2. Probability that the counters are different colours $P(RB) + P(BR) = \frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{2}{5} = \frac{12}{25}$

Probability Definitions

Total probability: adds to 1

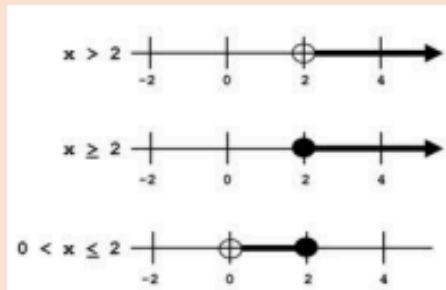
Relative frequency: *frequency $\div$ total trials*

Independent events: one event doesn't impact the other

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Linear Inequalities



Open circle: $</>$

Closed circle: $\leq/\geq$

Algebraic proof – toolkit

Even numbers: $2n, 2n+2, 2n+4, \dots$

Odd numbers: $2n+1, 2n+3, 2n+5, \dots$

Sum: add

Product: multiply

Difference: subtract

Show it's a multiple: factorise

Show it's even: show it's a multiple of 2

Show it's odd: show it's a multiple of 2, plus 1

Straight line graphs

$$y = mx + c$$

$m = \text{gradient}$

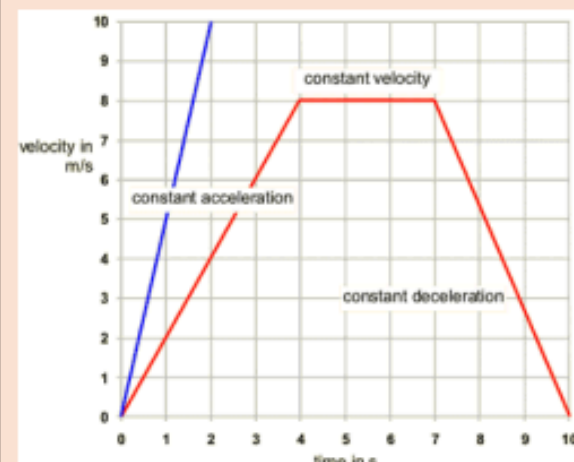
$c = y - \text{intercept}$

positive gradient

negative gradient

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in } y}{\text{change in } x}$$

Velocity / Time Graphs



Gradient = acceleration

Area = distance travelled

Completing the square

Quadratic expression factorised by completing the square:

$$(x + a)^2 + b$$

Turning point of graph occurs at $(-a, b)$

Solve quadratic inequalities

e.g solve $x^2 + 5x - 24 \geq 0$

1. Factorise: $(x + 8)(x - 3) \geq 0$

2. Solve: $x = -8, x = 3$

3. Sketch the graph



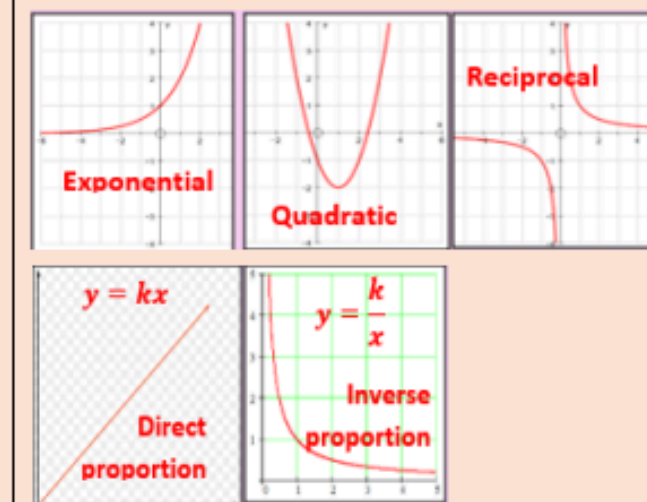
4. Values that satisfy the inequality $x \leq -8, x \geq 3$

Parallel lines – have equal gradients

Perpendicular lines – If L_1 and L_2 are perpendicular then

$$m_2 = -\frac{1}{m_1}$$

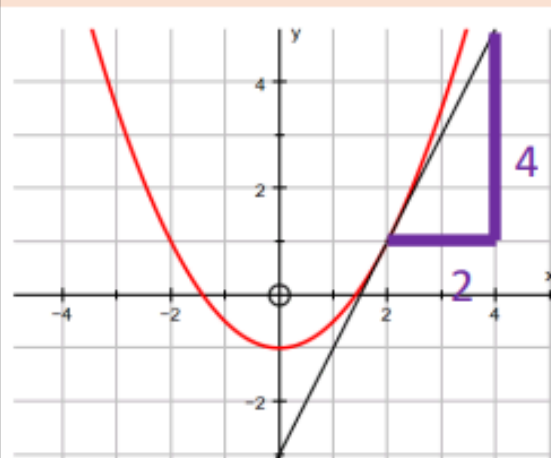
Graphs that need to be recognised:



Iteration – showing a root lies between 2 points:

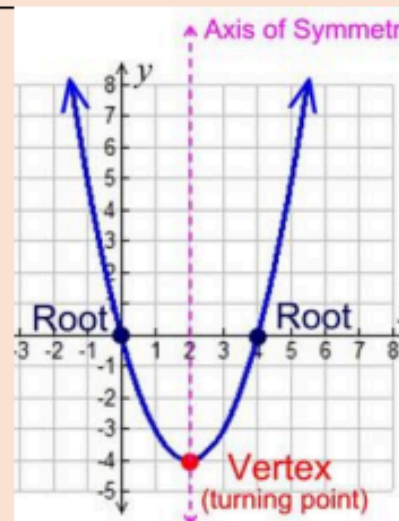
If there is a **change in sign** for y for two particular values of x then we can say there is a **root** between these values of x and we can say that the equation $f(x) = 0$ will have a solution between these two values of x .

Gradients of curves



Gradient of a curve at a point = gradient of the tangent at the point

Turning point and roots of a quadratic equation



Equation of a circle centre $(0, 0)$

$$x^2 + y^2 = r^2$$

Functions

$f(4)$: Substitute 4 into the function

$f(g(x))$: Substitute $g(x)$ into $f(x)$ i.e. replace all values of x in $f(x)$ with the entire function $g(x)$

e.g. $f(x) = 2x + 3, g(x) = x - 3, fg(x) = 2(x-3) + 3$

Geometry and measure - Higher

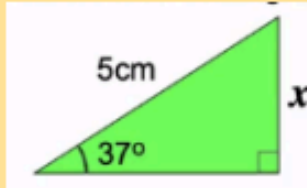
Trigonometry

$$S \frac{O}{H} C \frac{A}{H} T \frac{O}{A}$$

Example – finding a side:

$$\sin 37^\circ = \frac{x}{5}$$

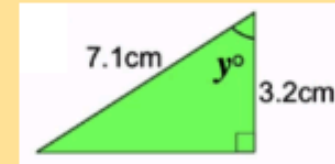
$$x = 5 \times \sin 37^\circ$$



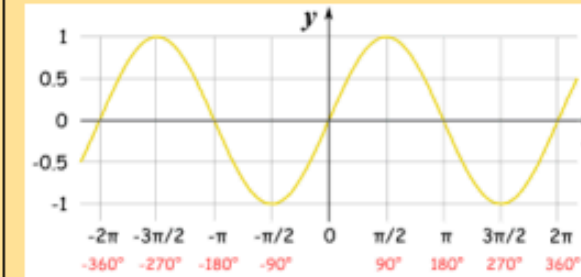
Example – finding a side:

$$\tan y^\circ = \frac{3.2}{7.1}$$

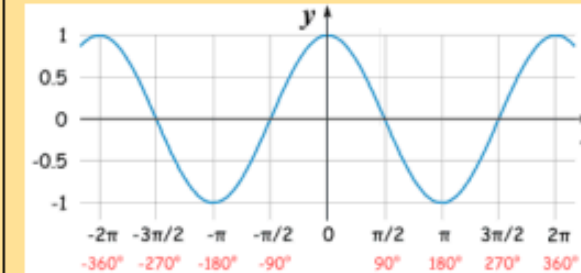
$$y = \tan^{-1}\left(\frac{3.2}{7.1}\right)$$



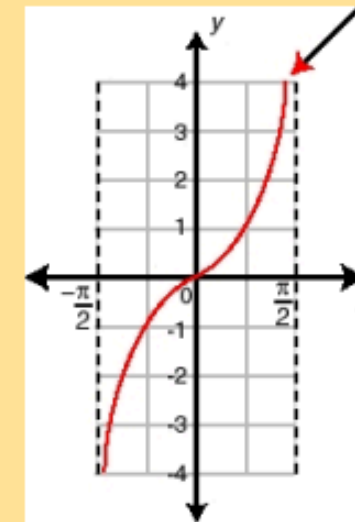
Sine Curve



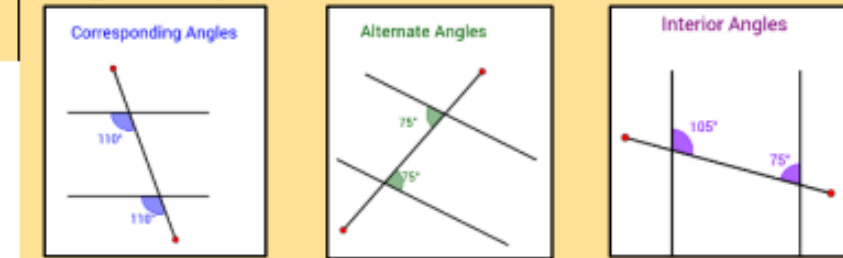
Cosine Curve



Tangent Curve



Angles in parallel lines



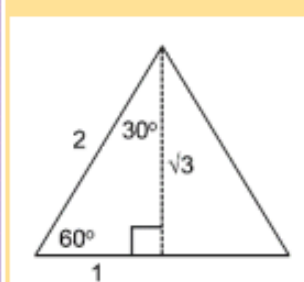
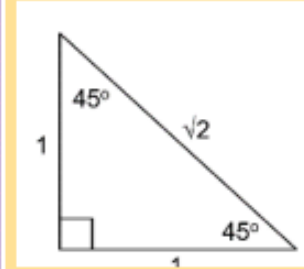
Corresponding angles are equal

Alternate angles are equal

Co-interior angles add to 180.

Exact Trig values

Angle (θ)	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
0°	0	1	0
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45°	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90°	1	0	undefined



Simple vector notation

$$\begin{pmatrix} a \\ b \end{pmatrix}$$

a : movement along the x-axis (left or right)

b : movement along the y-axis (up or down)

$-a$: movement left

$-b$: movement down

Operations with vectors

$$\begin{pmatrix} 2 \\ 6 \end{pmatrix} + \begin{pmatrix} 7 \\ -3 \end{pmatrix} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$$

$$\text{If } b = \begin{pmatrix} 4 \\ -2 \end{pmatrix}, \text{ then } 3b = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$$

Volume & surface area

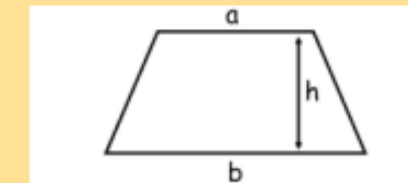
Learn the cylinder

$$V = \pi r^2 h$$

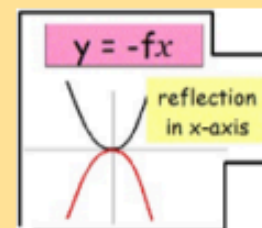
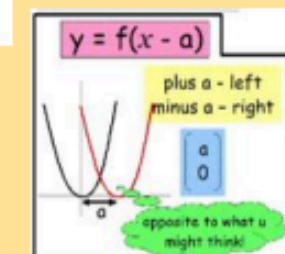
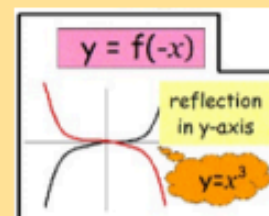
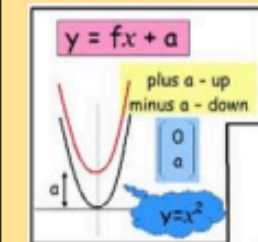
$$SA = 2\pi r^2 + \pi dl$$

Area of a trapezium

$$A = \frac{1}{2}(a + b)h$$



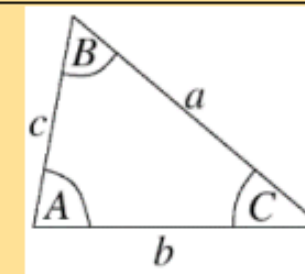
Transformation of a graph



Sine rule

$$\text{angles: } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{sides: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Area of a triangle

$$\frac{1}{2} ab \sin C$$

Angles in regular polygons

n = number of sides

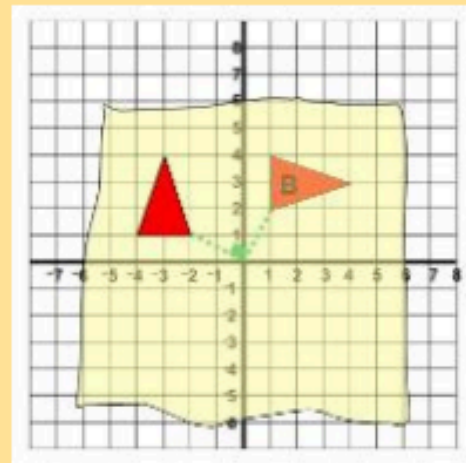
Interior angle + exterior angle = 180°

$$\text{Exterior angle} = \frac{360}{n}$$

$$n = \frac{360}{\text{Exterior angle}}$$



Transformations – rotation – describing:



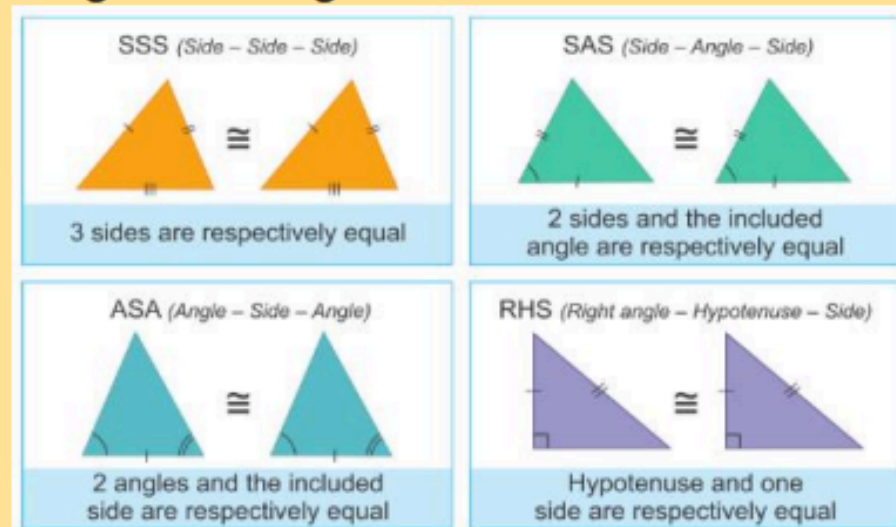
Always use tracing paper.
Describe:

1. It's a rotation
2. Size of rotation in degrees
3. Orientations: clockwise or anticlockwise
4. Centre of rotation given as a coordinate (x,y)

Transformation – translation

Vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$ 6 right, 4 down

Congruent triangles



Similar shapes

Same shape, different sides
The ratio of the lengths of corresponding sides are equal

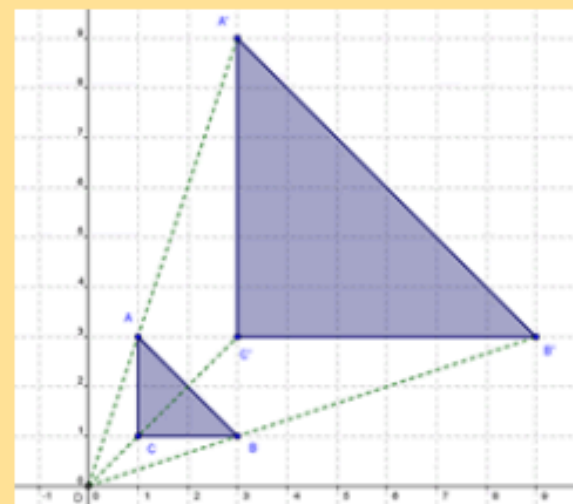
Length scale factor = x

Area scale factor = x^2

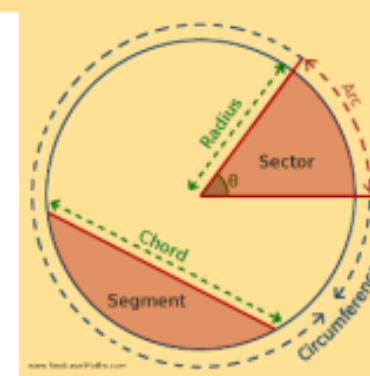
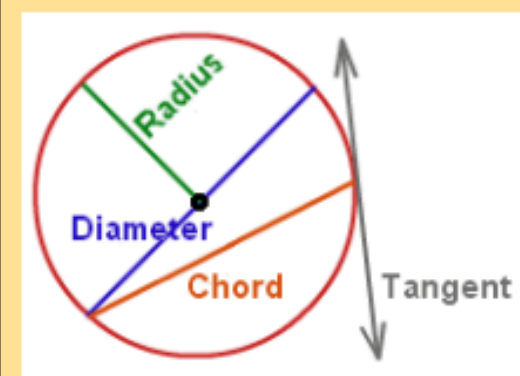
Volume scale factor = x^3

Transformations – enlargement - describing:

1. It's an enlargement
2. The scale factor (if the image is smaller than the object the scale factor is fractional e.g. $\frac{1}{2}$)
3. The centre of enlargement given as a coordinate



Circles



$$\text{Area} = \pi r^2$$

$$\text{Circumference} = \pi d$$

$$\text{Sector Area} = \frac{\theta}{360} \pi r^2$$

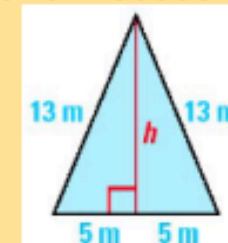
$$\text{Arc length} = \frac{\theta}{360} \pi d$$

Pythagoras' Theorem

$$a^2 + b^2 = c^2$$

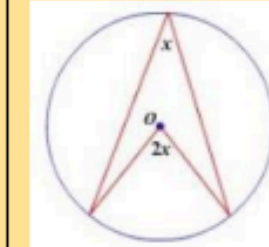
Only applies to right angled triangles.

Can be used to find the height of an isosceles triangle

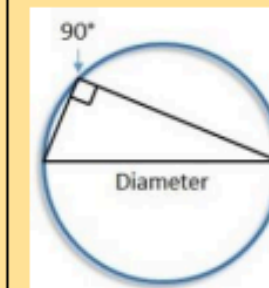


Can be used to find the length distance between two coordinates

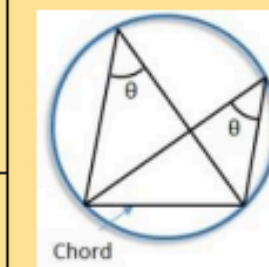
Circle Theorems



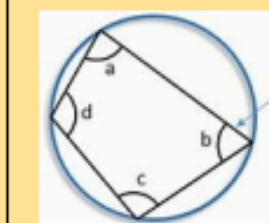
Angle at the centre is twice the angle at the circumference



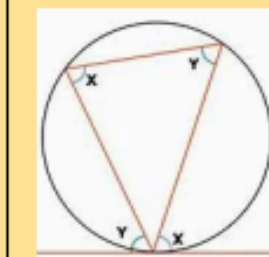
Angles in a semicircle are 90° .



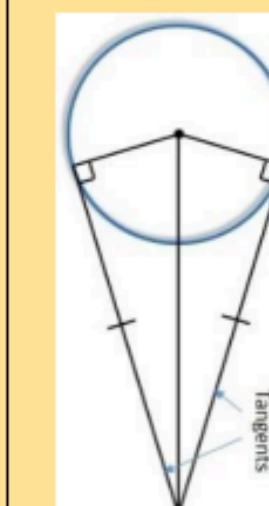
Angles in the same segment are equal.



Opposite angles of a cyclic quadrilateral add up to 180.

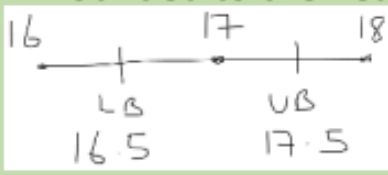


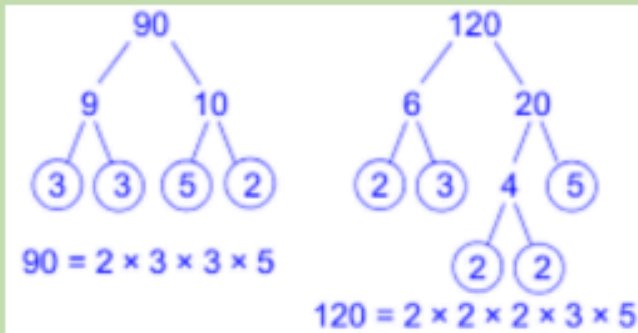
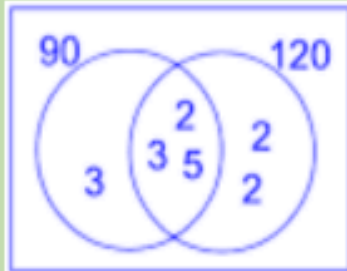
Alternate segment theorem.



Tangents from an external point are equal in length.

The tangent to a circle is perpendicular (90°) to the radius

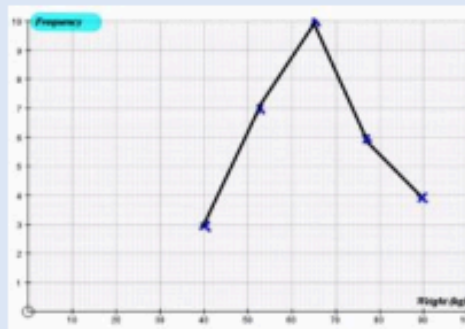
Number Ratio and Proportion - Higher		
Estimate Round each value to one significant figure	Recurring Decimals Form two equations where the digits following the decimal point are the same, and therefore can be cancelled	Percentages Finding percentages of an amount 1% $\div 100$ 5% $\div 20$ 20% $\div 5$ 25% $\div 4$ 50% $\div 2$
Standard form $a \times 10^n$, where $1 \leq a < 10$		
Reciprocal Reciprocal of 7 is $\frac{1}{7}$, reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ etc	Upper and lower bounds Look at the value above and below for the same place value. LB and UB will be half way between these points e.g. 17 rounded to the nearest integer  e.g. 24.6 rounded to one decimal place. LB = 24.55, UB = 24.65	Multipliers: To find the multiplier for a percentage, divide by 100 Use multipliers on a calculator paper e.g. 35% of 370 = 0.35×370
Sequences Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21 Geometric Sequence: each term is multiplied but he same constant to get the next number. E.g. 3, 12, 48, 191, (x by 4 each time)		
Simplifying Surds Find a factor that is a square number $\sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$ Manipulating surds $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ Rationalising Surds Rationalise by removing any surds from the denominator E.G with surd. $\frac{2\sqrt{3}}{\sqrt{5}} = \frac{2\sqrt{3} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{2\sqrt{3 \times 5}}{\sqrt{5 \times 5}} = \frac{2\sqrt{15}}{\sqrt{25}} = \frac{2\sqrt{15}}{5}$ E.G with surd expressions multiply by top and bottom by the denominator with the opposite sign. $\frac{5}{3 + \sqrt{2}} = \frac{5 \times (3 - \sqrt{2})}{(3 + \sqrt{2}) \times (3 - \sqrt{2})} = \frac{5(3 - \sqrt{2})}{9 - \sqrt{4}} = \frac{5(3 - \sqrt{2})}{7}$	Fractions Add and Subtract – ensure the fractions have the same denominator before adding numerators $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$ Multiply – multiply numerators and denominators $\frac{4}{5} \times \frac{1}{3} = \frac{4}{15}$ Divide – take reciprocal of the second fraction and then multiply the new numerators and denominators $\frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \frac{3}{1} = \frac{12}{5} = 2\frac{2}{5}$	Increasing and decreasing a given amount Calculator: <i>Original Amount x mutiplier = new amount</i> Non-calculator: find the increase or decrease and add to the original amount Finding percentage increase or decrease (profit/loss) $\frac{\text{value of increase/decrease}}{\text{Original}} \times 100$ Writing an amount as a percentage of the original $\frac{\text{Amount}}{\text{Original}} \times 100$ Reverse Percentage – finding the original amount $\text{Original Amount} = \frac{\text{New Amount}}{\text{multiplier}}$

Growth & Decay / Compound interest $original\ amount \times multiplier^{time}$ Where the multiplier is the percentage, increase or decrease from 100%, converted to a decimal. e.g. 30% decrease is 70% = 0.7 30% increase is 130% = 1.3	Dividing by decimals: 1. Write the calculation as a fraction 2. Form an equivalent fraction to makes integers (multiply by powers of 10) 3. Use short division (bus stop) to calculate e.g. $460 \div 0.4 = \frac{460}{0.4} = \frac{4600}{4} = 1150$	Conversions <table><tr><td>10 millimetres = 1 centimetre</td><td>15 minutes = 0.25 hours</td></tr><tr><td>100 centimetres = 1 metre</td><td>30 minutes = 0.5 hours</td></tr><tr><td>1000 metres = 1 kilometre</td><td>45 minutes = 0.75 hours</td></tr><tr><td>1000cm³ = 1 litre</td><td>1000g = 1 kilogram</td></tr><tr><td>1000ml = 1 litre</td><td>1000kg = 1 tonne</td></tr></table>	10 millimetres = 1 centimetre	15 minutes = 0.25 hours	100 centimetres = 1 metre	30 minutes = 0.5 hours	1000 metres = 1 kilometre	45 minutes = 0.75 hours	1000cm ³ = 1 litre	1000g = 1 kilogram	1000ml = 1 litre	1000kg = 1 tonne
10 millimetres = 1 centimetre	15 minutes = 0.25 hours											
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Compound Units (rearrange as necessary) $Speed = \frac{Distance}{Time}$ $Area = \frac{Force}{Pressure}$ $Density = \frac{Mass}{Volume}$	Error Intervals least possible value $\leq x <$ greatest possible value e.g. A fence is 30 m long to the nearest 10 m. $25\text{ m} \leq l < 35\text{ m}$ Truncation Truncation is a method of approximating a decimal number by dropping all decimal places past a certain point without rounding. e.g. Truncate 3.14159265 to 4 decimal places. $= 3.1415$	Negative numbers <u>Adding and subtracting: (vertical number lines help)</u> $-3 - 5 = -8$ $-3 + 5 = 2$ $-3 - -5 = -3 + 5 = 2$ $-3 - +5 = -3 - 5 = -8$ $-3 + -5 = -3 - 5 = -8$ <u>Multiplying and dividing:</u> Different signs – answer will be negative $+ \times - = -$, $- \times + = -$ Same signs – answer will be positive $- \times - = +$										
Product rule If there are <i>m</i> ways to do one thing and <i>n</i> ways to do another, then there are <i>m</i> x <i>n</i> ways to do <i>both</i>	Order of operations Bracket Indices Division and Multiplication Addition and Subtraction	Rounding to significant figures Start from the first non-zero number and round as normal, but ensure the place value is correct e.g. 345,635 to 2SF = 350,000 0.0060821 to 3SF = 0.00608										
Index Laws $a^n \times a^m = a^{n+m}$ $a^n \div a^m = a^{n-m}$ $(a^n)^m = a^{nm}$ $a^0 = 1$ $a^{-n} = \frac{1}{a^n}$ $a^{\frac{n}{m}} = \sqrt[m]{a^n}$	Prime Factorisation  HCF and LCM of 90 and 120 (<u>Factor Tree & Venn Diagram</u>) HCF is the product of common factors LCM is the product of common factors and remaining factors.  HCF: 2x3x5 LCM: 2³x3²x5											

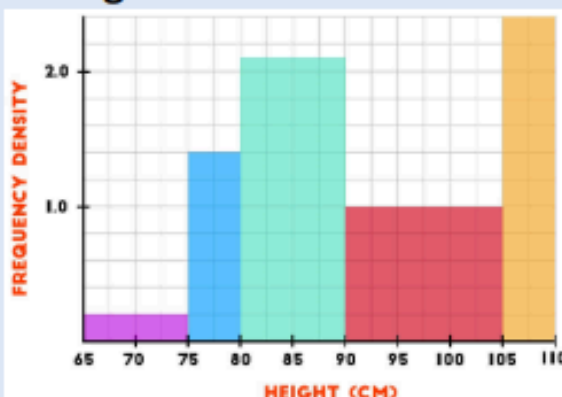
Frequency Polygons

1. Plot frequency at the mid-point
2. Join with straight lines

Weight w (kg)	Frequency
$30 \leq w < 50$	3
$50 \leq w < 55$	7
$55 \leq w < 75$	10
$75 \leq w < 80$	6
$80 \leq w < 100$	4



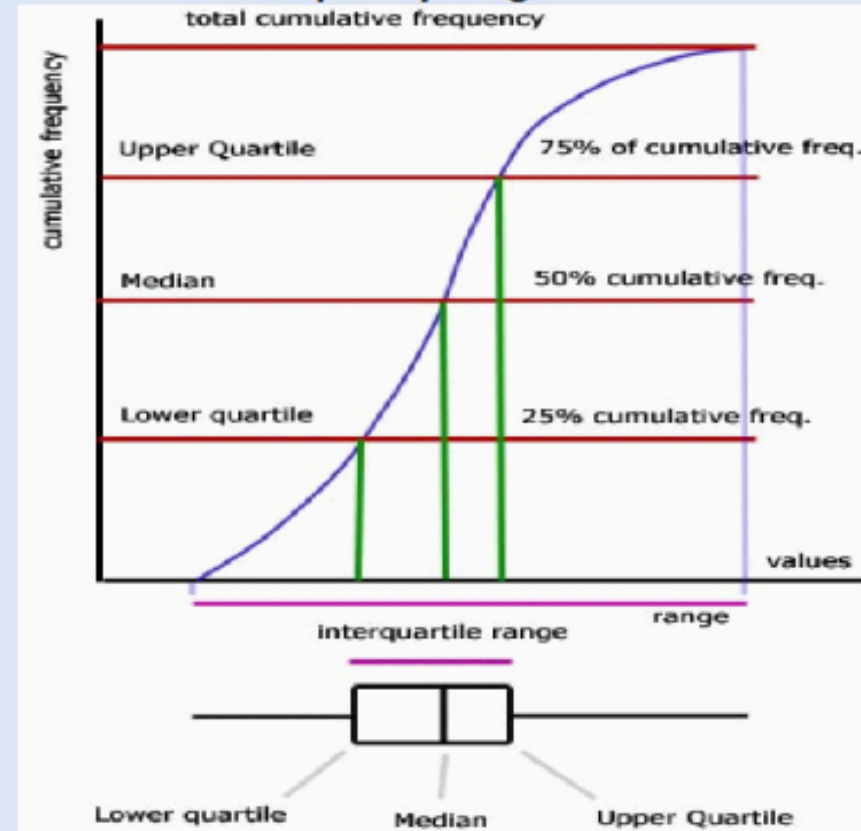
Histograms



FD = Frequency density

$$FD = \frac{\text{Frequency}}{\text{Class Width}}$$

Cumulative Frequency Diagrams and Box Plots



Averages from a frequency table

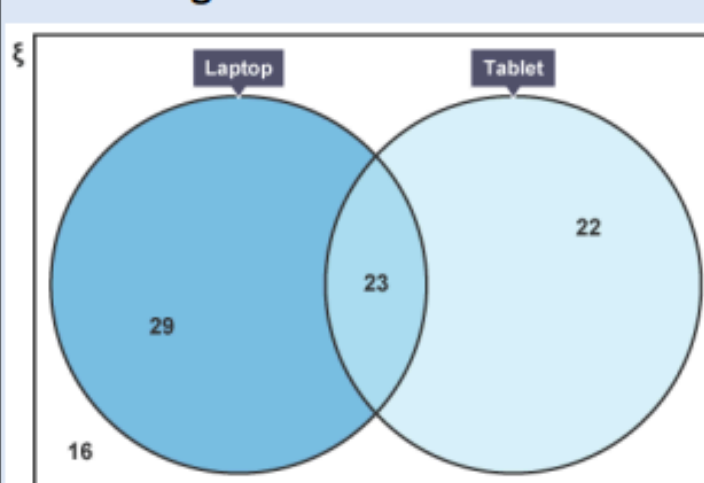
Mean: $\frac{\sum fw}{\sum f}$; where, w is the midpoint of the group.

Median group: find which group the $\frac{n+1}{2}$ th, value lies. Where, n is the total frequency.

E.G. in this table 51.5th value which lies in group $8 < w \leq 12$ (using the cumulative frequency)

Weight of box (w kg)	Frequency
$0 < w \leq 4$	11
$4 < w \leq 8$	16
$8 < w \leq 12$	29
$12 < w \leq 16$	26
$16 < w \leq 20$	20

Venn Diagrams



Information given:
90 pupils were surveyed
52 said they owned a laptop.
45 said they owned a tablet.
23 said they owned both.

Notation

A – all elements in A
A' – all elements not in A
B – all elements in B
B' – all elements not in B
A $\cup$ B – all the elements in A or B or both
A $\cap$ B – all the elements in both A and B

Expected outcomes

Relative frequency: $\text{frequency} \div \text{total trials}$

Expected outcome = probability $\times$ number of trials

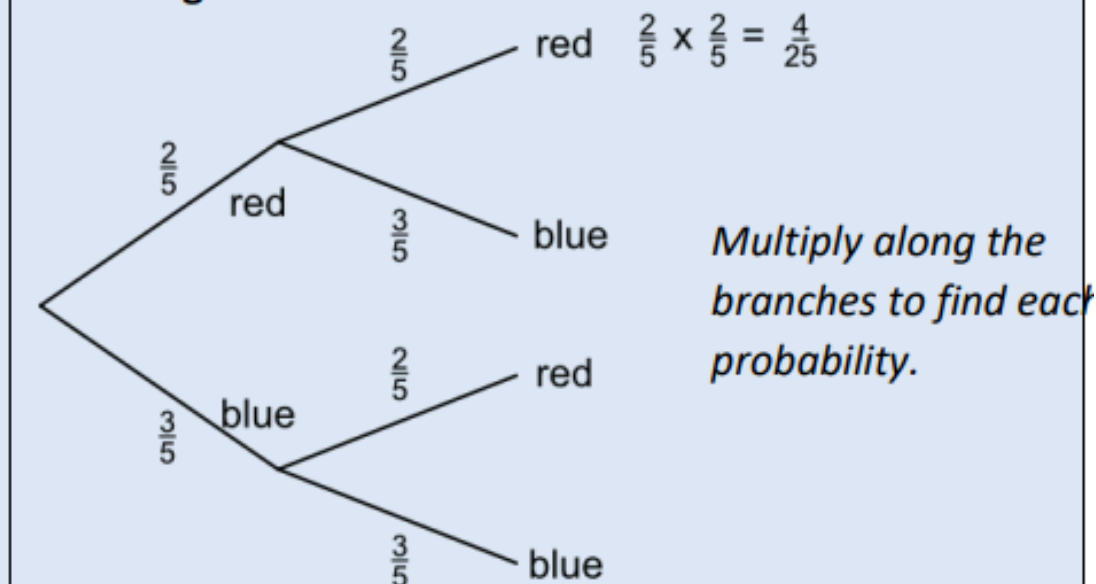
E.g. A biased spinner is spun 800 times. The probabilities of it landing on each colour is below. The probability of it landing on red is the same as the probability of it landing on green. How many times would you expect yellow to come up.

Result	Red	Green	Brown	Yellow
Probability		0.48	0.2	

$$P(Y) = (1 - 0.48 - 0.2) \div 2 = 0.32 \div 2 = 0.16$$

$$\text{Expected yellow} = 0.16 \times 800 = 128$$

Tree diagrams



1. Probability that a red counter is picked both times $P(RR) = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$

2. Probability that the counters are different colours = $P(RB) + P(BR) = \frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{2}{5} = \frac{12}{25}$



THS

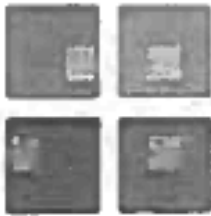
TIVERTON HIGH SCHOOL

Year 9

German

Work hard. Be kind. Belong.

Year 9 German

 **SentenceBuilders**
Powered by  **THE LANGUAGE GYM**

1. Beschreib dein Handy

Mein Handy ist (My phone is) Ich habe (I have) Mein Freund hat (My [male] friend has) Meine Freundin hat (My [female] friend has)	ein graues (a grey) ein schwarzes (a black) ein blaues (a blue) ein weißes (a white) ein silberes (a silver)	iPhone (iPhone) Samsung (Samsung) OnePlus (OnePlus) Nokia (Nokia)	und es ist (and it is) und ich denke es ist (and I think it is) und meiner Meinung nach ist es (and in my opinion it is) und laut meinen Freunden ist es (and as far as my friends are concerned it is) und ich finde es (and I find it)	ziemlich (quite) sehr (very) wirklich (really)	modern. (modern.) altmodisch. (old-fashioned.) nützlich. (useful.) nutzlos. (useless.) cool. (cool.)
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Year 9 German



4. Was hast du neulich mit deinem Handy gemacht?

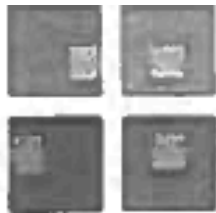
Letztes Wochenende, (Last weekend,) Gestern, (Yesterday,) Letzte Woche, (Last week,) Gestern Abend, (Yesterday evening,) Vor zwei Tagen, (Two days ago,)	nachdem ich mein Abendessen gegessen hatte, (after I had eaten my dinner,) nachdem ich meine Hausaufgaben gemacht hatte, (after I had done my homework,) nachdem ich meine Großeltern besucht hatte, (after I had visited my grandparents,) nachdem ich Zuhause geholfen hatte, (after I had helped at home,) nachdem ich nach Hause gekommen war, (after I had returned home,)	habe ich getwittert. (I tweeted.) habe ich ein Video auf TikTok hochgeladen. (I uploaded a video to TikTok.) habe ich mit meinen Freunden geplaudert. (I chatted with my friends.) habe ich Musik per Spotify gehört. (I listened to music on Spotify.) habe ich gewhatsappt. (I sent some messages via Whatsapp.) habe ich Fotos per Instagram geteilt. (I shared photos on Instagram.) habe ich einen Film durch Amazon Prime gesehen. (I watched a film on Amazon Prime.) habe ich Clash Royale online gespielt. (I played Clash Royale online.) habe ich ein Video auf YouTube gesehen. (I saw a video on YouTube.)
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Year 9 German



3. Wie wirst du das Internet benutzen?

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



2. Was sind die Vorteile von sozialen Netzwerken?

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

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

TIVERTON HIGH SCHOOL

Year 9

Music

Work hard. Be kind. Belong.

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**.



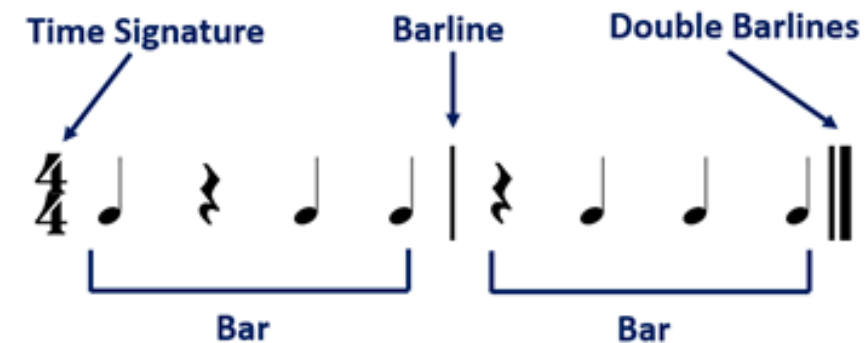
A. Pulse, Time and Metre in Dance Music

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 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 QUADRUPLER 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

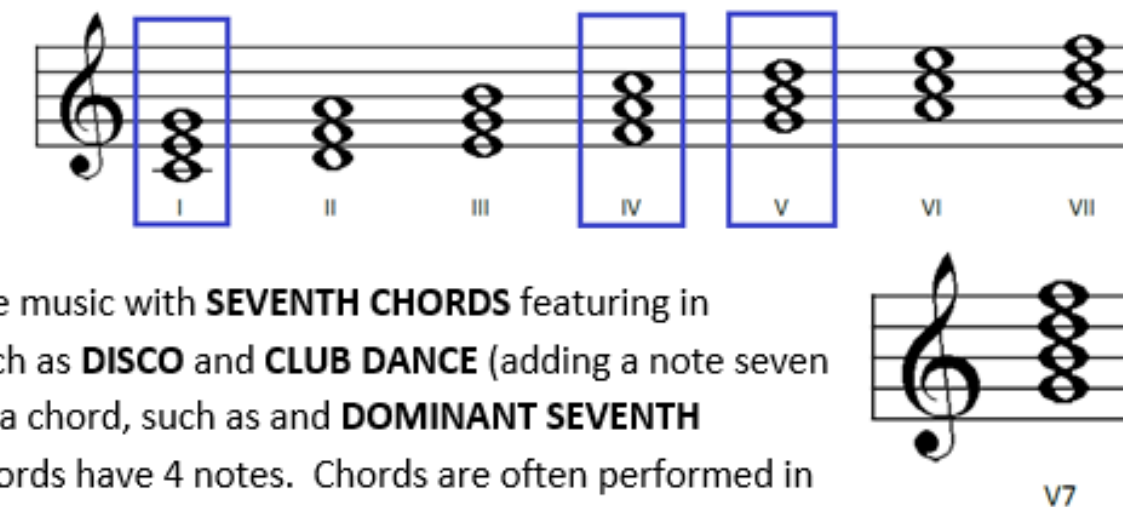
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PRIMARY CHORDS:

CHORD I, **CHORD IV**

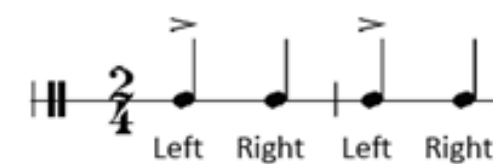
and **CHORD V** are most

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.

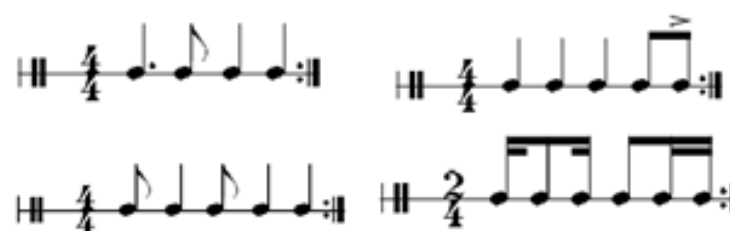


E. Characteristic Rhythms in Dance Music

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



The **TANGO** has several rhythms:



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



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								

F. Marches  Often with military connections or performed at ceremonies by large groups together. SIMPLE DUPE METRE (<u>2/4 time</u> signature), although some marches can be in 4/4). Strong emphasis on the first beat of the bar (LEFT, right, LEFT, right). Clear MELODY and ACCOMPANIMENT (HOMOPHONIC TEXTURE). Uses mainly PRIMARY CHORDS (I, IV & V). Often performed by MARCHING BANDS featuring BRASS, DRUMS and PERCUSSION.	G. The Waltz  A PAIRED DANCE with couples close, arms around and facing each other. Popular in Vienna and became a fashionable BALLROOM DANCE. SIMPLE TRIPLE METRE (<u>3/4 time</u> signature). Emphasis on first beat of the bar. Clear OOM-cha-cha, OOM-cha-cha rhythm. Clear MELODY and ACCOMPANIMENT (HOMOPHONIC TEXTURE). REGULAR 4-BAR PHRASES. Slow HARMONIC RHYTHM using PRIMARY CHORDS (I, IV & V). Performed by ORCHESTRAS. STRINGS (occasionally WOODWIND) normally have the MELODY LINE.	H. Latin Dance: The Tango  Originated in Argentina and became a popular LATIN BALLROOM DANCE. A dramatic and sensual PAIRED DANCE with close contact, serious expressions, and quick, jerky movements. Characteristic crisp "TANGO RHYTHMS" (see E.) often DOTTED/SYNCOPATED RHYTHMS. SIMPLE DUPE METRE (2/4) or SIMPLE QUADRUPLE METRE (4/4). Often MINOR TONALITY (sometimes MAJOR for contrast). Clear MELODY and ACCOMPANIMENT (HOMOPHONIC TEXTURE). Uses mainly PRIMARY CHORDS (I, IV & V). Instruments such as BANDONEON, VIOLIN, CELLO, DOUBLE BASS (often plucked – PIZZICATO), SPANISH/ACOUSTIC GUITAR, PIANO.	I. The Baroque Dance Suite  Popular between 1600-1750, a collection of shorter dances (MOVEMENTS) grouped together to form a SUITE. Dances included: • ALLEMANDE (German, 4/4, Stately) • COURANGE (French, 3/4, Lively, Dotted Rhythms and Disjunct melody) • SARABANDE (Spanish, 3/2, Slow and Stately, emphasis on 2nd beat of bar) • MINUET (3/4, Elegant, Stately) • GIGUE (6/8, Fast, Lively, Triplet Rhythms) All dances in BINARY FORM (AB) with each section repeated (AABB). Performed by a group of instruments such as HARPSICHORD, LUTE, VIOLIN, CELLO, OBOE, RECORDER, FLUTE.
J. American Line Dance GROUP SYNCHRONISED DANCE. All dancers face same way standing in lines performing steps at the same time without touching. Accompanied by COUNTRY AND WESTERN MUSIC: CATCHY MELODY, CROTCHET BASS LINE, SIMPLE HARMONY (CHORDS I & V) in crotchets. SIMPLE QUADRUPLE METRE (4/4) POPULAR SONG FORM MAJOR TONALITY Instruments such as GUITARS (Electric and Acoustic), STEEL GUITAR, DRUMS, BANJO, FIDDLE, HARMONICA, ACCORDION. 	K. Irish Jig and Reel  Traditional FOLK DANCES from Ireland with intricate footwork and arms by sides. REEL: COMPOUND TIME (6/8); JIG: SIMPLE TIME (2/4 or 4/4) both with "two in a bar" feel, continuous bouncy quaver or semiquaver rhythms, fast tempo and DECORATED melodies. BINARY FORM. MAJOR/MINOR or MODAL. Folk Instruments include: FIDDLE, FLUTE, TIN WHISTLE, ACCORDION, BODHRAN, UILLEANN PIPES, HARP.	L. Disco  Appeared in 1970's as an individual, IMPROVISED DANCE in clubs from a mix of jazz, funk and soul. SIMPLE QUADRUPLE METRE (4/4) FAST TEMPO (around 120 BPM) FOUR-ON-THE-FLOOR RHYTHM (see E.) SYNCOPATED bass line parts. Simple CHORD PATTERNS using CHORDS I and V and SEVENTH CHORDS. POPULAR SONG FORM with a strong GROOVE (long repeated rhythm section) and fade out endings, and catchy HOOKS/RIFFS. GUITARS, VOCALS, DRUMS, STRING/BRASS SOUNDS, SYNTHESISERS, SAMPLES.	M. Club Dance  Influenced by MUSIC TECHNOLOGY: samplers, synthesisers, sequencers and drum machines. Various genres: House, Techno, Drum and Bass, Garage, Trance, Ambient. Dancing in individual and IMPROVISED on one spot. SIMPLE QUADRUPLE METRE (4/4). Use of ELECTRONIC SOUNDS. A STRONG BEAT emphasised by the DRUM and STRONG BASS LINES. SHORT PHRASES and REPETITIVE SECTIONS. FAST TEMPO (Ambient is slower/chilled) Complex, layered drum patterns. Inclusion of SAMPLES.

Exploring Rhythm, Chords and Metre in Music for Dance

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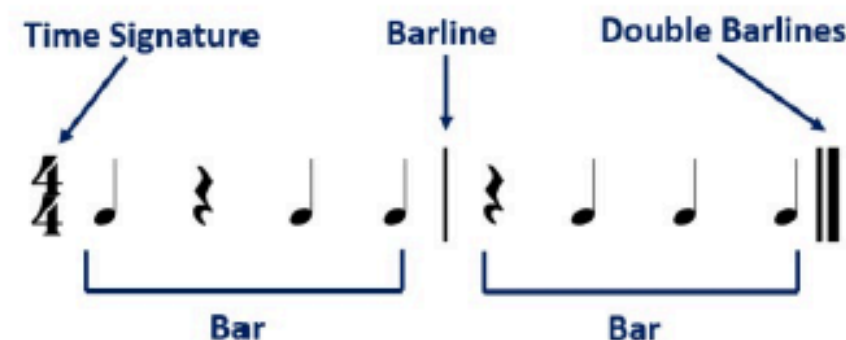
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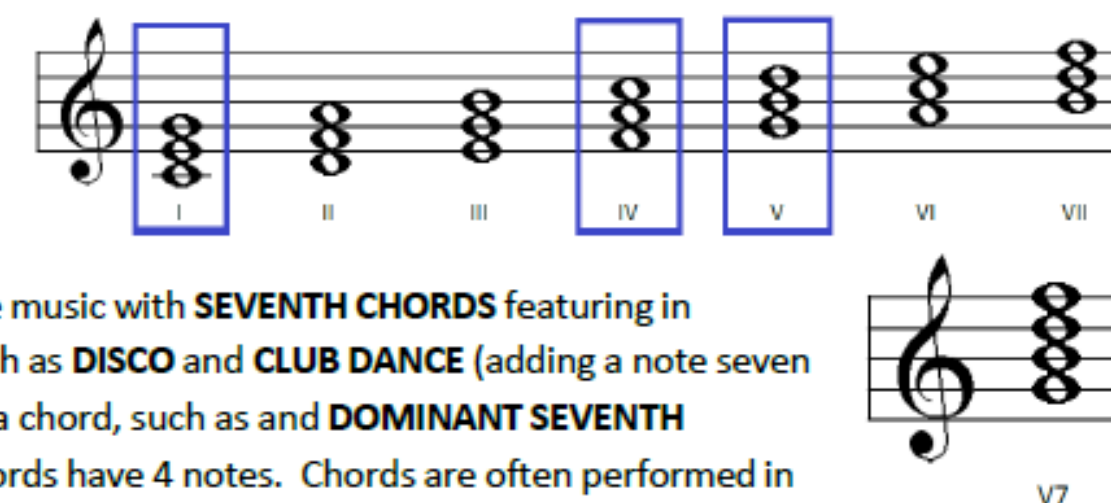
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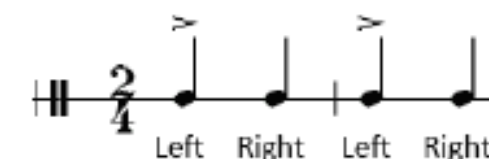
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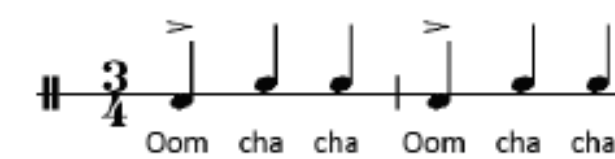


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Bass Drum	●		●		●		●	
Snare Drum or Hand Claps			●				●	
Hi-Hat Cymbal	●	●	●	●	●	●	●	●

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-DOUSING** – 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" or "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 Lost World: Jurassic Park (1997)
Medal of Honour (1999) Call of Duty (2003)



Mieko Ishikawa
Dragon Slayer (1988)



Martin O'Donnell and Michael Salvatori
Halo (2002)



Daniel Rosenfield
Minecraft (2011)

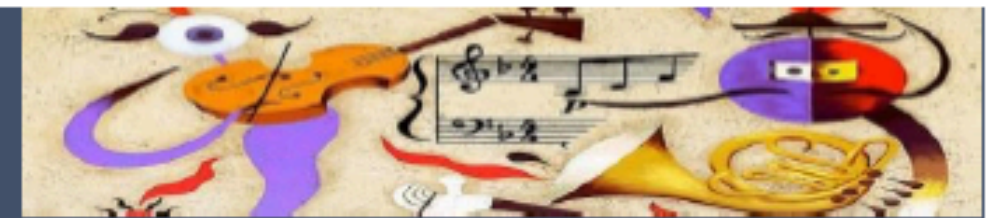


Tom Di Prisco
Fortnite (2017)

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, 20th 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
CONJUNCT - wide leaps, angular and spiky. CHROMATIC - uses all 12 notes (black and white) of the CHROMATIC SCALE . DISSONANCE - harsh sounds. EXTREMES OF DYNAMICS - (<i>pppp-ffff</i>) No clear melody/"tune".	ATONALITY – no (sense of) key. POLYTONALITY – two or more keys played at once. DISCORDS – dissonant, clashing chords.	SYNCOPIATION – half beat followed by full beat emphasising weaker beats of the bar. IRREGULAR ACCENTS (>) – e.g. <i>The Rite of Spring</i> IRREGULAR TIME SIGNATURES – 5 or 7 beats per bar.	Strange, intriguing, and exotic sounds; striking, sometimes explosive, contrasts. PERCUSSION – expanded in orchestra and more emphasis on percussion timbre and sonorities. Unfamiliar sounds from strange instruments such as EXTREME PITCH RANGES and playing instruments in different and unusual ways. TOTALLY NEW SOUNDS often involving ELECTRONIC EQUIPMENT and MAGNETIC TAPE .

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
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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

SURDO



REPINIQUE



TAMBORIM



CHOCOLO



RECO-RECO



APITO



AGOGO BELLS

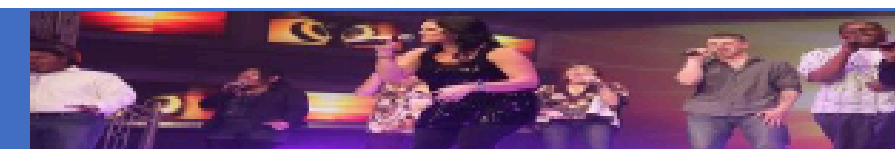


CAIXA DE GUERRO



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.



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)

Rational agnostic —willing to say they don't know what gives life meaning.	Humanist Optimist —takes life as it comes and hopes for a meaning to life.
Nihilist —believes in nothing and sees no purpose or meaning to life.	Spiritual post-modernist —relies on personal experiences to give life meaning.
Theistic believer —sees God and/or religion as a source of meaning in life.	Eastern worldview —sees life as part of a great mysterious, but purposeful cycle.

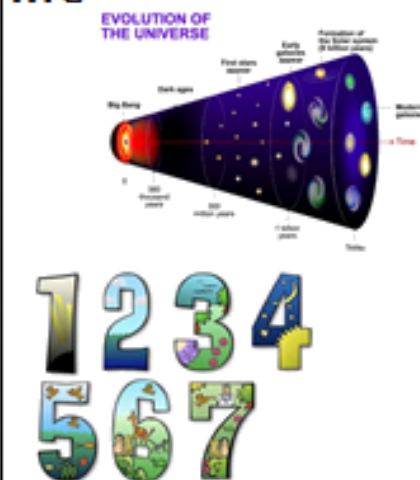
Plato's Allegory of the Cave—metaphorical story about life

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?
Religious view	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.
Non-religious view	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?



A) The Ummah (community) 	⇒ 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. ⇒ 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. ⇒ 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.	1. Ummah—global community of Muslims 2. Sunni—majority group of Muslims 3. Shi'a—minority group of Muslims 4. Mosque—Islamic place of worship										
B) Core beliefs and teachings 	⇒ 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). ⇒ The five pillars of Sunni Islam are: <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> ⇒ 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: Amr-bil-maroof—encourage what is good Nahil Anril Munkar —discourage what is bad Jihad—to struggle to be a good Muslim	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.	5. Tawhid—belief in one god 6. Allah—Islamic term for God 7. Shahadah—declaration of faith 8. Salah—five daily prayers 9. Sawm—month of fasting (aka Ramadan) 10. Zakah—donation of 2.5% (or more) to charity 11. Hajj—pilgrimage to Makkah 12. Obligatory Act—actions Allah has instructed Shi'a Muslims to perform 13. Amr-bil-maroof—encourage what is good 14. Nahil Anril Munkar —discourage what is bad 15. Jihad—to struggle to be a good Muslim
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.											
C) Islam in Britain 	⇒ 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. ⇒ 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. ⇒ 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.	16. Islamophobia—fear or hatred of Muslims 17. Discrimination—mistreatment or abuse of a person or group due to a prejudice										



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

Year 9 Evil and Suffering

What is the impact of evil and suffering?



A) What is evil?



Two forms of evil:

- ⇒ MORAL EVIL - caused by human; could be directly or indirectly. Examples of moral evil are violence, war, crime, prejudice/discrimination, abuse and murder.
- ⇒ NATURAL EVIL - caused by natural forces. Examples of natural evil are illness, diseases and natural disasters.
- ⇒ Christianity teaches that evil and suffering can make their faith stronger. The Story of Job who's life was destroyed by God shows that faith is the most important thing in life.
- ⇒ In the 3rd Century a philosopher called Epicurus said the fact evil and suffering exists proves that either; God must not exist; or is not as 'good' (omnibenevolent) and powerful (omnipotent) as people think He is.

1. Evil—that which causes harm or suffering
2. Story of Job—story from the Bible about how suffering strengthens faith
3. Omnipotence—the belief that God is all-powerful
4. Omnibenevolence—the belief that God is all-loving

B) Crime & War



Sin V Crime

- ⇒ Sins are intentional actions against a religious law; crimes are actions which are illegal.
- ⇒ Possible causes of crime: Greed, poverty, desperation, upbringing, peer pressure.

Types of punishment and reasons for it:

Why do we punish people?		Example (how)
Protection	To protect society from dangerous criminals. Criminals lose their freedom so others do not have to worry about their activities.	Prison/youth offenders institute/psychiatric hospital
Retribution	To take revenge on a wrong doer/ criminal.	Death penalty/life imprisonment
Reformation	To inspire the criminal to change for the better.	Correctional facility/therapy/rehab/ASBOs
Deterrence	To put people of (deter) people from offending or re-offending.	Death penalty/life imprisonment
Vindication	To show everyone that the justice is must be upheld and that there are consequences for breaking it.	Prison/death penalty /community service
Reparation	To repair the damage caused to society.	Community service/ fines/repayment to victims

Just War Theory

- ⇒ A just war is one fought for the right reasons and in the right way.

For a war to be sanctioned (considered 'just') by the United Nations:

1. It must be **started** for a **good/ethical reason**
2. It must be started by the **proper legal authority** e.g. a government or the UN
3. The **intention** must be to **do good not evil**
4. It must be a **last resort**
5. There must be a **reasonable chance of success**
6. Only a **reasonable amount of force** should be used
7. **Civilians** must not be **targeted**

- ⇒ Wars such as WW2, Ukraine and Israel/ Gaza would not be considered 'just wars' because they did not meet these criteria.
- ⇒ One famous religious teaching is "Blessed are the peacemakers" meaning God is more likely to reward people who do not fight.

5. Sin—actions God or religion has deemed wrong or evil
6. Crime—actions society has deemed wrong or evil
7. Retribution—revenge
8. Reformation—to reform/ improve something
9. Deterrence—something that puts people off from actions
10. Vindication—to validate or strengthen something
11. Reparation—to repair
12. Just War—a war which is justified
13. Civilian—a person not involved in a crime/conflict

C) Suffering



- ⇒ Suffering can occur in many ways; **physical, emotional and psychological (mentally)**. Examples include **physical pain, sadness, loneliness, loss, sickness and poverty**.
- ⇒ **Short-term aid** is when you send emergency supplies like **medical goods, temporary shelters, food and water**.
- ⇒ **Long-term aid** is when a country, region or community are assisted in rebuilding infrastructure like **roads, hospitals, schools, waterways, sanitation and housing**.
- ⇒ Aid is usually provided through **charities such as UNICEF, Oxfam, The Red Cross, Salvation Army, Islamic Relief and Khalsa Aid**.

14. Suffering—experiencing pain or distress
15. Aid—actions intended to help those in need
16. Charity—organisations aimed at helping people, using money/goods given by others



The disciplinary approaches to this unit will be:

Theological knowledge of justifications and explanations of evil and suffering

Historical knowledge of individuals considered martyrs

Sociological understanding the impact of evil and suffering



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Year 9 Science

Work hard. Be kind. Belong.

Knowledge Organiser – 4.1.1 Cell Biology

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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.

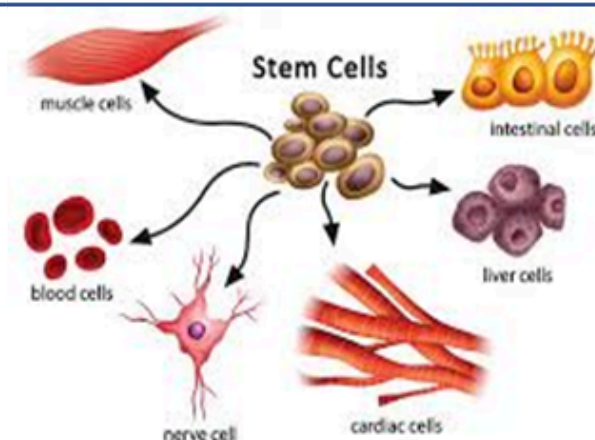
4.1.1.2 Definitions

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.

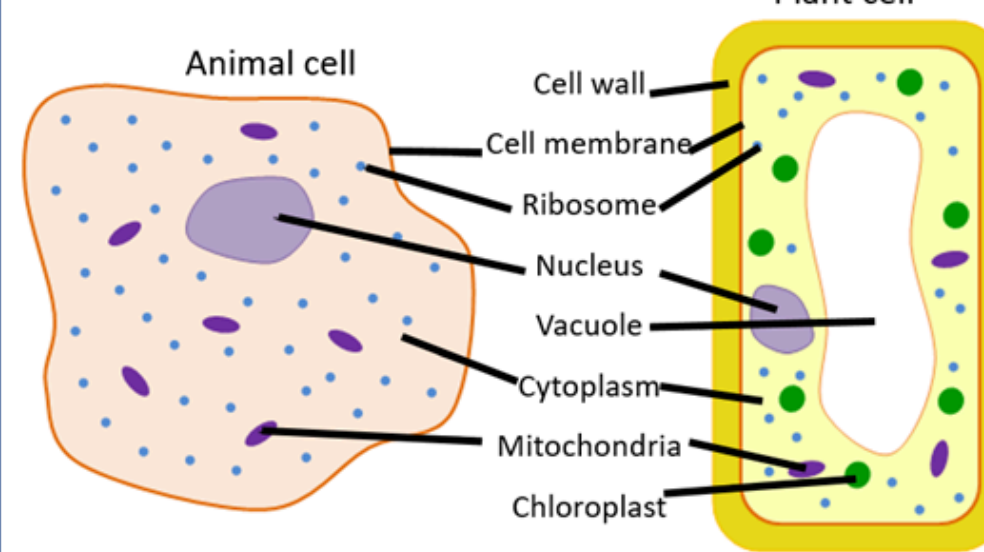
4.1.1.4 Cell differentiation

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:

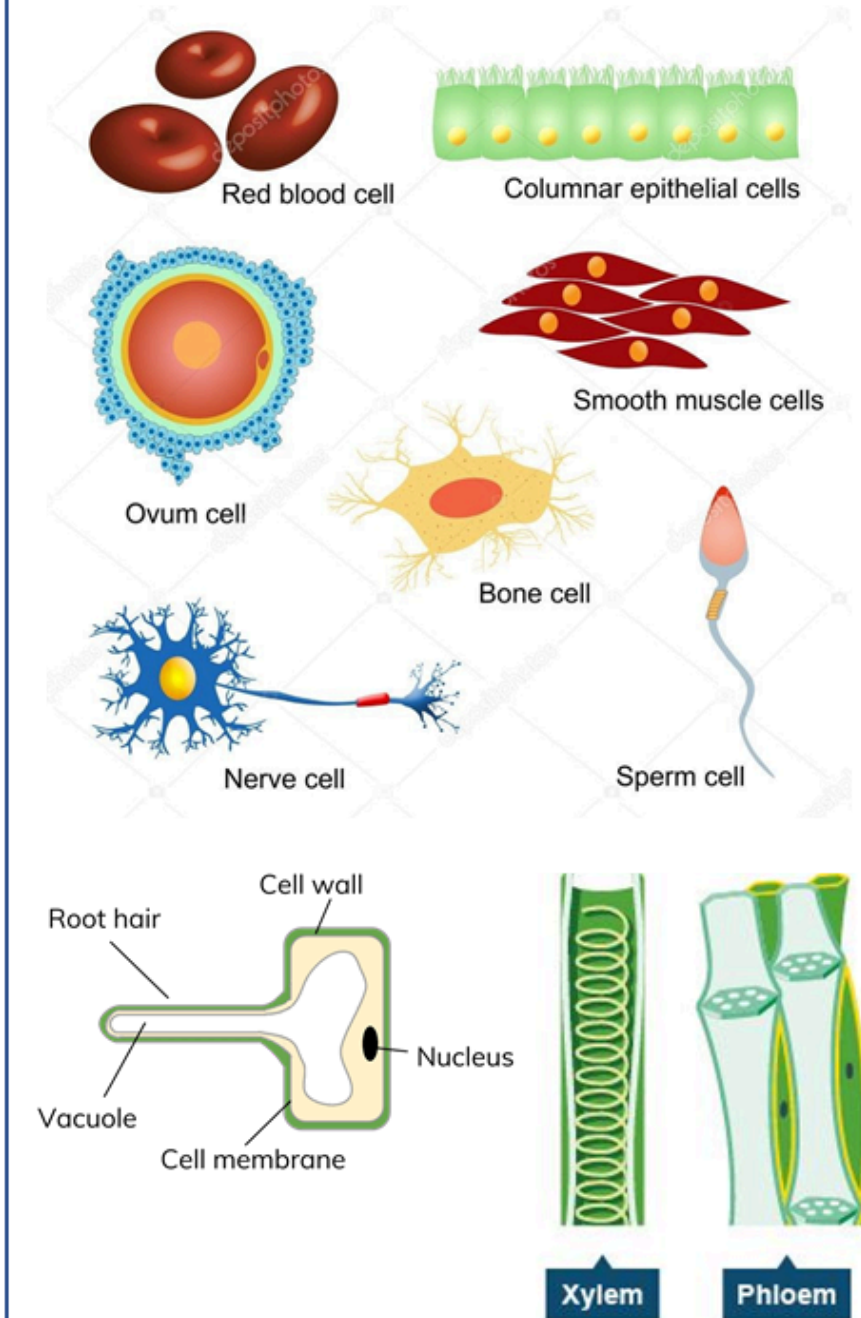
Most animal cells have the following

- **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:



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4.1.1.3. Cell specialisation:

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4.1.1.5 Microscopy

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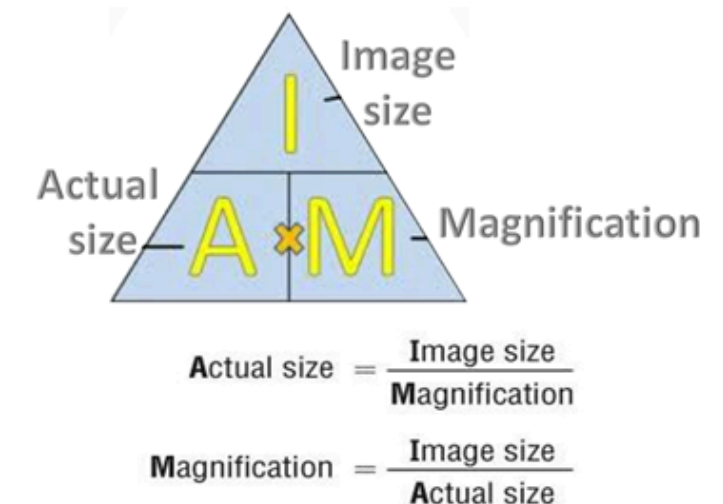
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4.1.1.5 Microscopy

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.**



4.1.1.2 Animal & plant cells

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4.1.1.4 Cell differentiation

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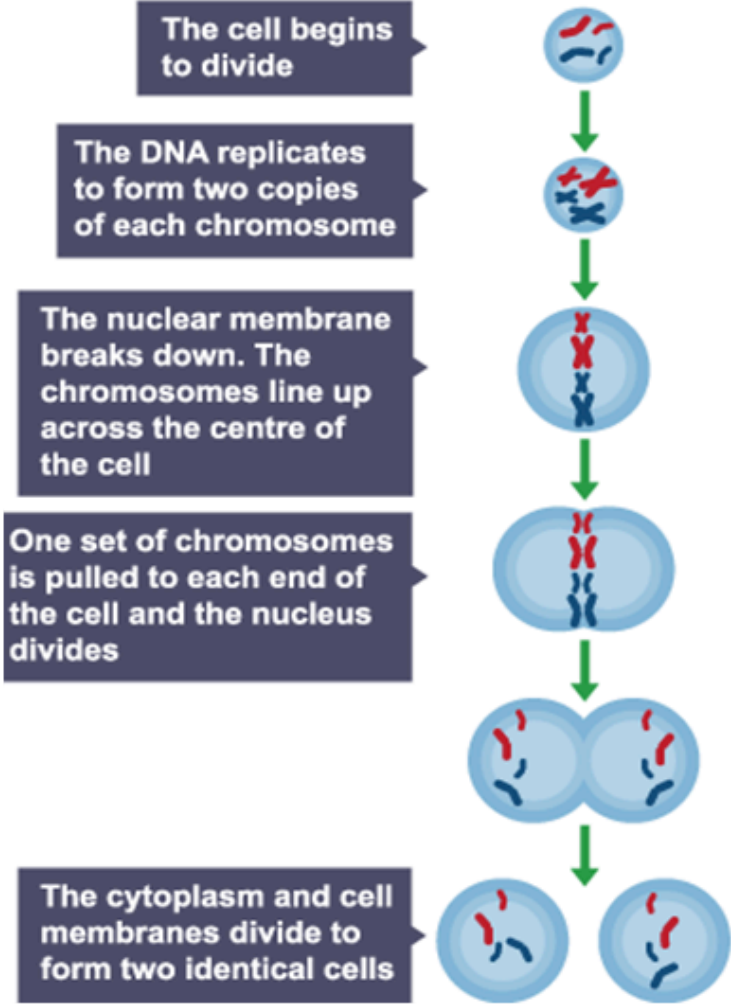
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Knowledge Organiser – 4.1.2 Cell Biology

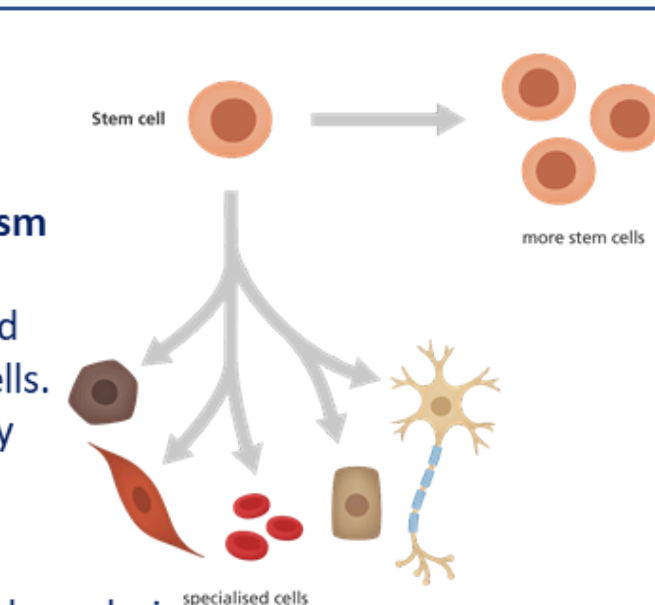
4.1.2 Cell Division : MITOSIS

- 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

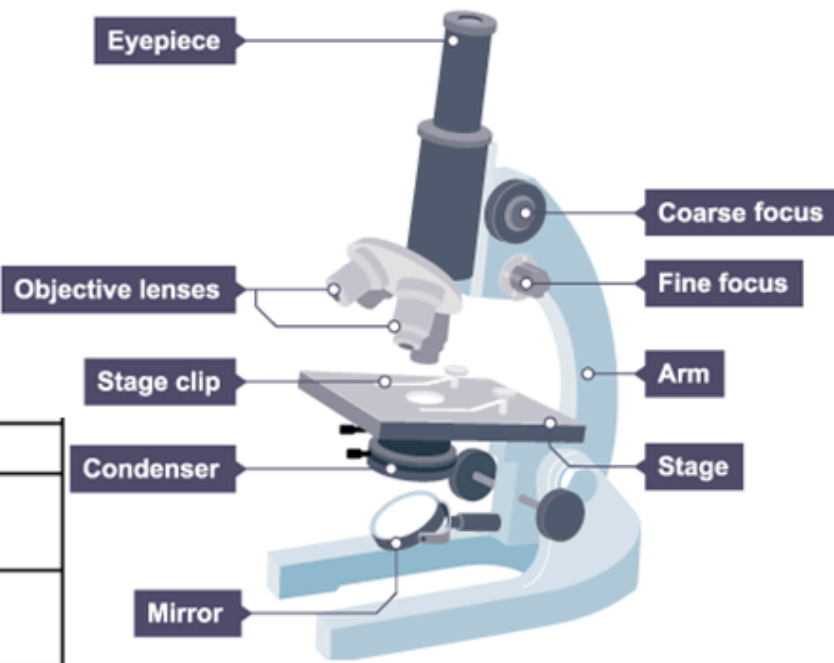
- A **stem cell** is an **undifferentiated cell of an organism** which is capable of giving rise to cells of any type.
- Stem cells from human embryos** can be **cloned** and made to **differentiate into most** types of human cells.
- Stem cells from adult bone marrow** can form many types of cells including **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. 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}m
Micrometre (μm)	0.000001m	10^{-6}m
Nanometre (nm)	0.000000001m	10^{-9}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

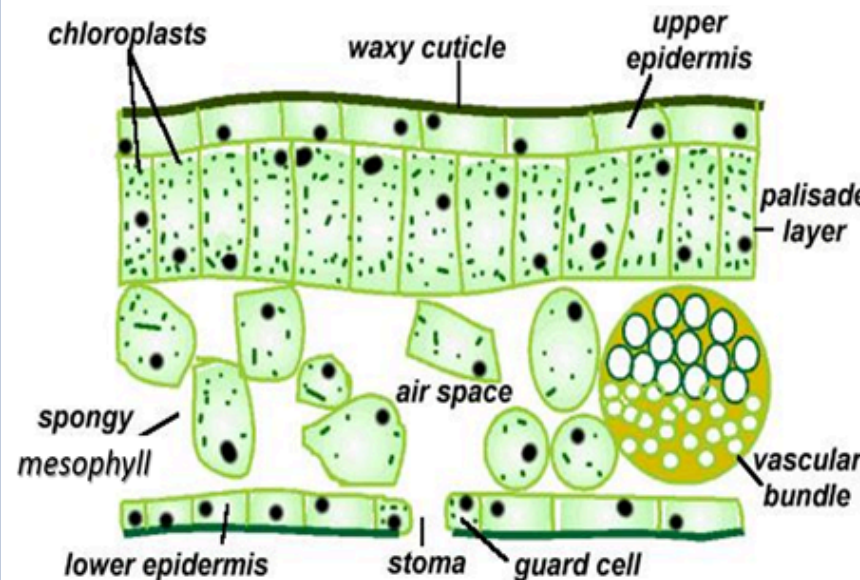
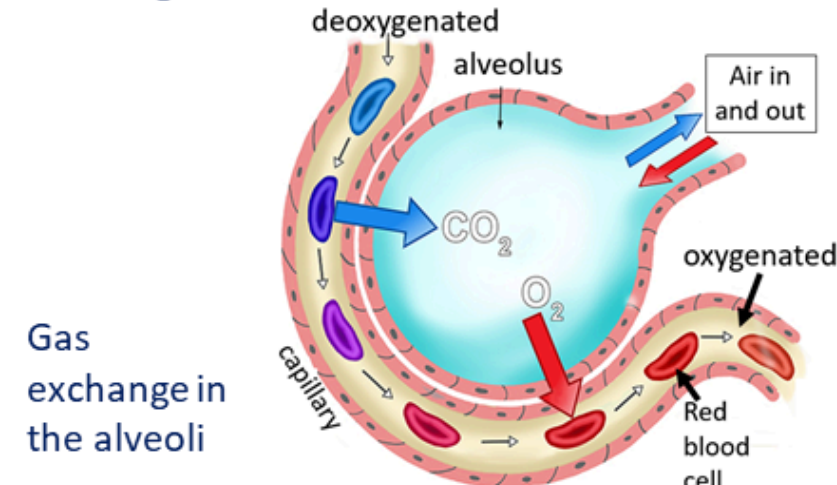
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4.1.3.1 Diffusion - examples

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)

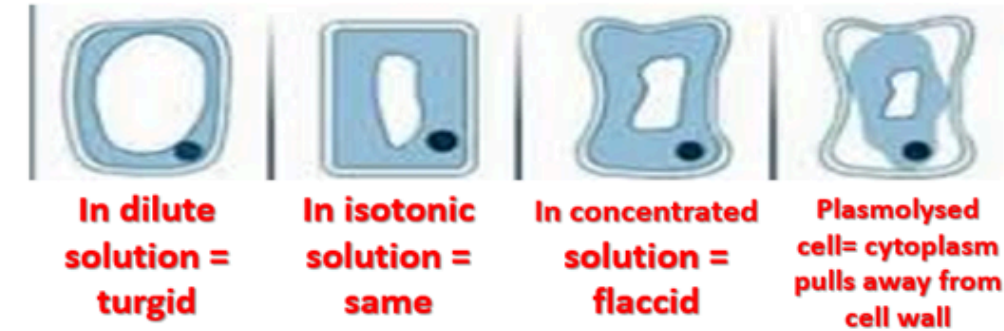


CO₂ diffuses from high concentration in the air space to a low concentration inside the mesophyll cells

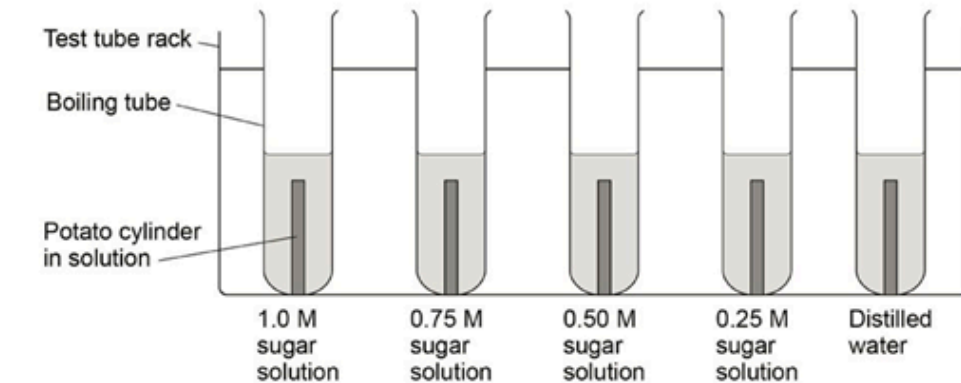
4.1.3.2 Osmosis

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



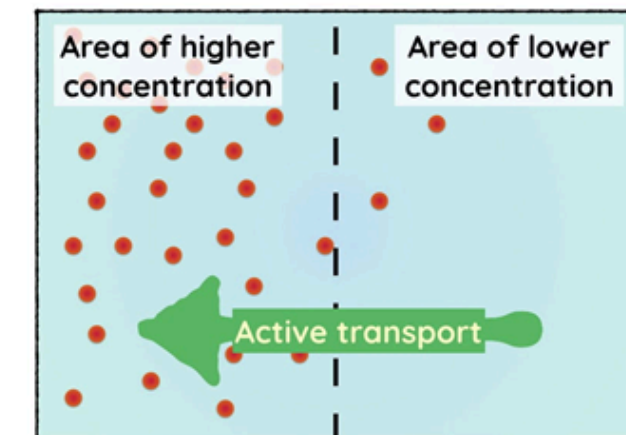
RPA: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue



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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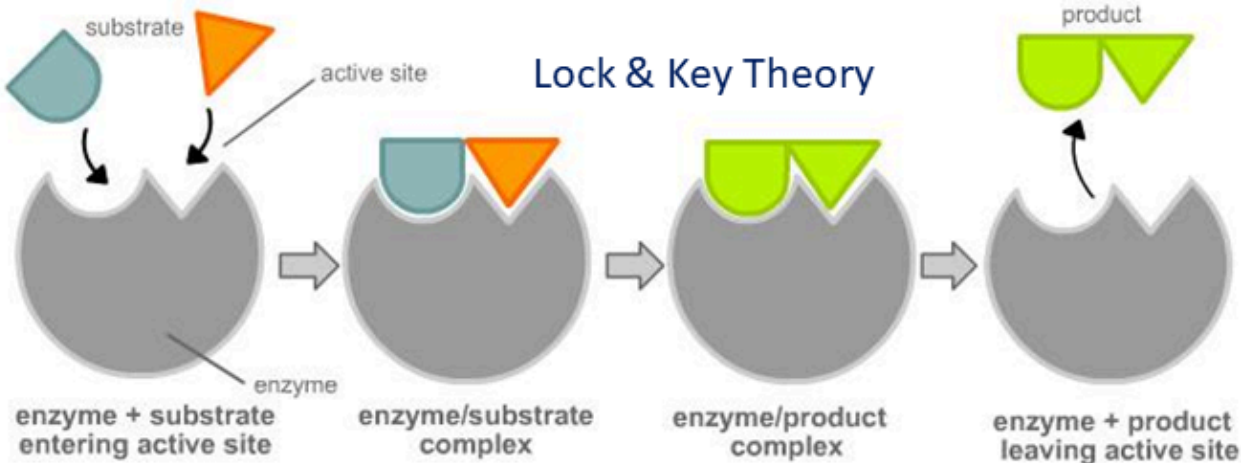
4.2.1 Principles of organisation

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 Eg. Amylase	Salivary glands	Carbohydrate Eg. starch	Simple sugars Eg. glucose	pH7 37°C
Protease	Stomach, pancreas	Protein	Amino acids	pH2 37°C
Lipase	Pancreas, small intestine	Lipid (fats & oils)	Glycerol & fatty acids	pH8 37°C

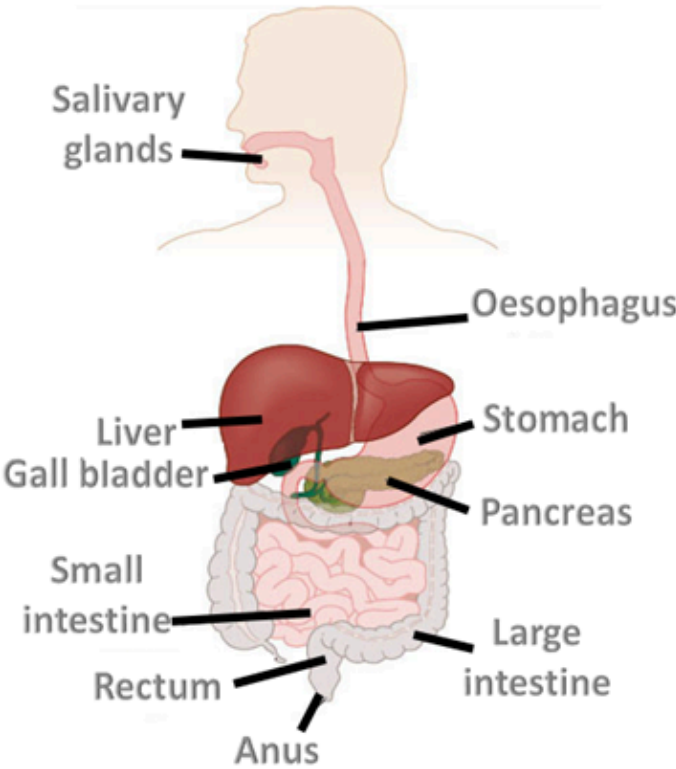
Enzymes are biological catalysts that breakdown food into small, soluble molecules that can be absorbed into the bloodstream from the digestive system.

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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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

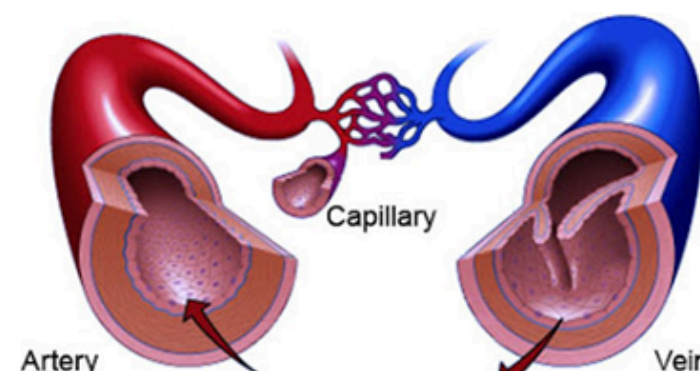
DV is the time at which the starch/ amylase solution no longer turns blue/black.

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



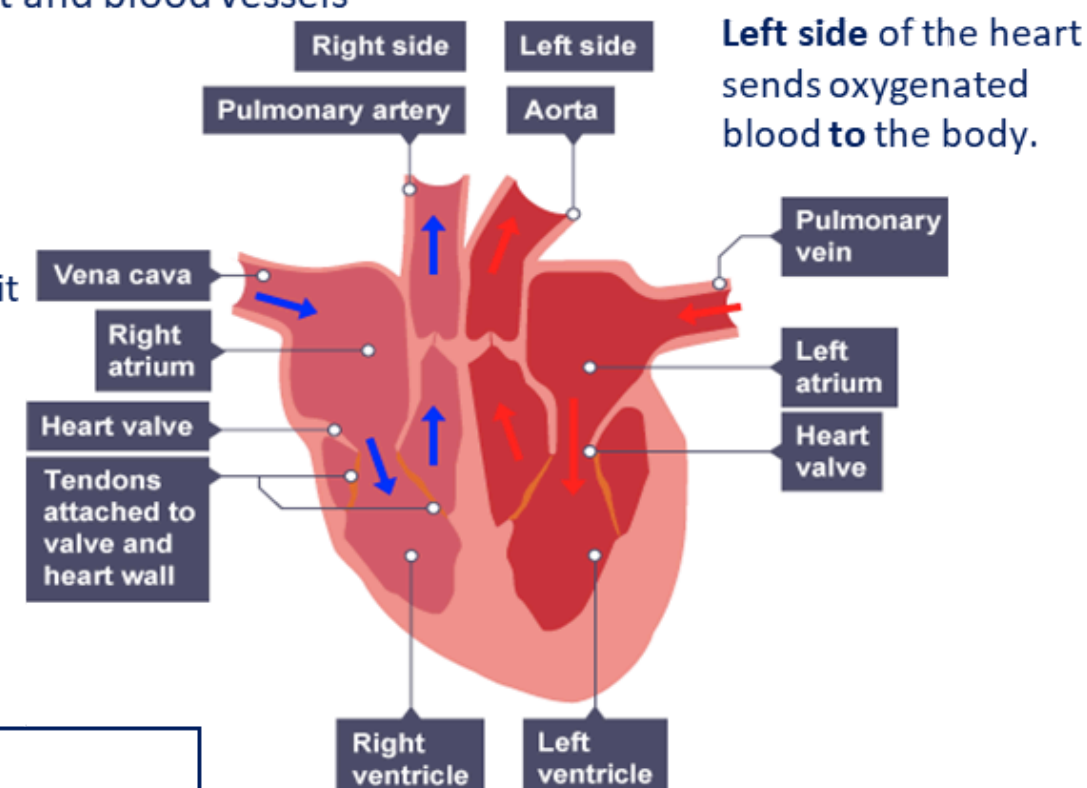
- Blood towards from heart
- Thinner wall
- Large lumen
- Under low pressure

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.

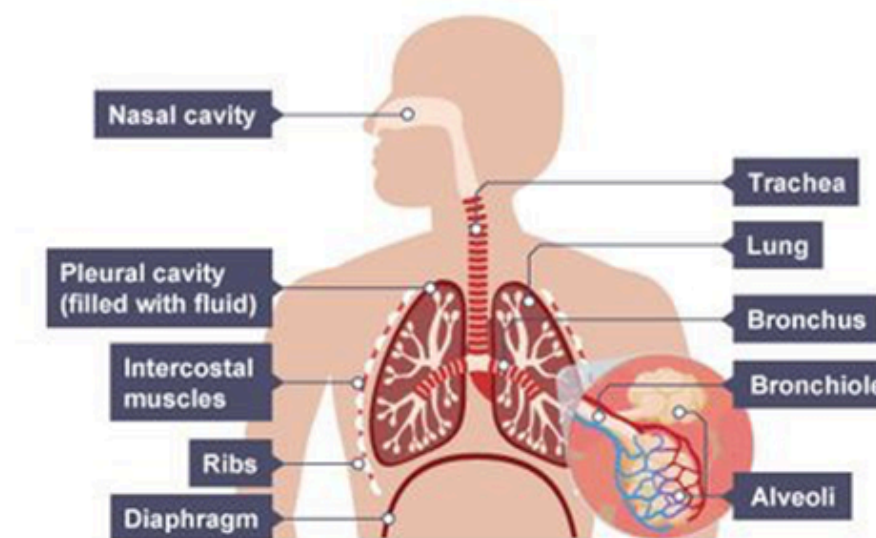
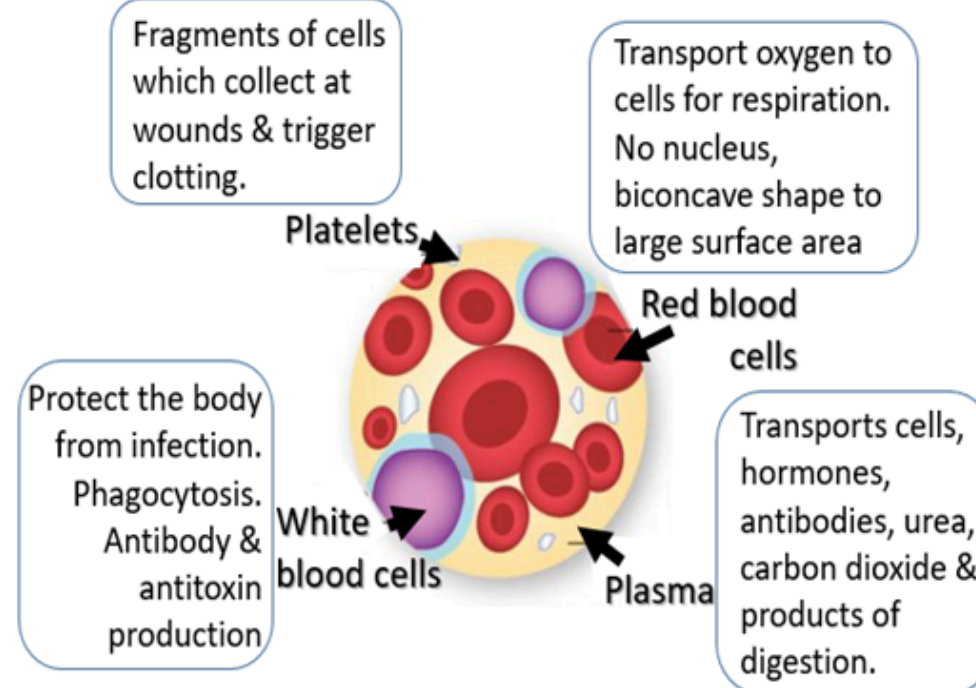
Pacemaker

Group of cells in the right atrium that control resting heart rate.

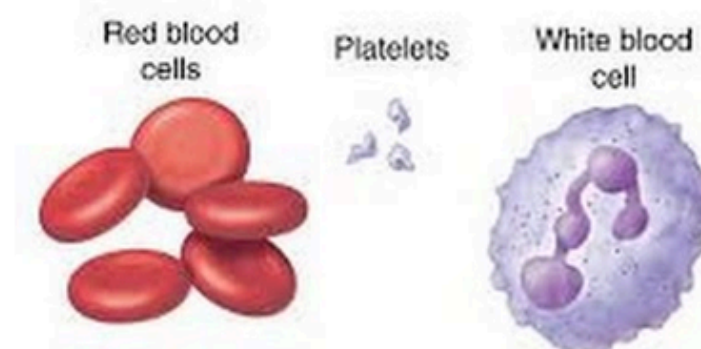


Left side of the heart sends oxygenated blood **to** the body.

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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4.2.2.4 Coronary
Heart Disease

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4.2.3.1 Plant
Tissues

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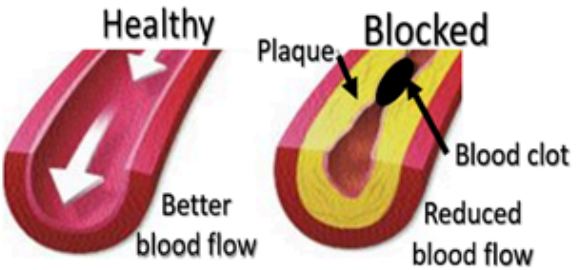
4.2.2.5 Health
issues & Types
of disease

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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

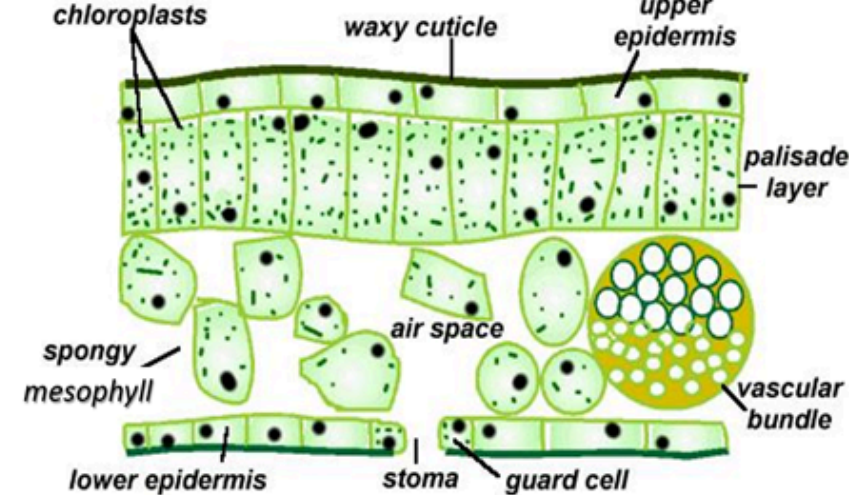
communicable, can be transferred from one organism to another, e.g. measles, food poisoning and malaria
non-communicable, which are not transferred between people or other organisms, e.g.

- **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

4.2.3.1 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.

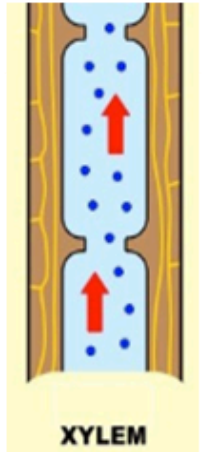
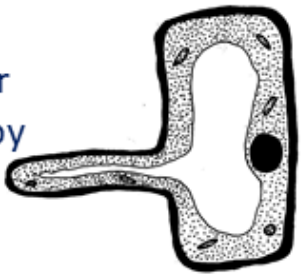
4.2.2.7 Cancer

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.

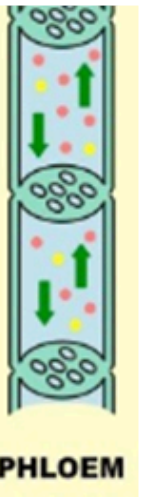
4.2.3.2 Plant organ system

Roots, stem, leaves form plant transport organ system.

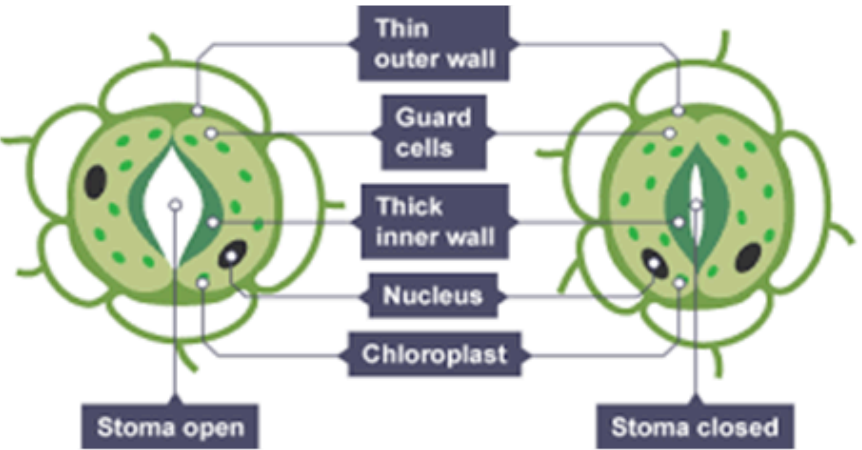
- **Root hair cells** are adapted for the efficient uptake of water by osmosis, and mineral ions by active transport.
- **Xylem tissue** transports water and mineral ions from the roots to the stems and leaves.
- Made of hollow tubes strengthened by **lignin** adapted for the transport of water in the **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.



XYLEM



PHLOEM



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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

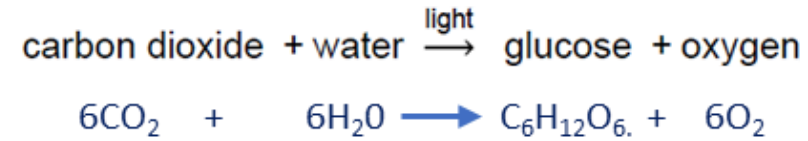
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4.4.1 Photosynthetic reaction

- 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
Photosynthesis	The endothermic reaction that transfers light energy to chemical potential energy. In it, simple molecules (CO ₂ and H ₂ O) are converted into more complex molecules (glucose) that can be used for food.
Nitrates	Ions containing nitrogen and oxygen. These are found in the soil; plants need nitrates to produce amino acids.
Rate	As always, rate means how quickly something happens.
Light intensity	The amount/strength of light. Use this term instead of 'amount of light'.
Chlorophyll	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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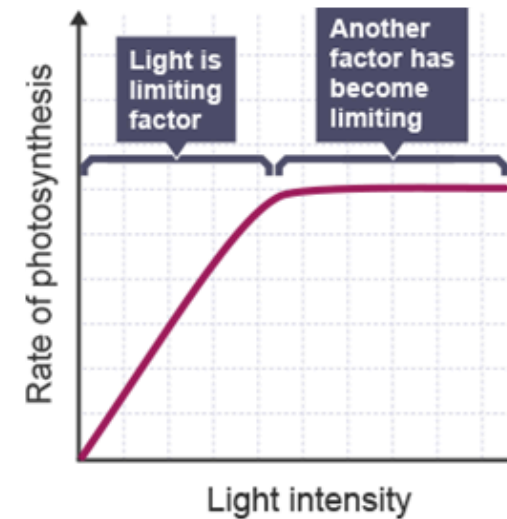
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4.4.1.2 Rate of Photosynthesis

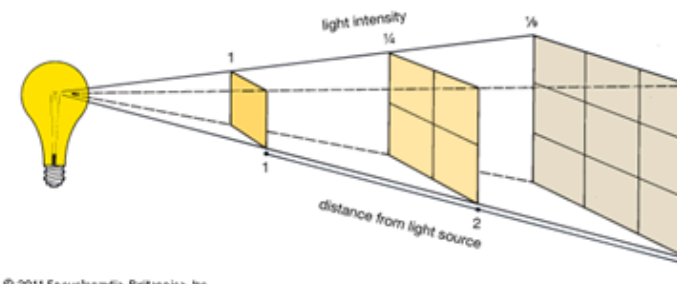
The following factors affect the rate of photosynthesis:

- **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 CO₂ 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.

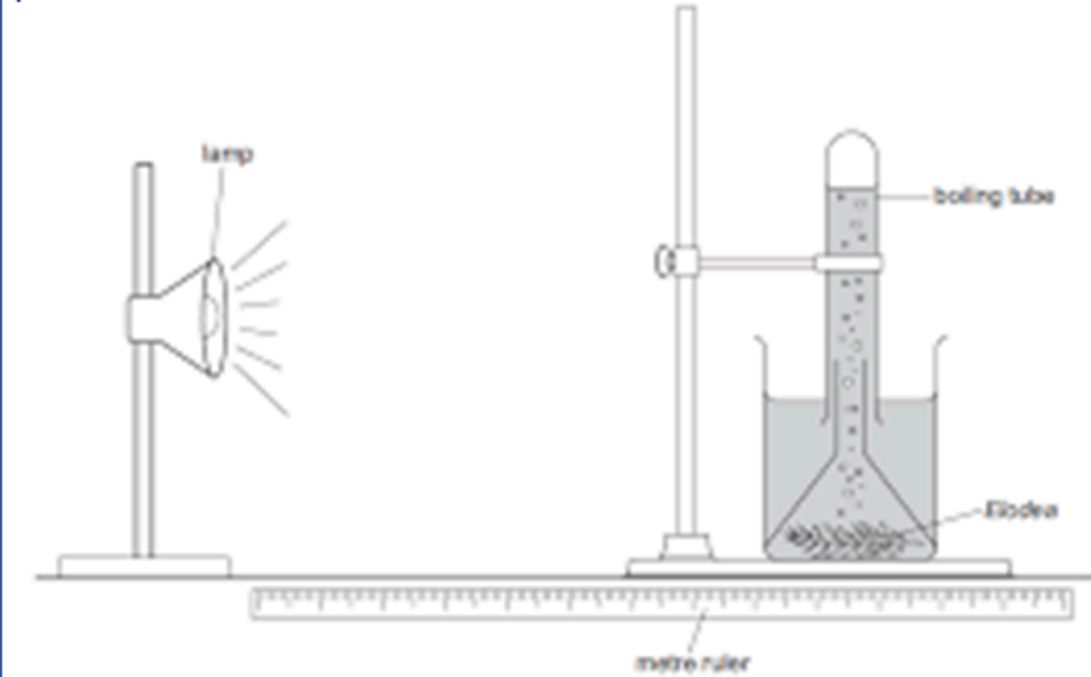
$$\text{light intensity} = \frac{\text{distance from source}^2}{\text{area of surface}}$$



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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.



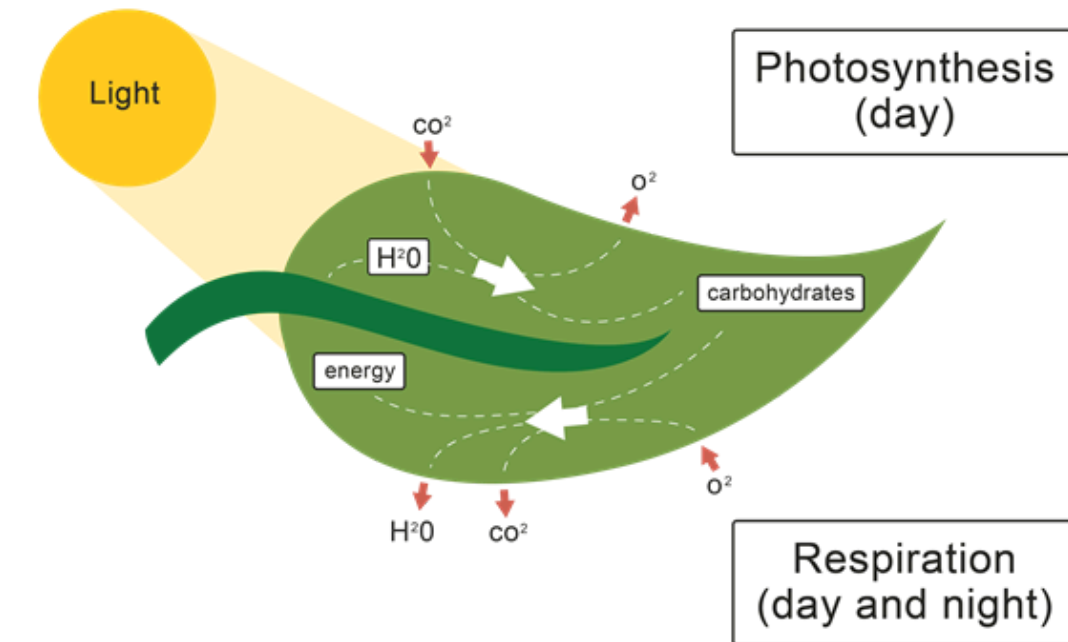
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RPA Light
Intensity

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Knowledge Organiser – 4.4 Bioenergetics

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4.4.2 Respiration

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4.4.2.3 Metabolism

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4.4.2.1. Aerobic and Anaerobic respiration

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AmoebaSisters

4.4.2.2 Response to exercise

BBC bitesize

BBC bitesize (HT)

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).

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.

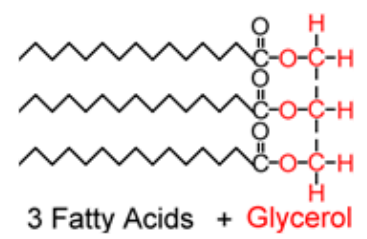
4.4.2.3 Metabolism

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



Key Terms	Respiration Definitions
Aerobic	Using oxygen
Anaerobic	Not using oxygen
Oxidation	A reaction with oxygen. In this case, food molecules like glucose reacting with oxygen.
Fatigue	Tiredness. Fatigue in muscles is caused by a build-up of lactic acid, which is produced during anaerobic respiration (when there is insufficient oxygen).
Oxygen debt	After exercise, the lactic acid has built up and caused an extra need for oxygen – called the oxygen debt.
Lactic acid	Chemical produced by the incomplete oxidation of glucose (anaerobic respiration).

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.

Knowledge Organiser – 5.1 Atomic structure & the periodic table

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5.1.1.1 Atoms,
elements &
compounds

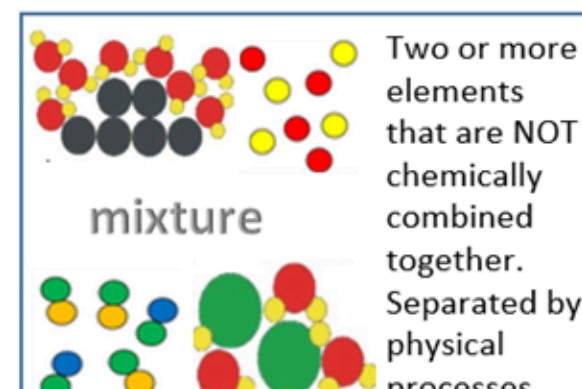
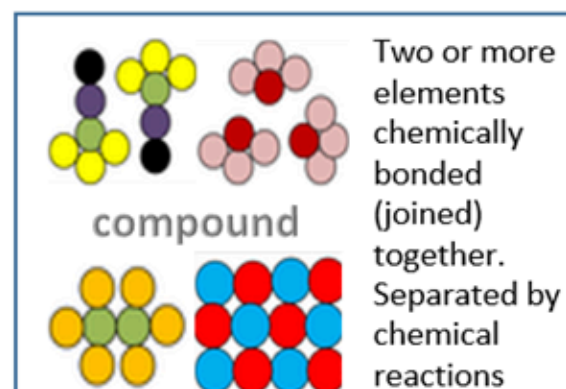
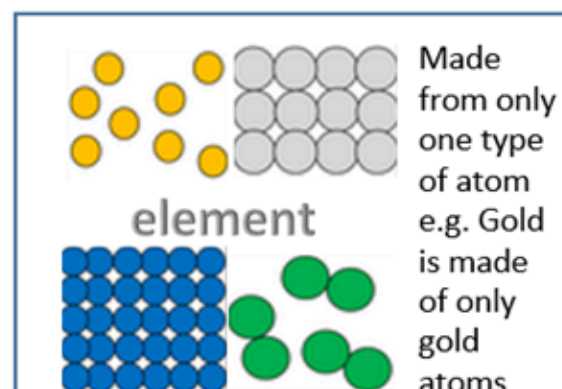
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5.1.1.1

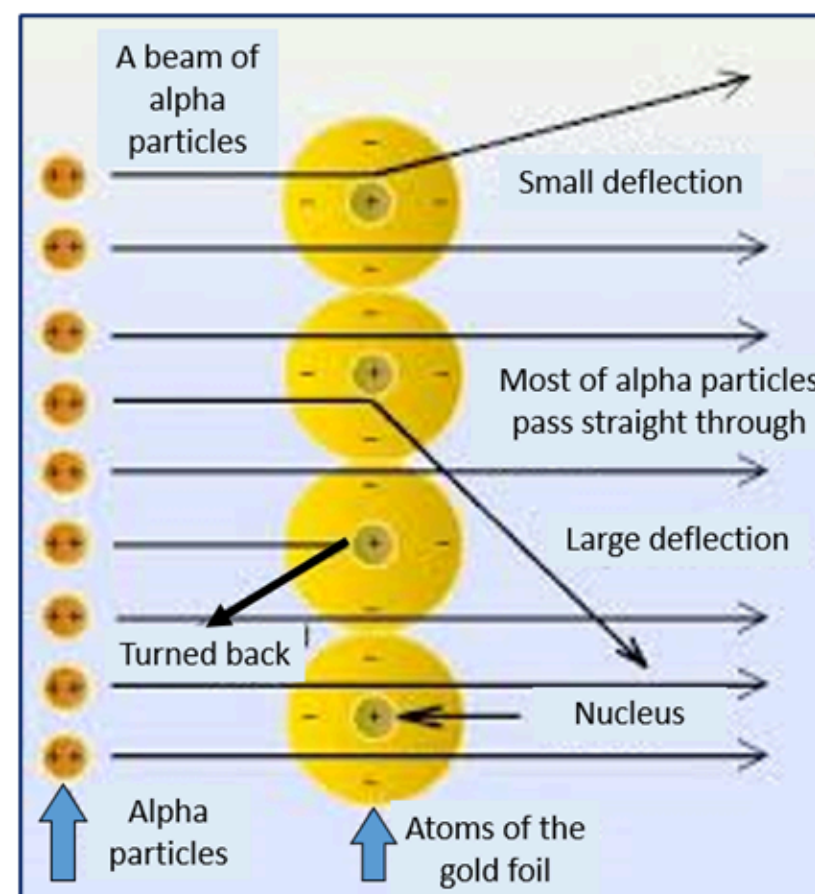
Atoms, elements &
compounds

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.

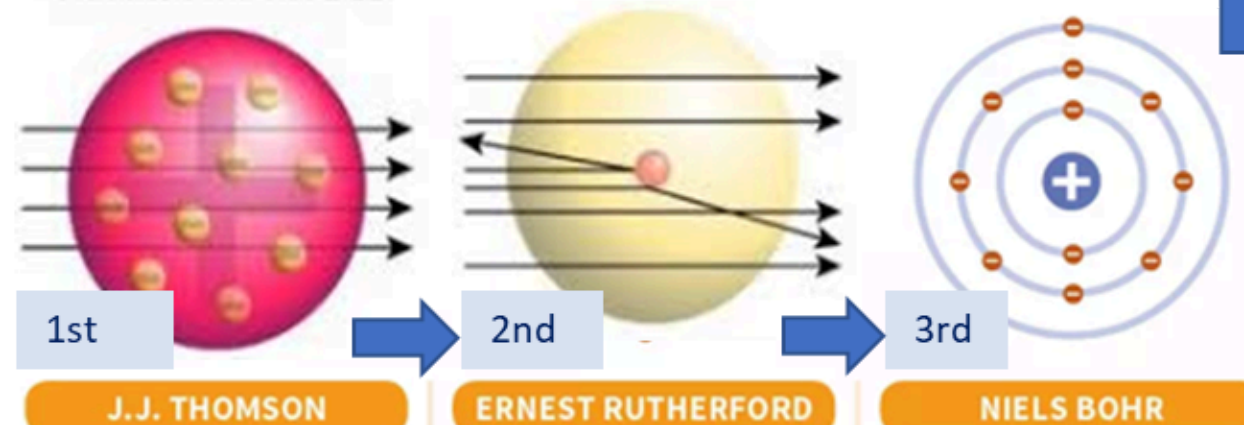
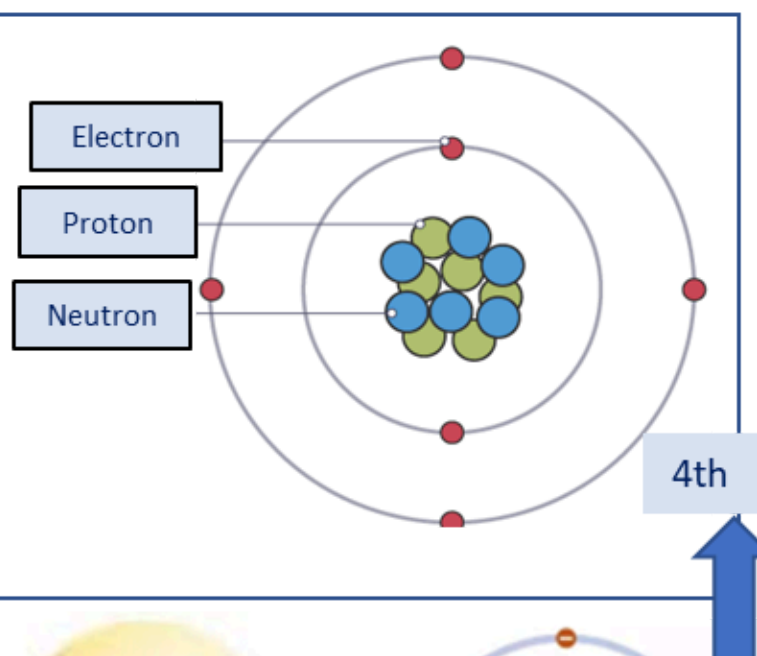


**Ernest Rutherford's Gold scattering
experiment**

- **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.



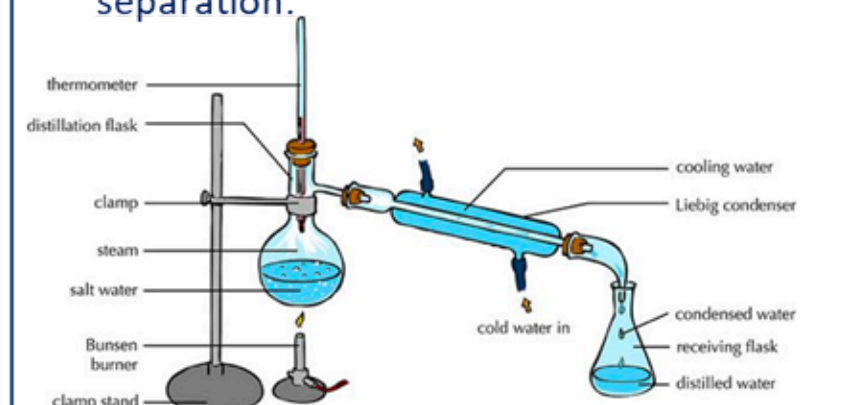
1904- **electron** discovered, placed in a sphere of positive charge (the **plum pudding model**)

1911 - gold scattering experiment discovered mass was concentrated in a central positive **nucleus** (the nuclear model)- further experiments led to discovery of **protons**

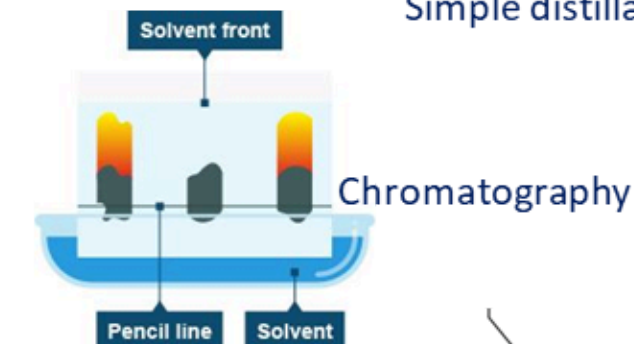
1913 - Suggested electrons orbit the nucleus in **shells**. The shells are at certain distances from the nucleus.

5.1.1.2 Mixtures

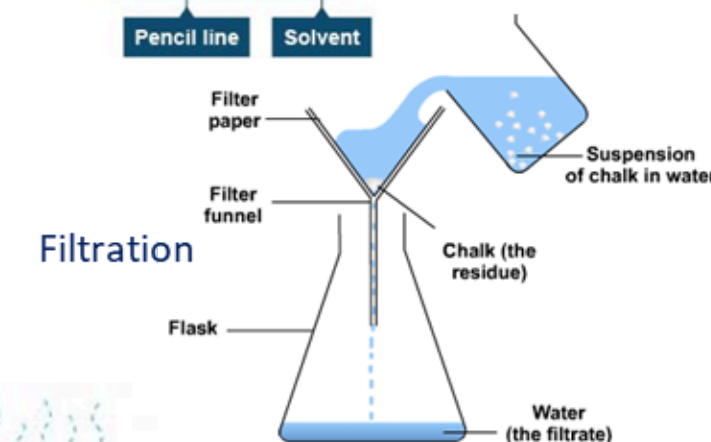
- Mixtures can be **separated by physical processes** such as **filtration, crystallisation, simple distillation, fractional distillation & chromatography**.
- These physical processes **do not involve chemical reactions and no new substances are made**.
- Examples of the specified processes of separation:



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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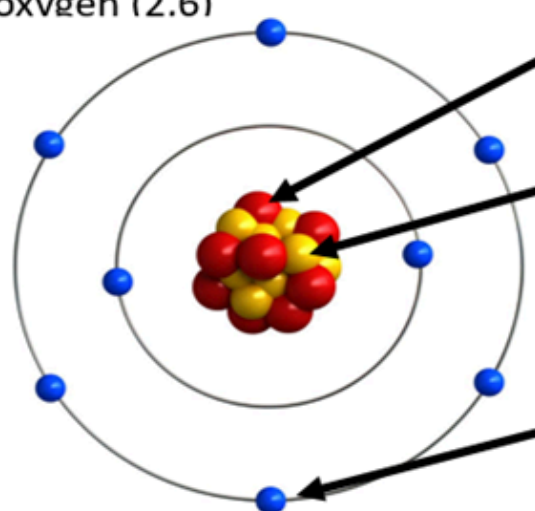
5.1.1.4 Relative electrical charges of subatomic particles & 5.1.1.7 Electron structure

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

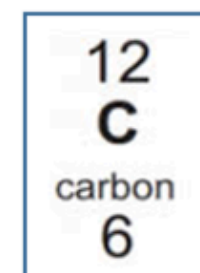
Atomic radius:
0.1 nm

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 (1×10^{-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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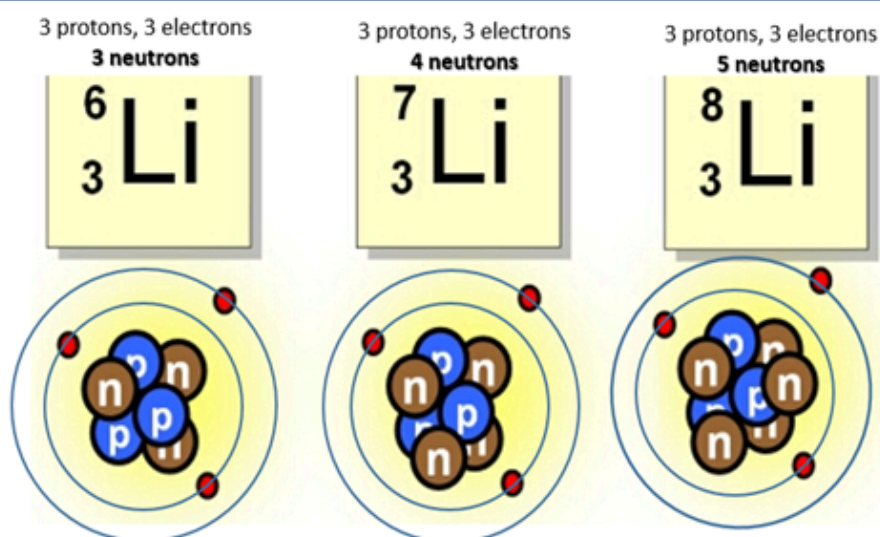
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5.1.1.6 Relative atomic mass

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

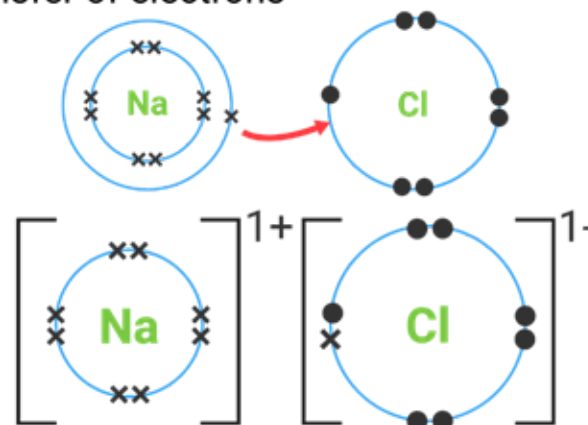
Covalent bonding the particles are atoms which share pairs of electrons. Covalent bonding occurs in most non-metallic elements and in compounds of non-metals

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

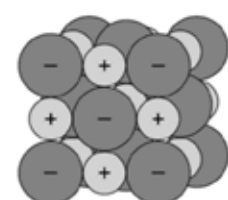
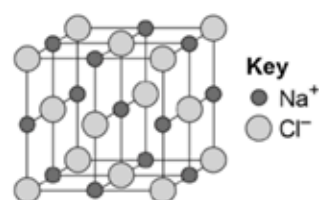


- Between a metal atom and a non-metal atom
- Metals lose electrons to form positive ions
- Non-metals gain electrons & form negative ions
- Electrons **transferred** (ions formed)
- Strong **electrostatic** forces
- Giant **lattice** structures
- High melting/boiling points
- If **molten** or in **solution** ions will conduct electricity

5.2.1.3 Ionic compounds

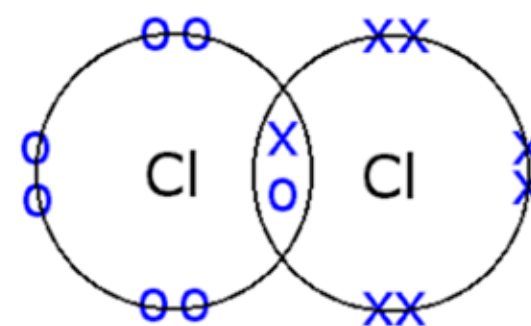
- An ionic compound is a **giant structure of ions**.
- Ionic compounds are held together by **strong electrostatic forces of attraction** between oppositely charged ions.
- These **forces act in all directions in the lattice** and this is called **ionic bonding**.

Eg: structure of sodium chloride

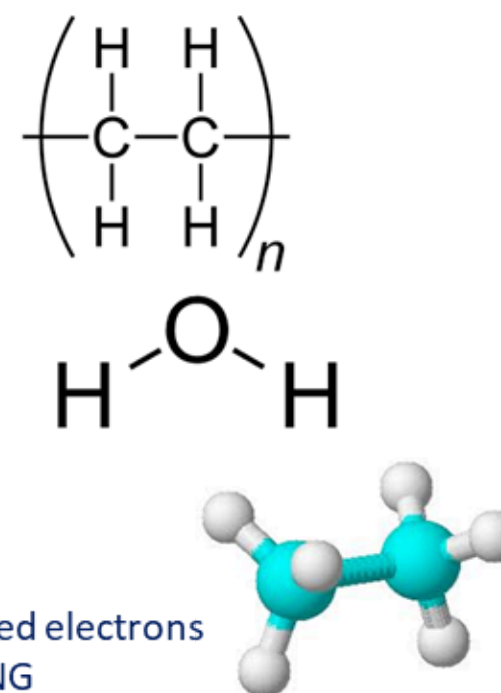


5.2.1.4 Covalent Bonding

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.**

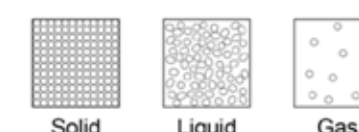
5.2.2.3 Properties of Ionic compounds

- 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

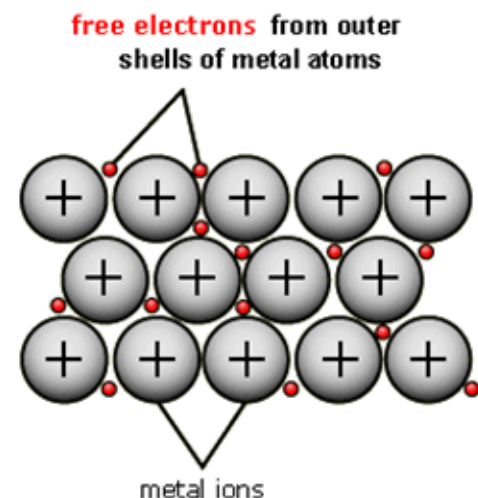
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5.2.1.5 Metallic bonding

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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

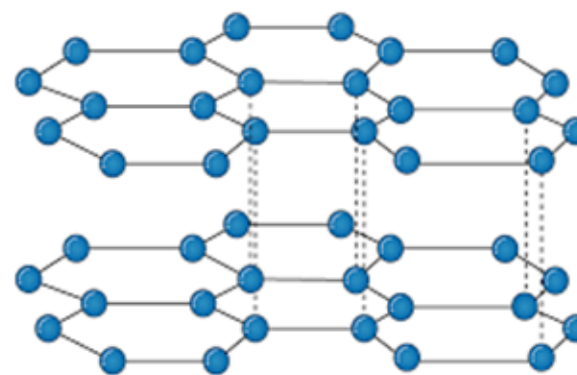
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5.2.2.8 Metals as conductors

- 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

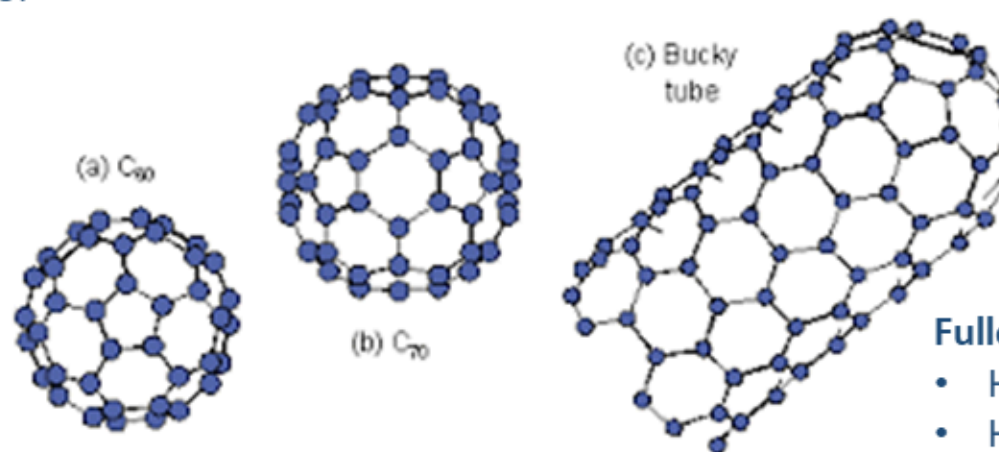
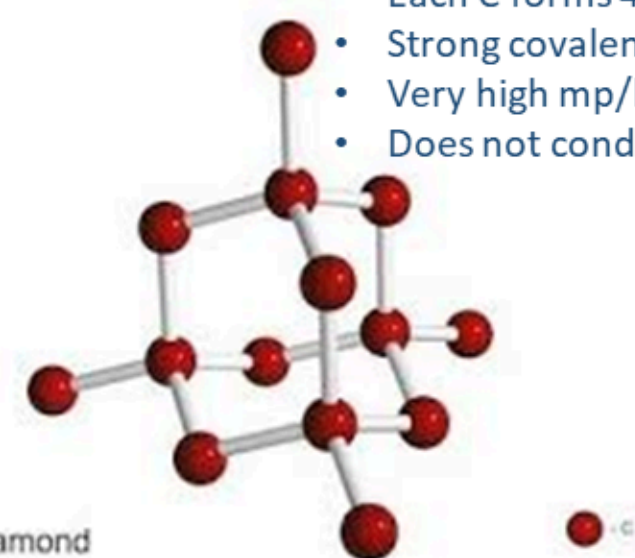


Graphite

- Giant lattice (in layers)
- Each C forms 3 bonds
- Layers of hexagonal rings with no bonds between layers
- Giving 1 delocalised electron
- Good conductor

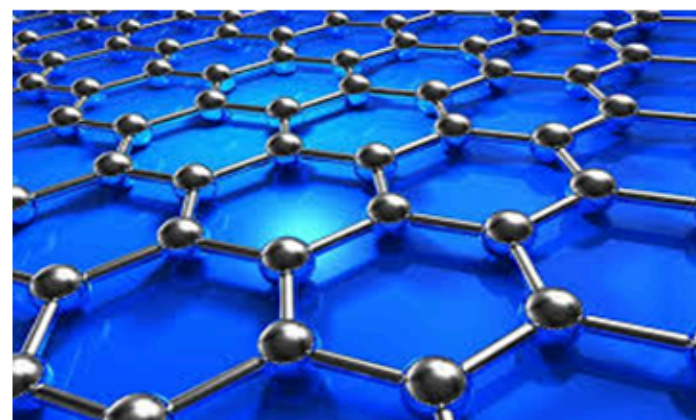
Diamond: Giant lattice

- 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 (C₆₀) 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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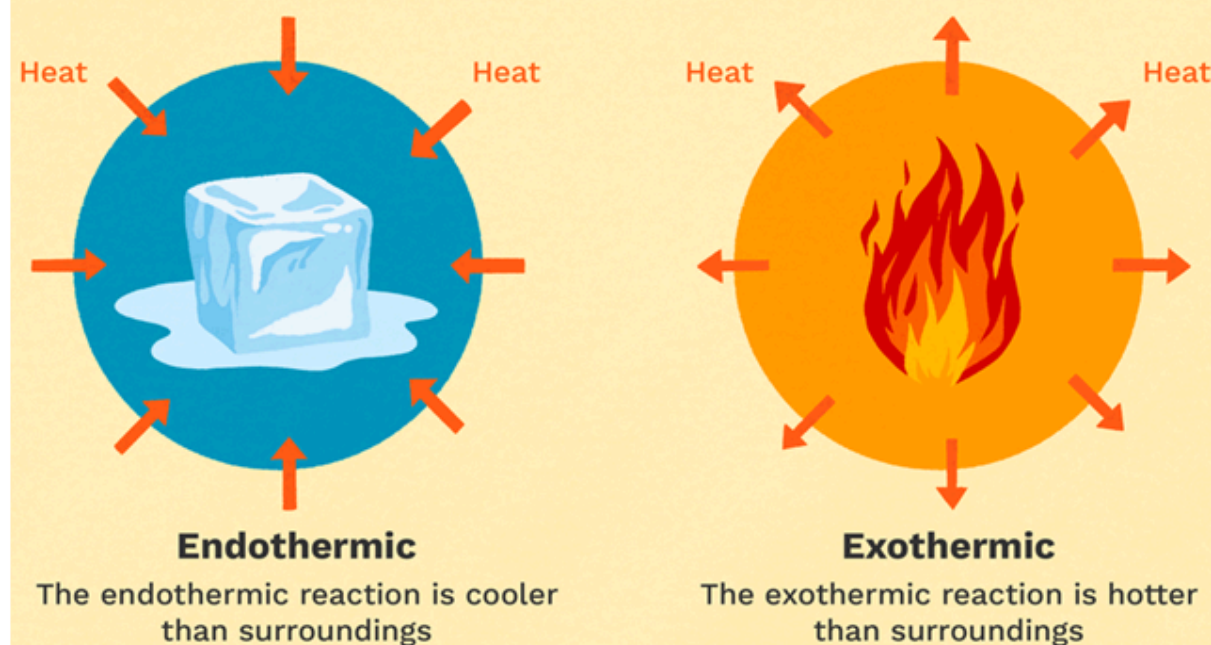
5.5.1 Exothermic and endothermic reactions

5.5.1.1 Energy transfer during Exothermic and endothermic reactions

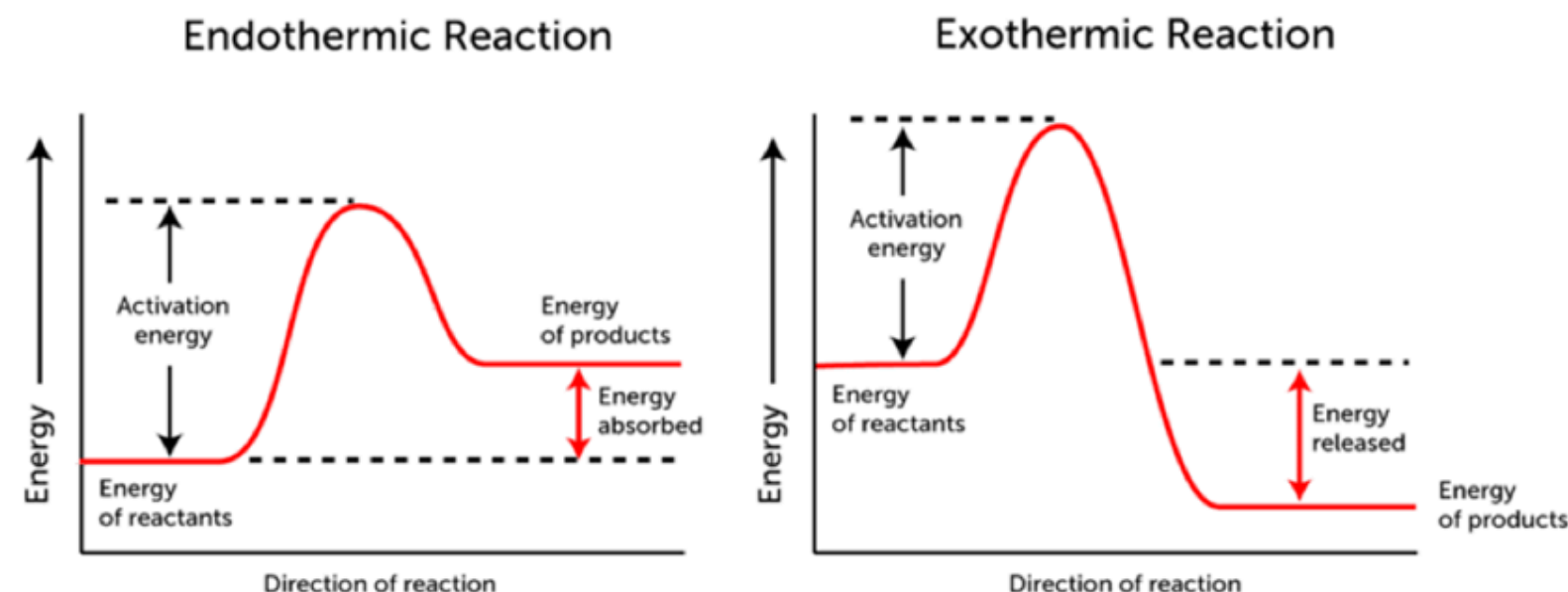
- **Energy is conserved** in chemical reactions.
- The amount of energy in the universe at the end of a chemical reaction is the same as before the reaction takes place.
- If a **reaction transfers energy to the surroundings** the **product** molecules must have **less energy than the reactants, by the 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

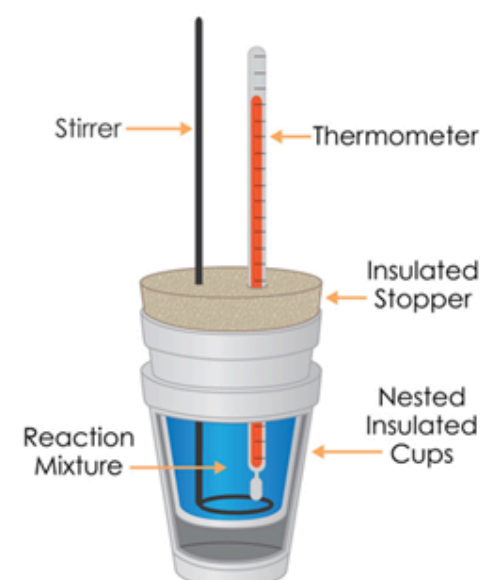


5.5.1.2 Reaction Profiles



- 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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Knowledge Organiser – 5.5 Energy Changes

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5.5.1.3 Energy change of reactions

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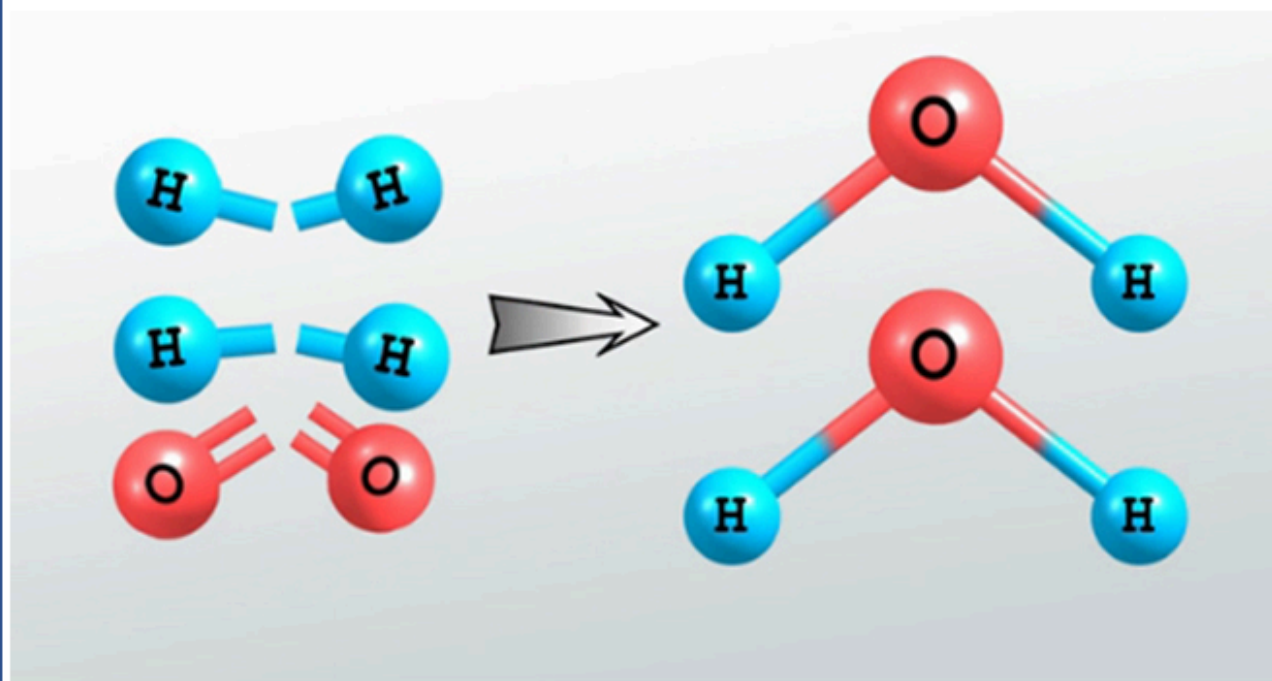
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5.5.1.3 Energy change of reactions (HT only)

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 ⁻¹)
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

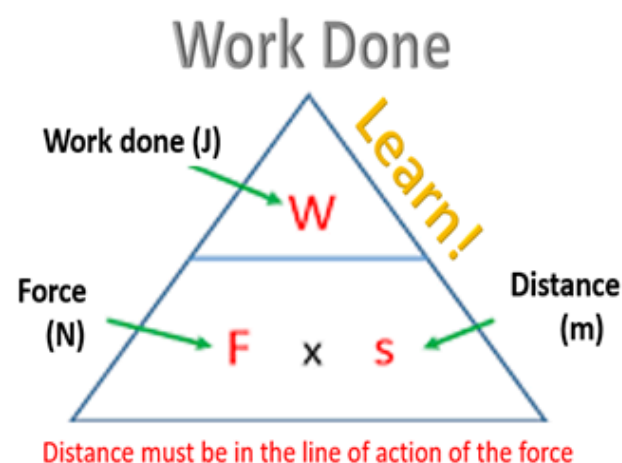
6.1.1.1. Energy stores

and systems

6.1.1.1 Energy stores and systems

Energy store	Description	Examples
Magnetic	The energy stored when repelling poles have been pushed closer together or when attracting poles have been pulled further apart .	Fridge magnets, compasses, maglev trains which use magnetic levitation.
Internal (thermal)	Total kinetic and potential energy of the particles in an object, eg the vibrations - also known as the kinetic energy - of particles . In hotter objects, the particles have more internal energy & vibrate faster.	Human bodies, hot coffees, stoves or hobs. Ice particles vibrate slower, but still have energy.
Chemical	The energy stored in chemical bonds , such as those between molecules.	Foods, muscles, electrical cells.
Kinetic	Energy of a moving object .	Runners, buses, comets.
Electrostatic	The energy stored when repelling charges have been moved closer together or when attracting charges have been pulled further apart.	Thunderclouds, Van De Graaff generators.
Elastic potential	The energy stored when an object is stretched or squashed .	Drawn catapults, compressed springs, inflated balloons.
Gravitational potential	The energy of an object at height .	Aeroplanes, kites, mugs on a table.
Nuclear	The energy stored in the nucleus of an atom .	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

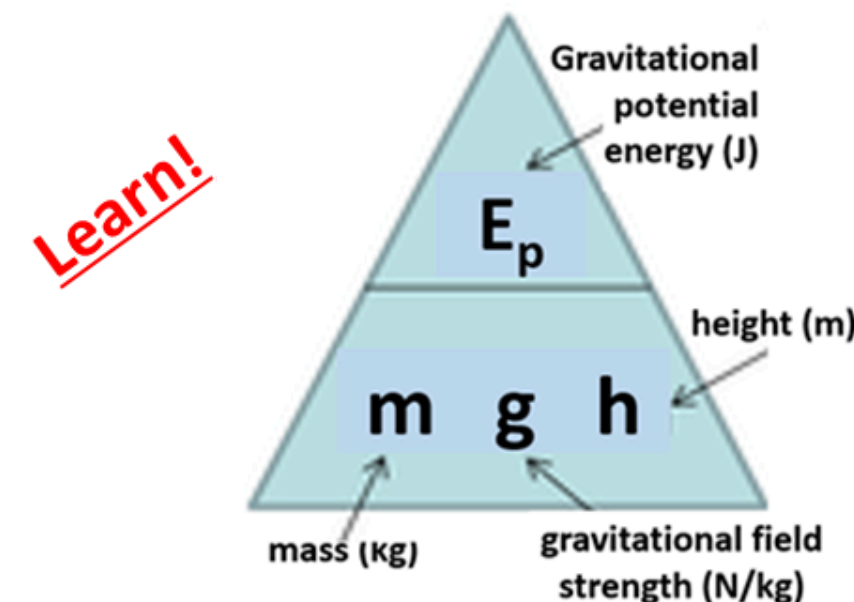
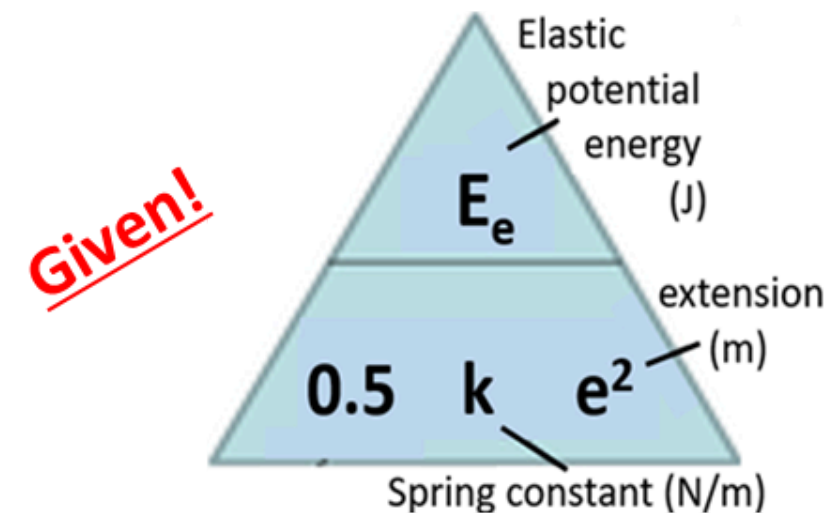
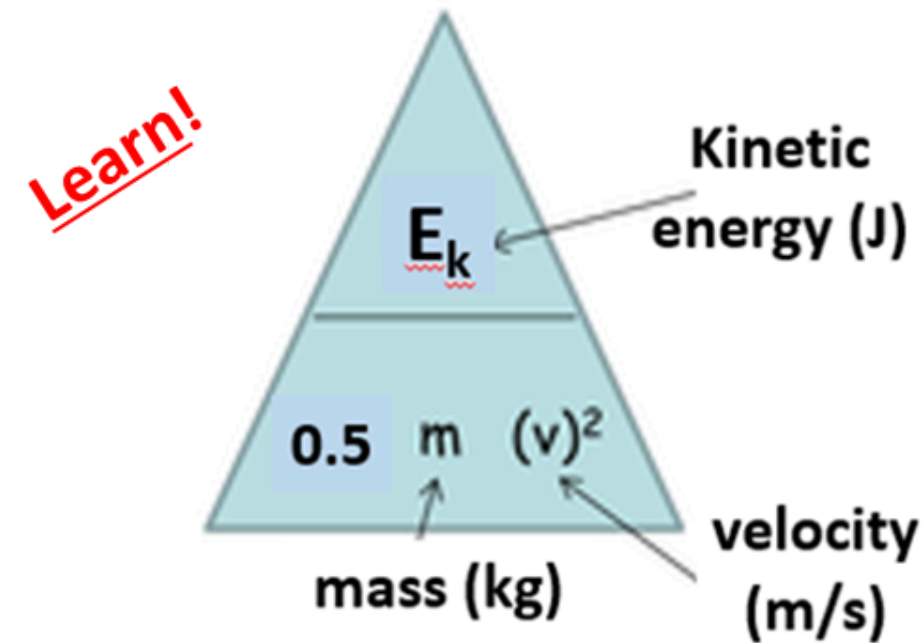
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Gravitational field strength is 9.8N/kg on Earth.
(g will be given in the exam).

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, ΔE , 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

Specific heat capacity

- This is the amount of energy needed to raise the temperature of 1kg of a material by 1°C

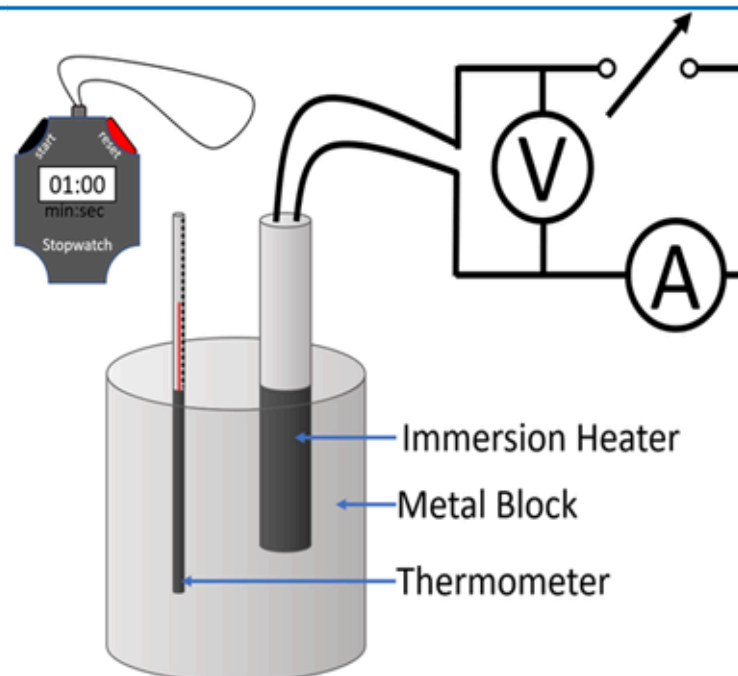
$$E = m \times c \times \theta$$

Energy (J) Mass (kg) Specific heat Capacity (J / kg °C) Change in temperature (°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

Lower Heat Loss

0°C outside house

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

$\frac{0.8}{40} \times 100 = 2\%$

$\frac{0.8}{4} \times 100 = 20\%$

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 (CO ₂ , SO ₂ , NO _x)
Nuclear	Reliable, No CO ₂ , 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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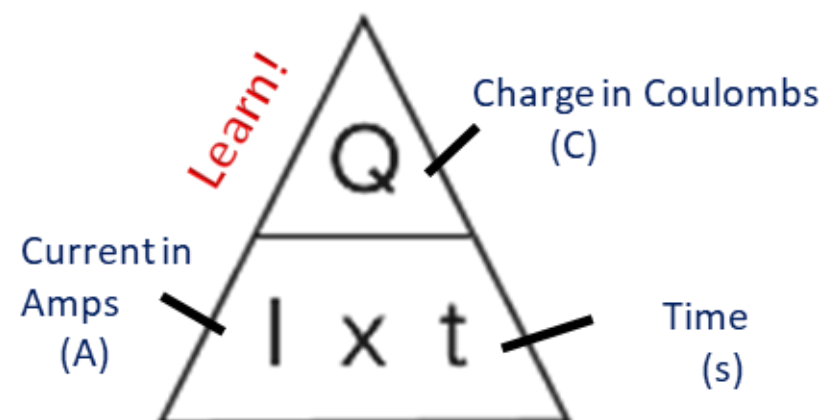
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6.2.1.2 Electrical charge and current

Electric current is a flow of electrical charge.
Size of current is **rate of flow of electrical charge**.

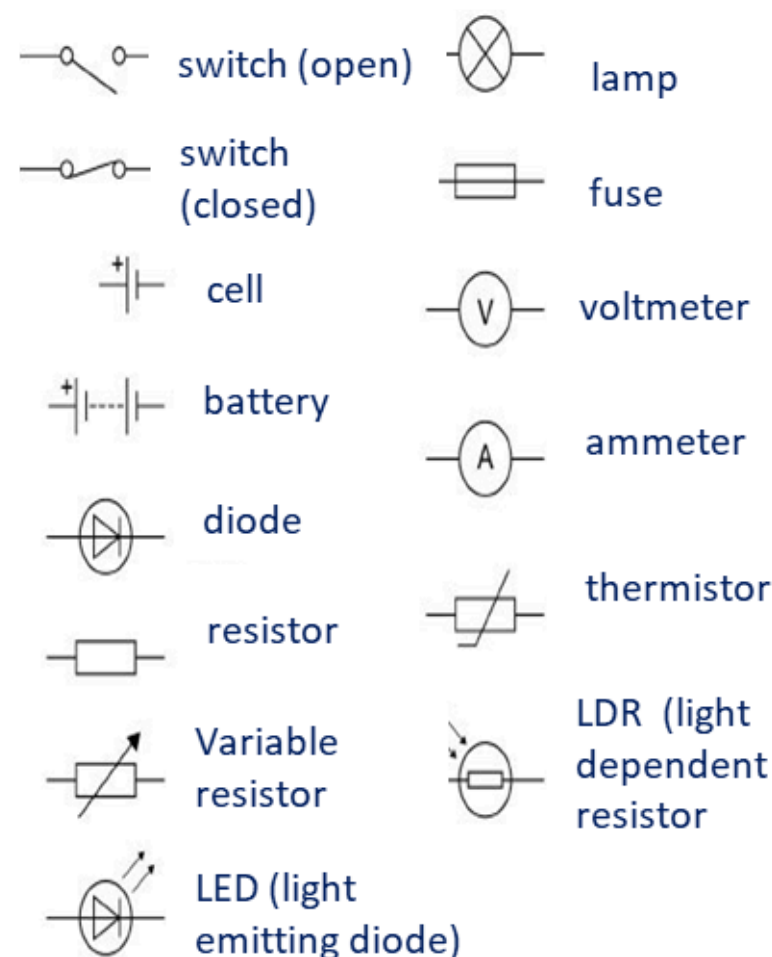
Charge flow, current and time are linked by the equation:

charge flow = current × time



- Current has **same value at any point in a single closed loop**.
- Measured with **Ammeter**

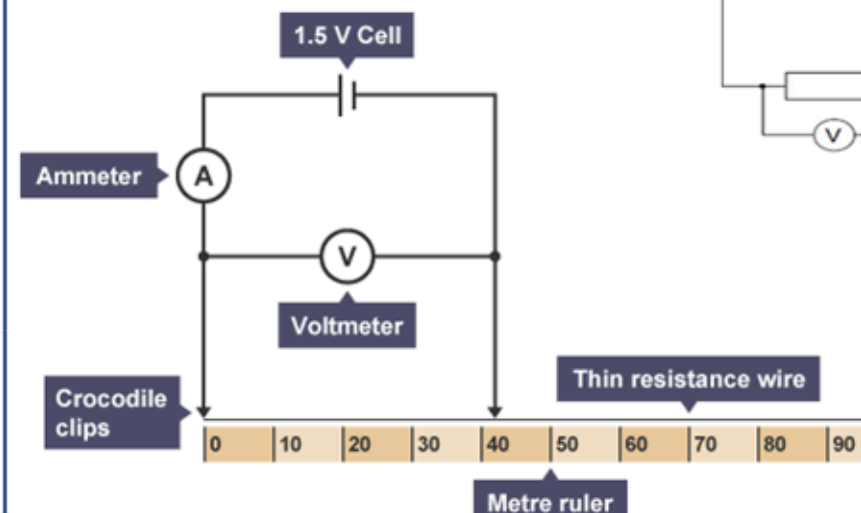
6.2.1.1 Standard circuit diagram symbols



RPA: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits.

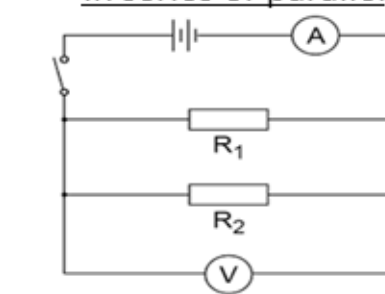
- the length of a wire at constant temperature
- combinations of resistors in series and parallel.

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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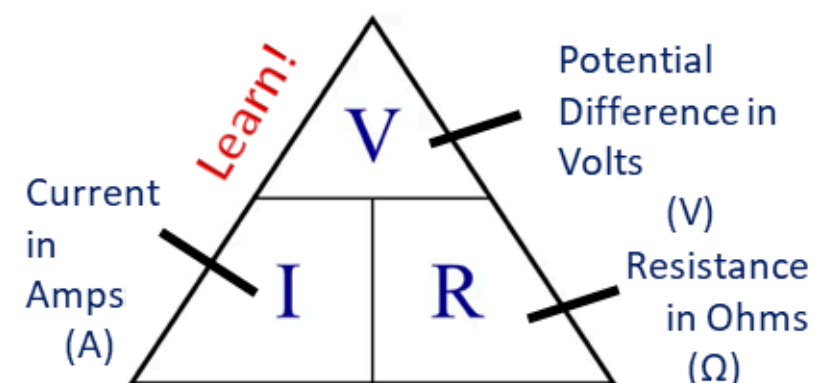
6.2.1.3 Current, resistance and potential difference

- 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, Ω

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

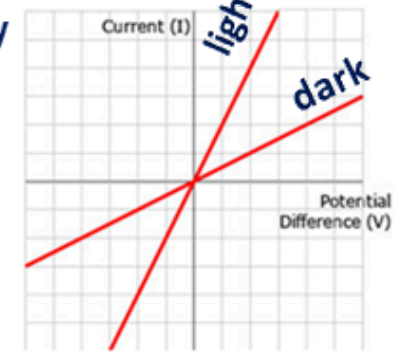
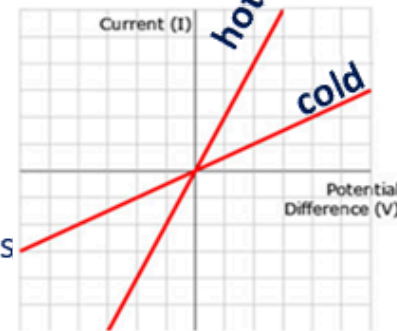
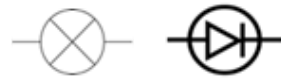
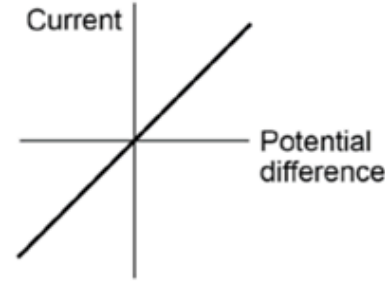
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6.2.1.4 Resistors

- **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.

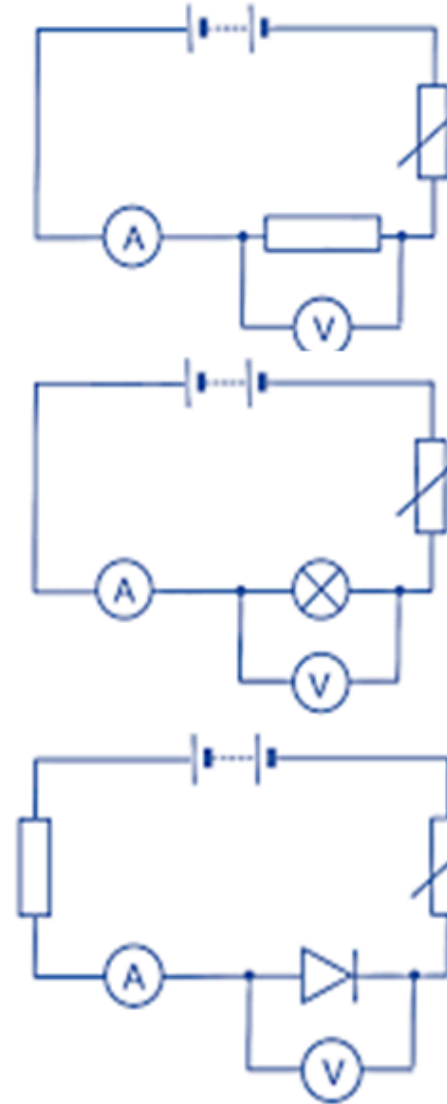


Unit	symbol
Potential difference	V
Current	A
Energy	J
Work done	J
Charge	C
Time	s
Power	W
Resistance	Ω

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.



6.2.2 Series and Parallel circuits

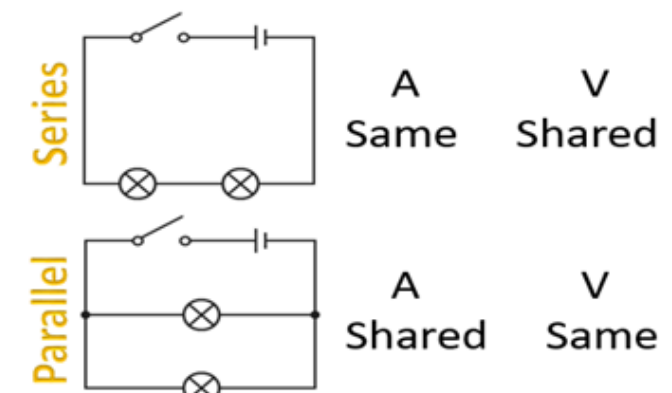
For components connected in series:

- 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**.



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6.2.2 Series and Parallel circuits

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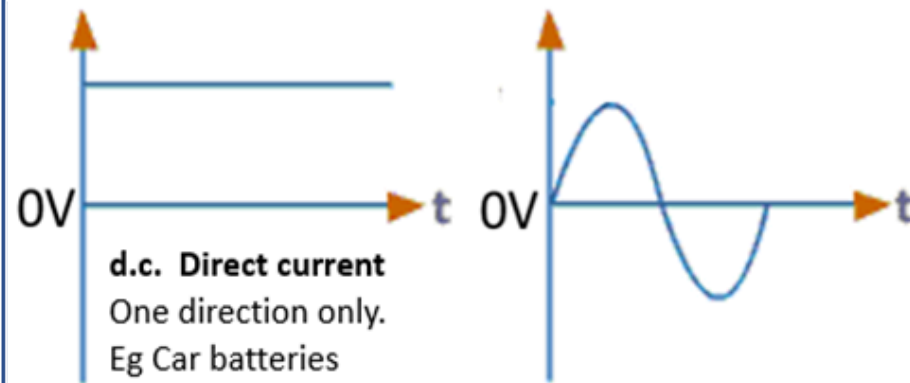
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Knowledge Organiser – 6.2 Electricity

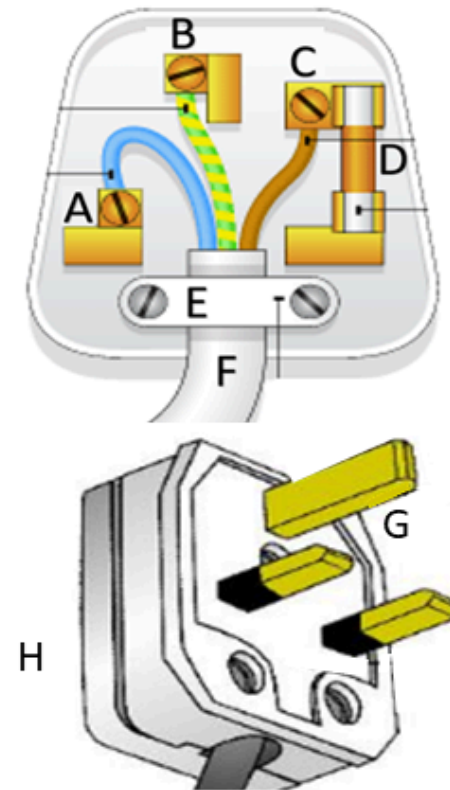
6.2.3 Domestic uses and safety

6.2.3.1 Direct and alternating potential difference



6.2.3.2 Mains electricity

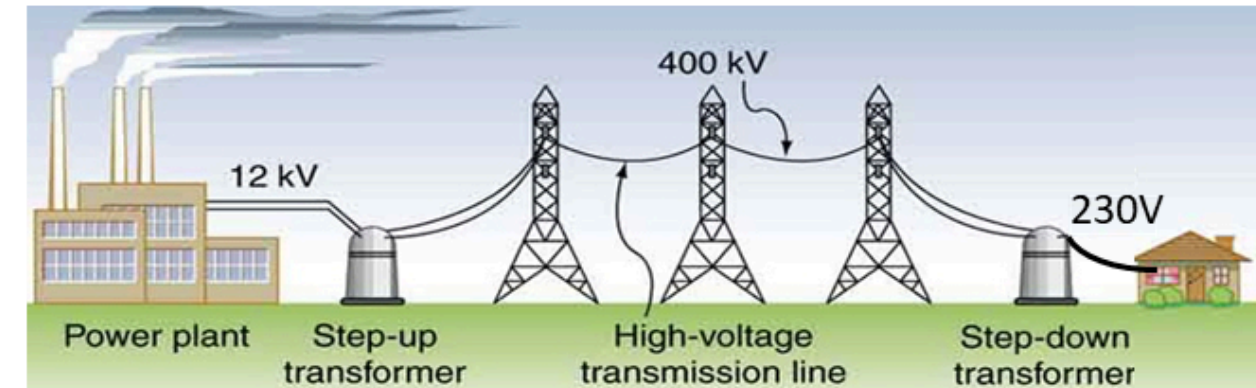
- A**= neutral wire, close to 0V.
- B**= earth wire, 0V, only carries current if there's a fault, stops appliance becoming live.
- C**= live wire, 230V between earth and live.
- D**= Fuse, internal wire melts when current is too big so breaks the circuit.
- E**= cable grip
- F**= three-core cable, copper 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

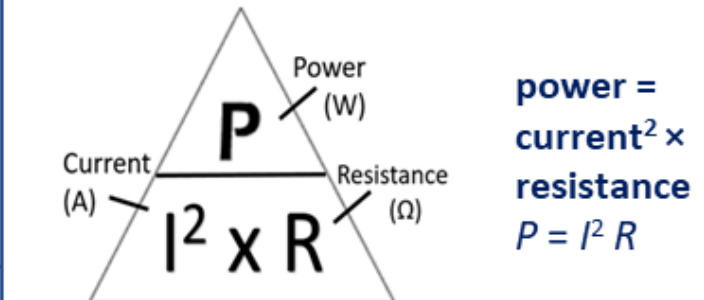
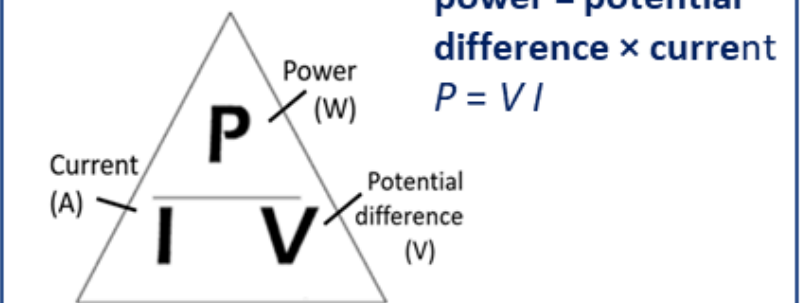
6.2.4.3 The National Grid



- 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?
 $V = E/Q$
 $= 10J / 5C$
 $= \mathbf{2 \text{ volts}}$

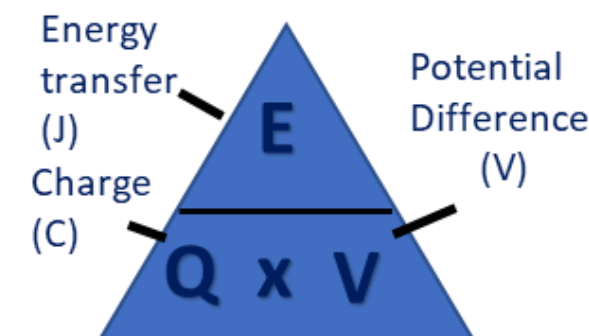
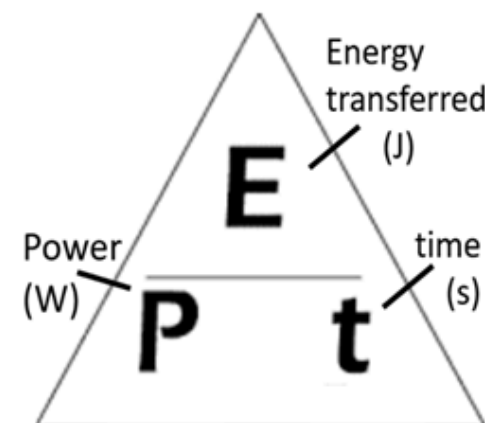
6.2.4.1 Power



- 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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6.2.4.1 Power
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6.2.3.1 Direct and alternating potential difference
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6.2.3.2 Mains Electricity
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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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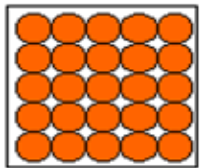
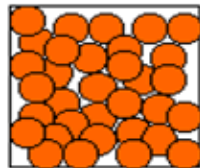
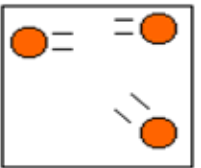
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6.3.1.1 Density of materials

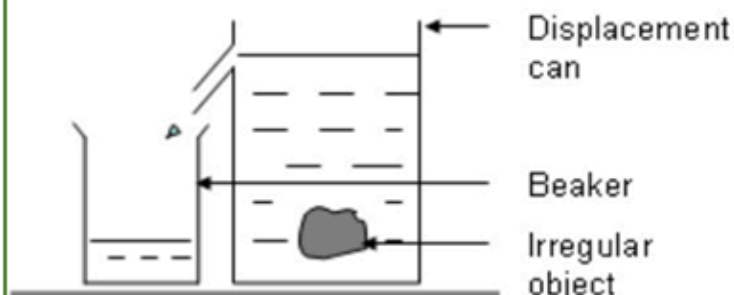
$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\left[\rho = \frac{m}{V} \right]$$

- density, ρ , in kilograms per metre cubed, kg/m³
- mass, m , in kilograms, kg volume, V , in metres cubed, m³
- The particle model can be used to explain the different states of matter
- differences in density.

Solid	Liquid	Gas
Particles closely packed - vibrate - Little energy - Very strong forces of attraction	Particles touching, - Move past each other - Some energy - Relatively strong forces of attraction	Particles very far apart - Move very fast - Lots of energy - 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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RPA Investigate
Density

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6.3.1.2 Changes of states

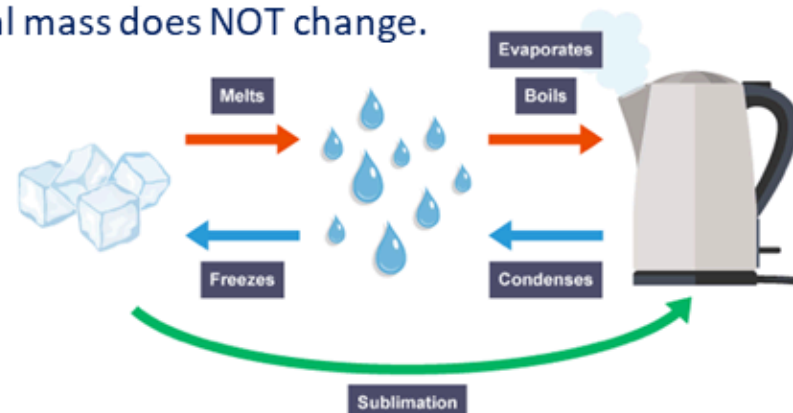
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6.3.1.2 Changes of State

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, ΔE , 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
condensation	A change of state in which gas becomes liquid by cooling.
energy	The capacity for doing work
evaporation	The process in which a liquid changes state and turns into a gas.
freeze	A change of state in which liquid becomes solid by cooling.
Internal energy	The total kinetic energy and potential energy of the particles in an object. Heating changes the energy stored within the object by increasing the energy of the particles that make up the system.
Kinetic energy	Energy which an object possesses by being in motion
Melting	The process that occurs when a solid turns into a liquid when it is heated
Specific heat capacity	The amount of energy needed to raise the temperature of 1 kg of substance by 1°C
Specific latent heat	The amount of energy needed to melt or vaporise 1 kg at its melting or boiling point
Sublimation	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.
Temperature	How warm or cold something is
Thermal energy	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.

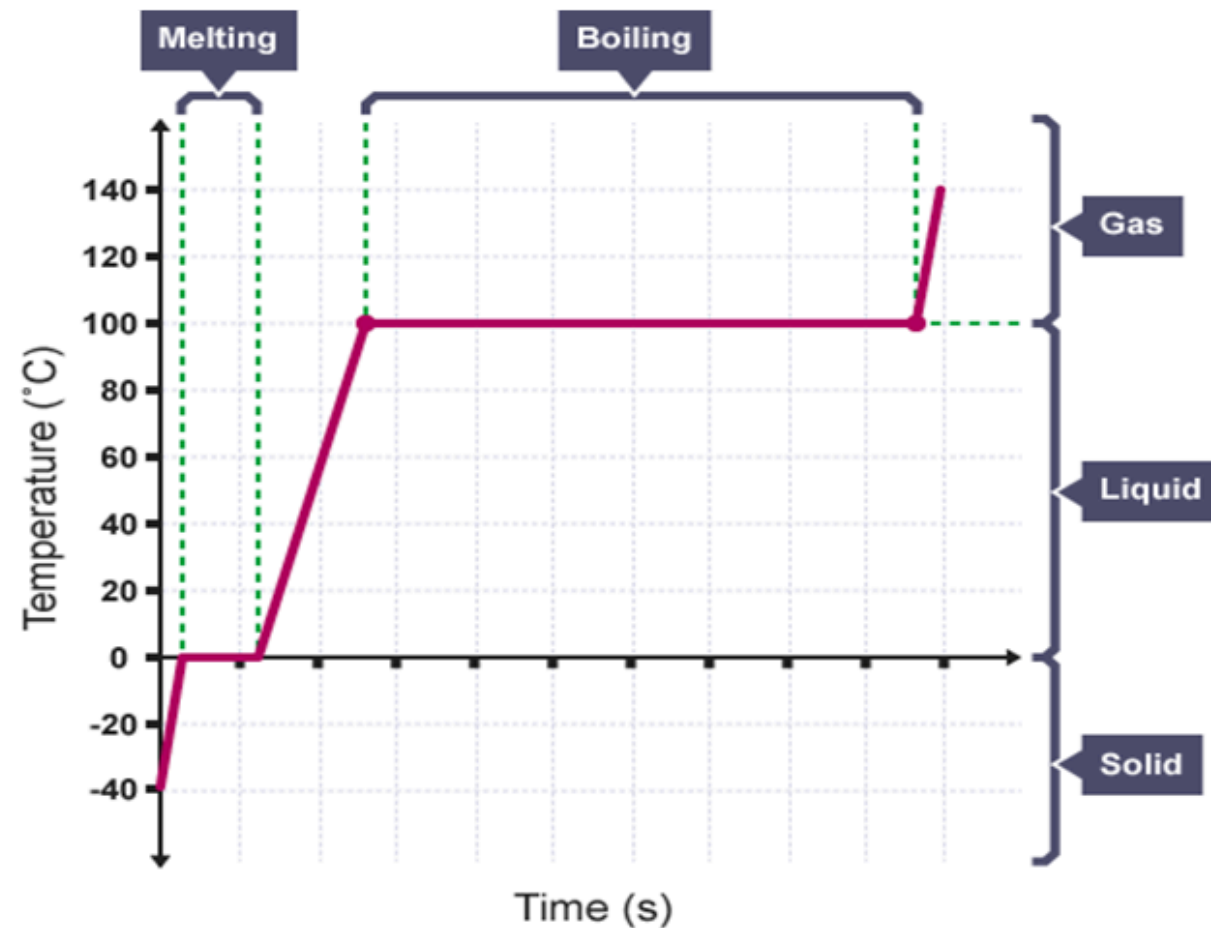
energy for a change of state = mass × specific latent heat

$$E = mL$$

- 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

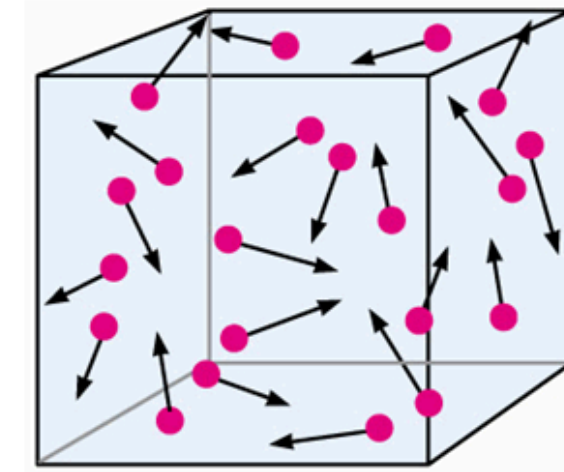
Specific latent heat of fusion – change of state from solid to liquid

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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