



The Trafalgar School at Downton

# Knowledge Organiser

Year 11: Terms 1 and 2



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Name.....House.....
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# Using a Knowledge Organiser well

## **What is a Knowledge Organiser?**

A Knowledge Organiser is a document that sets out the key information you need to understand, learn and memorise in each of the subjects you study this term.

## **Why do I have to carry my Knowledge Organiser around with me?**

Your teachers will want you to use your Knowledge Organisers in lessons. They are yours forever and you may want to annotate or highlight on them when your teacher talks about things in them. They will certainly be used in lessons when you have a cover teacher and you can use them whenever you find yourself with some spare time.

## **How should I use my Knowledge Organiser?**

You should use your Knowledge Organiser to learn this key information and commit it to memory. Your teachers will often quiz you on the information on the Knowledge Organiser in your lessons. The best way of using it is to use the look, cover, write, check method which you will have been introduced to in your Knowledge Organiser launch assemblies.

## **What do I do with my Knowledge Organiser at the end of the term?**

You don't have to carry your Knowledge Organiser around with you anymore but you should keep it somewhere safe where you can easily get it out and use it. Remember that the information on the Knowledge Organiser includes things you will need to remember for your GCSE exams, so your teachers will continue to quiz you on it.

## **Why is a Knowledge Organiser important?**

New GCSE specifications mean that students have to memorise more facts, equations, quotations and information than ever before and there are things you will learn right from the start of year 7 that you will need to know in year 11 when you sit your GCSE exams – the Knowledge Organiser helps you to identify the things that you need to try and commit to your long term memory and return to over and over again during your time at secondary school. There are also things that we think it is important you learn about and remember that might not be in a GCSE exam but represent useful knowledge for life.



# Learning the knowledge in the organiser

Your Knowledge Organiser is a vital document. It contains all the key things from your lessons that you will need to work on committing to your long-term memory.

The best method to use when you are working on memorising things from your Knowledge Organiser is to self-quiz, using the Trafalgar Revision Method, below:

Really read and understand	Read the information 3 or more times and ask for help in understanding
Reduce the knowledge	Rewrite the information, making revision cards or mind maps
Remember	Reread and test that you can remember
Repeat	Repeat the process above until you can recall the information quickly and accurately. Only at this point have you acquired the knowledge!



## How do I remember? Activating your memory

Students often say “I can’t remember” and the reason for this is that the information they are trying to remember and learn is not yet in their **long term memory**.

Your long term memory gets activated by repetition over a number of days. And so repeat the following process to embed knowledge in your long term memory.

<b>Look</b>	Read the information 3 or more times 
<b>Cover</b>	Now cover what you have just read up
<b>Write</b>	Now try and write down the information you have just read 
<b>Check</b>	Did you write down the information correctly? If you made mistakes, correct them with a different colour pen and repeat daily until you “just know it”.



**QUESTION FOUR**  
 Statement written. How far do you **AGREE**?  
 20 marks = 25 mins  
 Bullet points guide your answer  
 AO4 – Evaluate

**To answer: Read and highlight key words in the question**  
 Two stages: recognising **how** the writer tries to achieve effects and deciding **how effectively** this has been done.

- The best answers *mostly* agree with the statement
- “I agree with ... except when ...”
- “Although I agree that... it is also possible that ...”
- Methods** means **CONTRAST** – how does the writer use this? (it will always be there)
- + Narrative voice – Who is talking? Why this person/viewpoint?
- Use this phrase to frame your answer: **The writer uses the...**
- Then add: **the word/phrase/personification/metaphor/simile/alliteration...**
- Then add a **quotation**
- Then add: **This method shows that/suggests/implies ...**
- End by evaluating: **although/however/but ...**
- Then: **repeat** until you run out of time (literally repeat the above frame)

**Top Tips:**  
 Leave enough time to cover the whole text.  
 Consider **HOW** much you agree (a little or a lot).

Look at specifics within the statement (not just the statement as a whole.) Could compare within a text.

**MAKE SURE YOU DO THIS QUESTION FIRST!**

**QUESTION THREE**  
 How has the writer **STRUCTURED** the text to...?  
 8 marks = 15mins  
 You need to consider the **WHOLE** text.  
 Bullet points guide your answer  
 AO2 – Structure

**To answer:**  
 Read and highlight key words in the question  
 Leave 3 lines at the top of your answer for a summary statement – do it at the end though because by then you will have worked out what it is

- The 5Cs of Q3 + HOW & WHY**
- Construction** – how has the writer ‘built’ the text? Is it simply **chronological** or more **complex** – flashbacks, single/multiple narratives, repetition, patterns, motifs...
  - Contrast** = again, no.1 structural technique...it will always be there so learn what to say about it! Light/dark; small/big; 1 person/crowds of people; day/night; etc
  - Camera + Cinematic** – where are we positioned? What do we see?
  - Circular** = if they can find a circular narrative, the examiners will use it so look for this – it means we start & end in a similar place but something has changed – what?
  - Changes** in focus = **changes** in perspective = **changes** in paragraphs! Look at each paragraph – **how** has it changed? **why** has it changed? [TiPToP]
  - Summary statement = the examiners want this for the higher marks = one sentence overview of how the structure changes across the text – you’ve left 3 lines for this!
  - Always write about the ending
  - Check you’ve commented on each change of focus/perspective/paragraph
  - Consider **coherence** (connections and links across paragraphs, links within paragraphs, topic sentences.)
- Top Tips:**  
 Comment in the writer’s techniques like a film makers using phrases like: focusing, zooming, narrowing, widening, introducing, developing, changing focus, concluding, foreshadowing, contrasting. E.G. ‘We start to see things through the father’s eyes as if we are searching with him’ or ‘We go from a wide viewpoint to a close-up focus if we are getting inside the father’s mind’

**QUESTION TWO**  
 How does the writer use **LANGUAGE** to....?  
 8 marks = 15mins  
 Extract re-printed on your answer page.  
 Bullet points guide your answer  
 AO2 – Language

**To answer:**  
 Read and highlight key words in the question  
 ‘Analysis of Language’ in Q2 means you **must** write about **SYMBOLISM**  
 Pick your quotations **first** then consider devices

- CONTRAST** is the number 1/most important language technique – it is always in all good writing/extracts – so always look for this & comment on it
  - There are 10 key terms to learn for Q2:**
  - Imagery** = Simile, metaphor, personification, alliteration,
  - Adjective, adverb, verb,
  - Motif** – repeated images or patterns – often colours or ideas – freedom/flight/light
  - And the phrase **‘perhaps...’** (allows you to speculate & offer alternative ideas)
  - And also the phrases: **‘the effect of this is...’** & **‘the effect of the motifs...’** (don’t be afraid of sounding repetitive, the marks are for comments on ‘effect’...not for style!)
  - +There will always be at least one complex sentence used as a list - always find this and refer to it – you don’t need to comment on sentence forms in any other way.
- Top tips:**  
 Pick out individual words afterwards and discuss their **effect** (not meaning). When you pick out a word/device underline it – so the examiner knows you know which word is the ‘verb’ etc. **Track** through the extract from start to finish.

**QUESTION ONE**  
 4 marks = 5 mins  
 **LIST** 4 things in lines .....  
 Must be in selected lines  
 AO1 - Locate

- To answer:**  
 Read and highlight key words in the question  
 Simply select the correct lines from the passage  
 Write four short points in spaces A-D for 4 marks
- Top tips:**  
 This is not a trick question. It is easy. Be brief but accurate. Re-read the **correct lines** from the text.

**PAPER 1 LANGUAGE - READING CREATIVE TEXTS - 60 mins (25% GCSE) - One literary fiction text. 4 Qs.**

**REMEMBER YOU SHOULD HAVE ALREADY DONE Q5 - you are going to work backwards through the Qs**

**The Mark Scheme**

Bands 1-4	4 – DETAILED, PERCEPTIVE 3 - CLEAR, RELEVANT 2 - SOME, ATTEMPTS 1 – SIMPLE, LIMITED
Q1	<ul style="list-style-type: none"> <li>Reads with understanding</li> <li>Identifies explicit information.</li> </ul>
Q2/3	<ul style="list-style-type: none"> <li>Analyses the effects of writer's choices</li> <li>Well-judged quotations</li> <li>Sophisticated subject terminology</li> </ul>
Q4	<ul style="list-style-type: none"> <li>Same as Q2/3</li> <li>Evaluates (judges the effectiveness of) the text in a detailed way</li> </ul>

**Language features**

Simile	Similes help readers to picture a particular object, person or place by <b>comparing something they don't know to something they do</b> . They can also be used for <b>exaggeration</b> .	Alliteration	Alliteration creates a memorable sound in the readers' head that means they notice that particular line more or they can remember it quite well. <b>This means it can be used to emphasise a particular point, idea or feeling.</b>
Metaphor	Metaphors help readers to picture a particular object, person or place by <b>transforming them into something they understand better</b> . They can also be used for <b>exaggeration</b> .	Nouns and Verbs	Nouns are people, places or objects. Verbs are actions or 'doing words'. <b>Both can be used carefully to evoke or give off certain emotions or feelings.</b>
Personification	Metaphors help readers to picture a particular object or place by <b>transforming them into something they understand better</b> . They can also be used for <b>exaggeration</b> .	Adjectives and Adverbs	Adjectives are words that <b>describe nouns</b> . Adverbs are words that describe <b>verbs</b> . These are both used to add to <b>descriptions</b> and help <b>build specific images or feelings in the readers' heads</b> .

**Q3: Structure**

Narrative perspective/voice
Flash-forward/ Flash-back
Dialogue
Topic sentence
Discourse markers
Ellipsis
Foreshadowing
Focus/Narrowing
Contrast/ juxtaposition

**Assessment Objectives (AOs)**

<b>AO1</b>	<ul style="list-style-type: none"> <li>Identify and interpret explicit and implicit information and ideas.</li> <li>Select and synthesise evidence from different texts.</li> </ul>
<b>AO2</b>	<ul style="list-style-type: none"> <li>Explain, comment on and analyse how writers use language and structure to achieve effects and influence readers</li> <li>Use relevant subject terminology to support views.</li> </ul>
<b>AO4</b>	Evaluate texts critically and support this with appropriate textual references.

**Pace and Tone: A way to think about sentences**

Sometimes students can feel a little confused when asked to consider 'sentence forms' in Q2, but there is an easier way to look at them. Every writer wants to establish a pace and a tone to their writing. Pace is how fast or slow a text is meant to be read, and tone is the kind of sound or mood you want to give to a piece of writing.

If you use lots of short sentences together it can build tension, but it can also speed up a text as a reader becomes more desperate to find out what happens as tension builds. Alternatively short sentences can make a reader stop and reflect on specific ideas.

Longer, more complex sentence forms can be used to aid description or to help a reader build up an understanding of character.

So when you read the exam text, think about what kind of tone and pace is created and how the writer uses sentences to achieve that effect on the reader.

**Q2: Language**

Pronouns
Direct speech
Terms of address
Noun phrase
Subordinate/ main clause
Narrative voice
Simple/compound /complex sentences
Accent /Dialect
Utterances
Ellipsis
1 <sup>st</sup> /3 <sup>rd</sup> person
Hyperbole
Imperatives
Exclamations

**Basics & Stretch Yourself**

Know your basics	Noun/verb/adverb/adjective/ simile/metaphor/question/alliteration/onomatopoeia/5 senses/listing/personification/repetition
Reach for the stars	Give one sentence overview for each question, identifying patterns - use the word 'main' or 'key'/Embed quotations/Look at the bigger picture – not just individual quotes/Consider genre and form/narrative voice/be /use terms: implies/illuminates/

**Key things to consider about the text**

**Genre:** What type of story is it? Is it horror? Romance? A mystery? What conventions does the story include that make it fit into that genre? Why has the writer chosen this genre?

**Reader:** How is a reader supposed to respond to this text? Are they meant to be scared? Happy? Confused? How does the writer achieve this?

**Atmosphere:** What type of mood or tone does the writer create in their story? How do they achieve it?

**Names:** Which characters are named? What are they called? Which characters are not named? Why not this be? Why might these names be important?

**Dialogue:** Do characters speak to each other? Why? Why do they talk about? What does this tell us about character, theme or plot?

**Description of character:** How are the characters described? What does this information reveal to us about them?

**Archetypes:** What types of characters do we have in this story? Villains? Heroes? Antiheroes? Comedic characters?

**Description of setting:** How is the setting described? Why is this important? Is setting more important than character?

# PAPER 1 LANGUAGE Q5 - WRITING CREATIVE TEXTS - 45 mins (25% GCSE) – NARRATIVE OR DESCRIPTIVE.

**REMEMBER YOU SHOULD ALWAYS DO Q5 FIRST**

<p>Generally – why not go for the narrative and have a bit of fun writing? <b>BUT</b> learn the rules (6 of them) on how to write an effective story in 45 mins. Find a style that suits you and practice/learn it!</p>	<p><b>6 rules for writing stories</b> Start every sentence with a new word Include the word ‘choreography’ Have a long sentence – 30 words plus Have a sentence with 4 verbs End a paragraph with a short sentence Use CONTRAST in every sentence</p>		<p><b>The basics</b></p>		<p><b>The Exam</b></p>		<p><b>The descriptive ‘rules’</b></p>	
<p><b>DESCRIPTION</b> Write 3-4 sides Use the photo/picture as a springboard but it is there to inspire not limit you Use the 6 camera method for this too? Watch ‘howto cheat the description Q’ (Mr Salles)</p>	<p><b>Mr Salles Method for planning stories [The 6 Camera Method]</b> 1. Zoom out: viewpoint 1 2. Motif: symbol or image (repeating) 3. Zoom in: viewpoint 2 4. Motif: symbol or image (repeating) 5. Zoom out: viewpoint 1 (again) or 3 6. Final Zoom in + Motif: viewpoint</p>		<p>Capital letters</p>	<p><b>45 minutes - 1 task - 40 marks</b> (1 from a choice of 2 - usually 1 descriptive <u>or</u> 1 narrative...but could be 2x narrative or 2x descriptive)</p>	<p>No names for people</p>	<p>Full stops</p>	<p>Step one: read &amp; highlight key words in question (including PURPOSE, AUDIENCE, LANGUAGE &amp; FORM)</p>	<p>At least 3 zoom-ins</p>
<p><b>NARRATIVE</b> No killing or blood Don’t use whole film plots or ideas from the Lit texts without being creative* Don’t reuse a story that is obviously from a PPE Q Don’t use computer games*</p>	<p><b>Plan like this in the exam</b> [exactly like this – the details will look after themselves when you start writing] But do practice planning like this using a picture e.g. picture of a plane on a runway...idea = The Plane Crash</p>	<p>Question marks</p>	<p>Step two: Study the stimulus (picture) then choose one of the two questions</p>	<p>No person described for more than a paragraph</p>	<p>Commas</p>	<p>Step three: Plan 6-8 things you can include, then put them in order (Steps 1 to 3 = 10 mins)</p>	<p>Minimum 5 senses</p>	
<p><i>*you can use characters and ideas from games or films – especially if you can play it into a great twist – but pick a <u>very</u> small section – up to 2mins max (these are great to practice on – turn a 1min scene into a piece of writing)</i></p>	<p>1. Zoom out: viewpoint 1 2. Motif: symbol or image (repeating) 3. Zoom in: viewpoint 2 4. Motif: symbol or image (repeating) 5. Zoom out: viewpoint 1 again or viewpoint 3 6. Final Zoom in + Motif: viewpoint</p>	<p><b>Example 1:</b> 1. Flock of geese 2. Guitar (red) 3. Face - stewardess 4. Music – link to the guitar 5. Space eyed view 6. Guitar (red links to danger)...crash (but you aren’t going to write this bit ...just lead up to it)</p>	<p>Apostrophes</p>	<p>Step four: Write it’ (Step 4 = 30 mins) <input type="checkbox"/> Should be lots of crossing out to show ‘crafting’ <input type="checkbox"/> Should be 2 sides approx</p>	<p>1-3 sentences of direct speech</p>	<p>Consistent tense</p>	<p>Step four: Write it’ (Step 4 = 30 mins) <input type="checkbox"/> Should be lots of crossing out to show ‘crafting’ <input type="checkbox"/> Should be 2 sides approx</p>	<p>Maximum 1 exclamation mark</p>
<p><b>Planning:</b> Think up 3 ideas...discard the first 2: by the third idea you have moved away from what most people will do – use this! <b>Then plan using the 6 Camera Method - don’t skimp on this stage!</b></p>	<p><b>Example 2:</b> <b>Lighthouse</b> Viewpoint 1 Zoom in – inside Zoom out - boat Zoom in – light on Zoom out - boat Lighthouse</p>	<p>Abandoned – dark; light not on at start – <i>repeat opening with light on at end – circular narrative!</i> Fixing the light – dark frown Danger – moving towards dark Relief – bright smile lit up face Boat avoids danger Same as 1 but light on</p>	<p>Paragraphs</p>	<p><b>Symbolism</b> literary device that contains several layers of meaning, often concealed at first sight, and is representative of several other aspects, concepts or traits than those that are visible in the literal translation alone. Writers often use symbolism to convey a message to readers in a more subtle or personal way.</p>	<p>3<sup>rd</sup> person</p>	<p>Homophone spellings</p>	<p><b>Motif</b> In narrative, it is a repeated sign or element which can help create mood or theme. Colours are often used in this way as is light &amp; dark – <i>think of the colours used in film to represent good or bad characters</i></p>	<p>No thoughts</p>
<p>Connectives</p>	<p><b>Contrast (technique)</b> A rhetorical device through which writers identify differences between two subjects, places, persons, things, or ideas. Simply, it is a type of opposition between two objects, highlighted to emphasize their differences. All the best writing is based around the use of contrast so you should always look for it.</p>	<p>Present or past tense (not both)</p>	<p>Semi-colons</p>	<p><b>Imagery</b> Includes simile, metaphor &amp; personification - sometimes called ‘figurative language’. Essentially this is where a writer uses language visually – to create an image by suggesting a connection between ideas that the reader can then ‘see’.</p>	<p>Move the camera – like a film</p>	<p>Colons</p>	<p><b>Assessment Objectives</b></p>	<p></p>
<p>Hyphens</p>	<p><b>AO5 Content and Organisation</b> Communicate clearly, effectively and imaginatively, selecting and adapting tone, style and register for different forms, purposes and audiences. Organise information and ideas, using structural and grammatical features to support coherence and cohesion of texts.</p>	<p></p>	<p>Parenthesis (...)</p>	<p><b>AO6 Technical Accuracy</b> Candidates must use a range of vocabulary and sentence structures for clarity, purpose and effect, with accurate spelling and punctuation. (This requirement must constitute 20% of the marks for each specification as a whole.)</p>	<p></p>	<p>Topic sentences</p>	<p></p>	<p></p>
<p>Vary sentence starts/lengths</p>	<p></p>	<p></p>	<p>Vary paragraph lengths</p>	<p><b>ISPACED... VARIETY!</b></p>	<p></p>	<p><b>Sentence starts</b></p>	<p></p>	<p></p>
<p>Verb – <i>Running quickly, she .....</i> (make sure you finish sentence)</p>	<p></p>	<p></p>	<p>Adverb – <i>Darkly, the night sky....</i></p>	<p></p>	<p></p>	<p>Adjective – <i>Red light filled the ...</i></p>	<p></p>	<p></p>
<p>Preposition – <i>Down there, all...</i></p>	<p></p>	<p></p>	<p>Connective – <i>However, his life...</i></p>	<p></p>	<p></p>	<p></p>	<p></p>	<p></p>

# Language Methods to Practise in your Fortnightly Writing Challenge

alliteration:

You'll never put a better bit of butter on your knife



anecdote:

Talking to his children about the dangers of running in the house, a dad might include an anecdote about falling in his home as a boy and breaking his arm.

antithesis:

That's one small step for man, but a giant leap for mankind.



chiasmus:

'Let us never negotiate out of fear, but let us never fear to negotiate.'

emotive language:

Think about the poor, defenceless animals that suffer due to our rubbish!

experts:

'Group chat can often be a source of upset,' warned psychologist Dr Linda Pappadopolis.



extended metaphor:

*The Road Not Taken*, by Robert Frost, is one of the most famous examples of extended metaphor; in the poem, he compares life's journey to a forest path.

foreshadow:

The witches in *Macbeth* are used to foreshadow that Macbeth is not innocent: 'Fair is foul and foul is fair', a line he echoes in his first appearance when he says 'so foul and fair a day I have not seen'.



imperative verbs:

Chill out! Do as I say! Don't eat the daisies! Please be quiet! Be quiet!

metaphor:

'The sun in the west was a drop of burning gold that slid near and nearer the sill of the world.'



modal verb:

You must be home by midnight. You could be tired if you're any later. You should ring your uncle. E.g. mustn't, can, might, shouldn't, may, will etc.

pathetic fallacy:

In *Macbeth*, the night the King is murdered 'has been unruly ... in th' air, strange screams of death ... Some say the Earth was feverous and did shake.'

sensory description:

Wind swirled around the beach house, whistling loudly. He felt the snowflakes melting on his skin, their liquid trickling down his neck, cold, wet, seeping into his clothes.



simile:

Without warning, Lionel gave one of his tight little sneezes: it sounded like a bullet fired through a silencer.

statistics:

You have a 20% chance of surviving a 60mph crash if you don't wear a seatbelt!

superlative:

This is the worst day of my life but at least we're in the finest café in London.

onomatopoeia:

The dog knocked over the vase with a crash!



personification:

Dancing on the water, the sun shone endlessly.



repetition:

'As my grandfather went, arm over arm, his heart making sour little shudders against his ribs, he kept listening for a sound, the sound of the tiger, the sound of anything but his own feet and lungs.'

# Homophones



- ❖ there: I'd love to go **there**.
- their: Is that **their** cat?
- they're (they are): **They're** late.
- ❖ to: I'm going **to** work.
- too: I've had **too** much to eat!
- two: I have **two** hands.
- ❖ no: We have **no** chance.
- know: How do you **know** that?
- ❖ your: What's **your** name?
- you're (you are): **You're** not alone.
- ❖ new: She has a **new** phone.
- knew: I already **knew** that.
- ❖ which: **Which** colour do you like?
- witch: She was a wicked **witch**.
- ❖ of: Please have a piece **of** pie.
- off: Get **off** the grass!
- ❖ where: **Where** are you going?
- wear: What should I **wear**?
- were (was): **Were** you joking?
- ❖ our: I want **our** team to win!
- are: When **are** you home?
- ❖ here: Please come back **here**.
- ❖ hear: Can you **hear** the birds?



Use *lie* to indicate the act of reclining: I am tired just watching the dog *lie* in the warm sunlight.  
(to lie: lie(s), lay, lain, lying)

Use *lay* to indicate the placement of something: Please *lay* the paper on the table.  
(to lay: lay(s), laid, laid, laying)

## PROPER GRAMMAR



## IT SAVES LIVES.

with the apostrophe

it's

Contraction of "it+is" or "it+has"

It's great to see you.  
It's been fun.  
It's clear to see.

without the apostrophe

its

Possessive form of "it"

The tree dropped its leaves.  
The pencil lost its point.  
A robot recharged its battery.



**Use fronted adverbials:**

Rather slowly, (manner)  
During the night, (time/temporal)  
Every minute or two, (frequency)  
At the end of the corridor, (spatial)

Just beyond the stairwell on his left,  
he opened the door.

**Use a two and then three word sentence:**

It hurt. I was dying!

Snow fell. Flakes floated precariously.

**Use anaphora:**

Now is the time for action. Now is the time to take up arms. Now is the time to fight for your country.

**Use epiphora (epistrophe)**

I can't believe I was robbed. Everything is gone. My television and electronics are gone. The money I left on my nightstand is gone.

**Use a range of sentence structures:**

The spotted green frog jumped into the pond.  
(simple)

The spotted green frog jumped into the pond and he splashed water on me.  
(compound – coordinating conjunction: for, and, nor, but, or, yet, so)

The spotted green frog jumped into the pond when the hawk flew overhead.  
(complex – subordinating conjunction: if, although, as, before, because, when, after, since, until, so that, while etc.)

When the hawk flew overhead, the spotted green frog jumped into the pond.  
(subordinate/dependent clause start)

The frog, which had been lurking underwater, jumped on the lily pad.  
(embedded clause)

**Use a past participle - 'ed' start:**  
Glazed with barbecue sauce, the rack of ribs lay nestled next to a pile of sweet coleslaw.

**Use a present participle - 'ing' start:**  
Whistling to himself, he walked down the road.

**Use a tricolon (tripartite list):**

'I stand here today humbled by the task before us, grateful for the trust you have bestowed, mindful of the sacrifices borne by our ancestors.'

Snap! Crackle! Pop! (Rice Krispies slogan)

**Use a conditional sentence:**

When people smoke cigarettes, their health suffers.

If I had cleaned the house, I could have gone to the cinema.

**Use paired adjectives to describe a noun:**

Take a look at this **bright red** spider.

Luckily, it isn't a **wild, dangerous** one.

**Use anadiplosis (yoked sentence):**

Building the new motorway would be **disastrous, disastrous** because many houses would need to be destroyed.

'Fear leads to **anger**. **Anger** leads to **hate**. **Hate** leads to suffering.'  
Yoda, *Star Wars*.



**Use different sentence types:**

The wind is blowing. (declarative)

Put your pen down. (imperative)

Who do you trust most in the world? (interrogative)

Pollution is killing us! (exclamation)

**Use discourse markers to begin paragraphs and start/link some sentences:**

First of all, To begin with, Firstly,

Therefore, Consequently, Hence, As a result,

Furthermore, In addition, Additionally, Moreover,

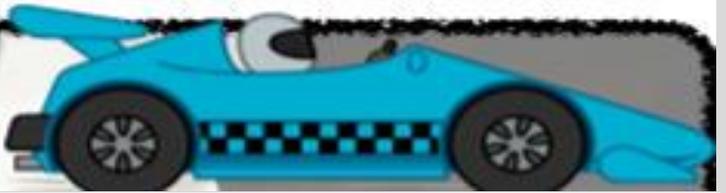
Meanwhile, Later that day, Seconds later, Subsequently, That afternoon,

On the whole, Interestingly, Basically, In short, Broadly speaking,

Alternatively, Conversely, Similarly, On the other hand, Despite this, Likewise, However,

To conclude, Finally, In conclusion, Eventually, In the end,

# PUNCTUATION PIT STOP



## Full Stop

Full stops are used to:

- 1) mark the end of a sentence.



Carefully, he kicked the ball into the goal.

- 2) show when a word has been abbreviated.

Saint Peter's Road is on the High Street.  
→ St Peter's Road is on the High Street.

## Exclamation Mark

Exclamation marks express strong emotions: forcefulness, commands, excitement, anger, surprise etc.

Don't buy that car! Stop telling me what to do! I'm free! You're late! She actually won! They're also used for most interjections:  
'Hi! What's new?'  
'Oh! When are you going?'  
'Ouch! That hurt.'



## Dash -

Dashes are used for parenthesis: a word or phrase inserted as an explanation or afterthought into a passage which is grammatically complete without it. E.g.  
Last year, they roasted the winning brisket — the size of pillow — in a mighty clay oven.

Paul was scared – more scared than he'd ever been.

## COMMAS

Commas are used to separate:

- 1) items in a list.

Bert, Ernie and Elmo are my three pet rats.

- 2) dependent clauses and phrases.

While I was in the bath, the cat scratched at the door. That meant, because I was on my own in the house, I had to get out to let him in. Thankfully, I had a towel handy!

## Semi-colon

Semi-colons are used to separate two sentences that are closely related:

It was winter; the snow was falling heavily. They can also be used to separate items in a list made of longer phrases.

I have been to Newcastle, Carlisle, and York in the North; Bristol, Exeter, and Portsmouth in the South; and Cromer, Norwich, and Lincoln in the East.

## Brackets

Brackets are used in pairs for parenthesis: a word or phrase inserted as an explanation or afterthought into a passage which is grammatically complete without it. E.g.

Andrew Jacklin (last year's losing finalist) is expected to win this heat.

Tigers are carnivores (meat eaters)!

## Quotation Marks

Quotation marks show exact words that are spoken or written by someone.'



'Don't be late!' shouted Mrs Smith

'I will be,' Molly said, and added, 'don't expect me before 11.'

Mrs Smith replied, 'What time?'

## Colon

Colons are used to:

- 1) begin a list.

I have three pet rats: Bert, Ernie and Elmo.

- 2) indicate that what follows it is an explanation or elaboration of what precedes it.

Unfortunately, the weather forecast was wrong: it rained all day!

## Ellipsis

Ellipsis is used to:

- 1) show a pause or hesitation in someone's speech or thought.

I don't know ... I'm not sure.

- 2) build tension or show that something is unfinished.

Looking up, Paul couldn't believe what he saw ...

## Question Mark

Question marks are used at the end of direct questions instead of a full stop.

What is your favourite food?

How do you feel today?

An indirect question ends with a full stop, rather than a question mark:

I'd like to know what you've been doing all this time. I wonder what happened.

## Apostrophe

An apostrophe is used to show:

- 1) omission - where a letter or letters has been missed out.

does not → doesn't I am → I'm

- 2) possession – when some thing/one owns something.

Thankfully, they played Susan's game. Interesting, David's house does not have a garden, but Sarah's house does.

# PUNCTUATION PIT STOP



### Writing a formal letter

**Writing Forms**

221B Bakers Street  
London  
NW1 6XE

35 Hibiscus Crescent  
Andover  
Hants  
SP10 3WE

Dear Sir or Madam

I am writing because you chair a committee in charge of the compulsory wearing of school uniforms. I am a student at Brinsley High School, a friendly and successful school where uniforms are not worn.

Of course, I understand that all students won't spend all morning choosing what to wear or beg parents for clothes. But there is another side to this case: uniforms breed uniformity. We are culturally diverse nation and all dress the same, this encourages us to be the same. At Brinsley High, we are encouraged to express our individuality, yet this seems to be in contradiction of the message enforced uniform sends.

Furthermore, ...

Yours faithfully  
**Sherlock Holmes**

20<sup>th</sup> February, 2020

Formal Salutation: Sir/Madam/Mr Roderick/Mrs Roderick

fluently sequenced paragraphs

fluently sequenced paragraphs

formal sign off: Yours faithfully (Sir/Madam = Faithfully) (Mr/Mrs = Sincerely)

reader's address

writer's address

date

### Text for a Speech

#### 'Address to Nation on the Challenger' by Ronald Regan (28<sup>th</sup> January, 1986)

Ladies and Gentlemen, I'd planned to speak to you tonight to report on the state of the Union, but the events of earlier today have led me to change those plans. Today is a day for mourning and remembering. Nancy and I are pained to the core by the tragedy of the shuttle Challenger. We know we share this pain with all of the people of our country. This is truly a national loss.

...

For the families of the seven, we cannot bear, as you do, the full impact of this tragedy. But we feel the loss, and we're thinking about you so very much. Your loved ones were daring and brave, and they had that special grace, that special spirit that says, 'Give me a challenge and I'll meet it with joy.' They had a hunger to explore the universe and discover its truths. They wished to serve, and they did. They served all of us.

...

The crew of the space shuttle Challenger honoured us by the manner in which they lived their lives. We will never forget them, nor the last time we saw them, this morning, as they prepared for the journey and waved goodbye and 'slipped the surly bonds of earth' to 'touch the face of God.'

Thank you.

a clear address to an audience

retorical indicators that an audience is being addressed throughout

a clear sign off e.g. 'Thank you for listening'

### Dystopian Narrative:

#### The Machine Stops by E.M. Forster

Above her, beneath her, and around her, the Machine hummed eternally; she did not notice the noise, for she had been born with it in her ears. The earth, carrying her, hummed as it sped through silence, turning her now to the invisible sun, now to the invisible stars. She awoke and made the room light.

"Kuno!"

"I will not talk to you," he answered, "until you visit me."

"Have you been on the surface of the earth since we spoke last?"

His image faded.

Again she consulted the book. She became very nervous and lay back in her chair palpitating. She directed the chair to the wall, and pressed an unfamiliar button. The wall swung apart slowly. Through the opening she saw a tunnel that curved slightly, so that its goal was not visible. Should she go to see her son, this would be the beginning of the journey.

Of course she knew all about the communication-system. There was nothing mysterious in it. She would summon a car and it would fly with her down the tunnel until it reached the lift that communicated with the air-ship station: the system had been in use for many, many years, long before the universal establishment of the Machine. Those funny old days, when men went for change of air instead of changing the air in their rooms! And yet — she was frightened of the tunnel: she had not seen it since her last child was born.

### Article

#### Andy Murray's Appliance of Science

By Jim White

If the Caledonian superman wins Wimbledon this year, it will be thanks to pieces of sushi a day, a magic potion and a battalion of experts.

If you want to know what it is about Andy Murray that makes him stand out from the rest of us – apart from that fizzing backhand return and the huge-mouthed celebratory yodel – it is summed up in one word: science!

Today, before he even steps out on to the Centre Court for his Wimbledon semi-final, he has been subject to several of these. He does a urine sample. The osmolarity check is conducted by one of his staff, its purpose to gauge the percentage of water and minerals in his urine, to show whether his body is correctly hydrated. The fact is, if Murray wins today, it may be thanks to the bloke who inspects his wee.

At 7.30 this morning, while many of us arriving at Wimbledon's press restaurant will have begun their day assaulting a sizzling Himalaya of fried starch, Murray will have eaten yogurt, fruit and a bagel smeared in peanut butter ...

clear/apt/original title

by-line

strapline

sub-headings

introductory (overview) paragraph

fluently sequenced paragraphs

fluently sequenced paragraphs

### Writing in the Essay Form

#### Zoos Should be Banned

In America, approximately 175 million people visit a zoo each year. That's half of America's population. Clearly this suggests that zoos remain popular places for people to visit for entertainment and to learn about wild animals. However, although some people are of the opinion that zoos can provide a source of educational entertainment and a sanctuary for endangered animals, I believe that the cruelty that animals suffer outweighs this benefit, and that they should be shut down.

On the surface, zoos are a tourist attraction because they allow families to spend a day out in the sun, looking at animals, and eating overpriced junk food. But what most people don't know is that zoos are far more sinister than selling small bottles of water for £5.00. Statistics show that in all zoos, fifteen percent of animals die every year due to living in captivity. Obviously then, zoos must be an unsuitable environment for wild animals and should, therefore, be abolished. How can zoos justify their existence by claiming animals in captivity provide people with the experience of observing wildlife they wouldn't otherwise experience, when it costs at a cost to their life?

...

In conclusion, a zoos only purpose is to make as much money as possible by showing thousands of people per day to gawk at animals and spend far too much money on souvenirs and junk food. Zoos do not protect or help to repopulate animals, nor do they educate people on the specifics of these animals, and therefore should be abolished.

clear title

effective introduction

fluently linked paragraphs

effectively sequence a range of ideas

to segue

a range of ideas (no room to reproduce the other two paragraphs here)

convincing conclusion

### Journey Description

Sitting in my seat – aisle, two rows from the front – I look out. Illuminating a town engulfed in darkness, lights flash past me: shop lights, street lights, car lights, and as the clouds part just enough for the moon to penetrate through the smog, moonlight!

Inside it's silent. No one speaks. The bus windows shut, lulled by the rocking motion, side-to-side, back-and-forth, up-and-down, my eyes feel heavy. Outside, I'm mesmerised by the noise I can only see, only imagine: mouths asking, replying, laughing, traffic screeching, angry drivers honking, shop doors opening and closing.

Once more the bus door opens and, as if I've lifted my head out from underwater, I can hear the street bustle, smell the takeaways, taste the diesel fumes.

### Writing the text for a leaflet

#### Stay Safe and Sound Online

Anything that you upload, email or message could stay online forever. Therefore, before you post anything online, consider whether or not you would want your parents, teacher or a future employer seeing it. If the answer is no, don't post it! Your privacy is key here.

Make sure you set high privacy settings on social networks. Regularly you should change passwords and never share or put online any of your personal details like a phone number, address or your school details. Make sure your safety and privacy settings are activated on your mobile devices too, so you aren't sharing private information. Be aware that using public WiFi might not filter inappropriate content, so look for friendly WiFi symbols when you're out and about.

...

Remember:

- make sure you know how to block abusive comments and report worrying content;
- don't arrange to meet people in real life that you've only talked to online;

clear/apt/original title

subtitles

effectively/fluently sequenced paragraphs

bullet points

### Description of Place

Green limbs tangled above the decaying shells of long-abandoned vehicles, forming a canopy that barely permitted the harsh rays of the sun to burn through. The stealthy fingers of squat oak trees reached out tenaciously towards them. The vehicles themselves were coated in a thick layer of copper – and were battered and bruised through years of exposure to the elements.

Like a queue of taxi cabs, the vehicles waited patiently in the forgotten depths of the forest. Specks of light from the midday sun, which had successfully fought their way through the overhead canopy, lit up their broken bodies. Their trunks opened wearily and their shattered eye sockets stared blindly forward.

The aroma of rust and decay occupied the clearing: it was choking, corrosive. No fresh breeze could infiltrate the thick shrubbery to provide relief. The cars lay there, suffocating on their own putrid stench. It was overpowering. Meanwhile, the squawks of blackbirds echoed like sirens around the clearing. The chilling sound was relentless. It echoed through the car's hollow bodies, fed its way through the cracks in windows and deep, soaking the upholstery of the rotting seat as it passed.

Spread over the floor of the clearing, a thick blanket of autumn leaves hid the earth beneath. They had turned a shade of burnt red and had bleached edges that resembled torn parchment. They were brittle and cracked from the heat of the clearing. Amongst them, all manner of insects scuttled – manoeuvring themselves between moments of shade, before the unforgiving rays of sun could scorch their exposed bodies.

spatial discourse markers

adjectives

metaphor, simile, personification

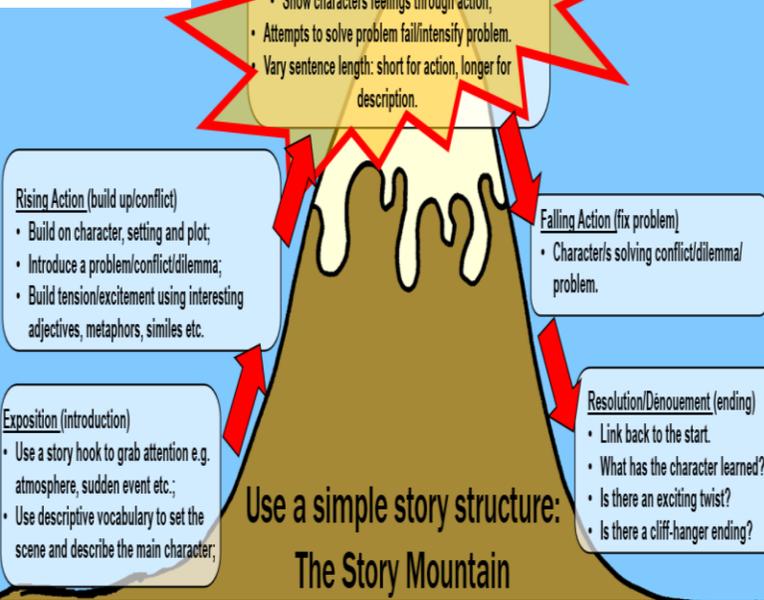
sensory description

sensory description

sensory description

adjectives

**Best for planning narratives (stories).**



Paragraph content/topic	Language method/vocab	Sent struc	Punc
1: waves engulfing and devouring the sea side town - noisy and disruptive movement	onomatopoeia crash, whip, smash personify so violent/threatening	'ing' start verbs (pres)	! ;
2: train victim railway line past houses towards destination	to its daily destination. Snatching bites, the sea salt nips at its metal skin as it passes, eating away at it, killing it. Rattles. Will it survive?	Question	
3: zoom in on one carriage window, motion sick	Windows hit by spray that 'like a tamed ca' has 'turned savage' today. Passenger pitched side-to-side; bubbling sickness rising bile from stomach!	Anadiplosis (yoked)	' ' ; !
4: houses	Like soldiers standing to attention they are defending their inhabitants. Diff pastel colours of a seaside town: prawn pink, salmon peach, oyster grey, seaweed green, cracking paintwork	Fronted spatial adverbials	( ) :
5: canopy of sky above threatening	Adjectives for mood: grey sky, stuffed clouds full of cold, sharp rain, Verb: beating down, attacking,	Two then three word sentences	... ;

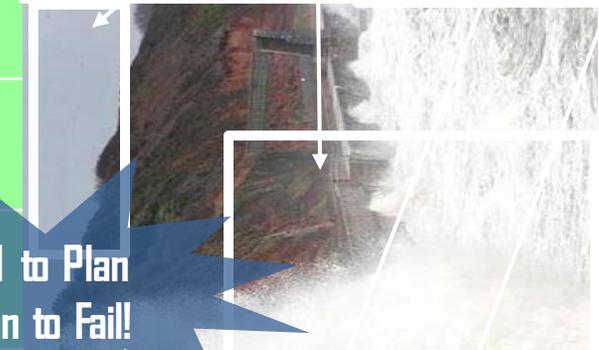
**The Grid Plan is good for making sure you include lots of different methods, or to compare two/more things side-by-side. Each row/column = a paragraph.**

waves engulfing and devouring the sea side town - noisy and disruptive, onomatopoeia crash, whip, smash personify so violent/threatening movement

zoom in on one carriage window, motion sick. Windows hit by spray that 'like a tamed ca' has 'turned savage' today. Passenger pitched side-to-side; bubbling sickness rising bile from stomach!

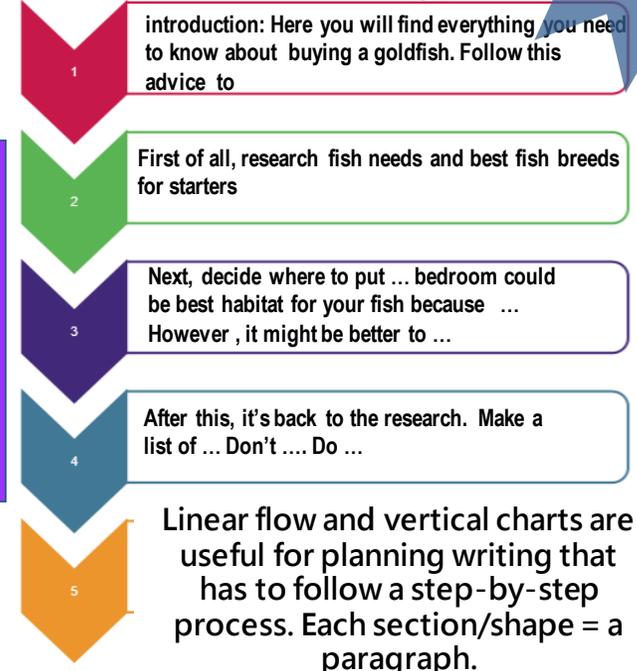
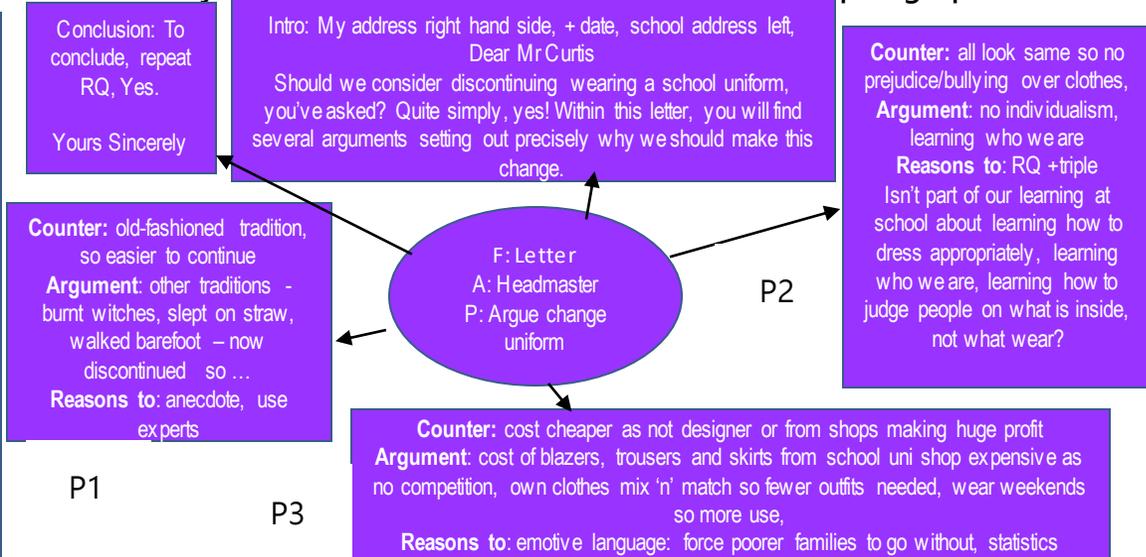
canopy of sky above threatening  
Adjectives for mood: grey sky, stuffed clouds full of cold, sharp rain, Verb: beating down, attacking,

houses , Like soldiers standing to attention they are defending their inhabitants. Diff pastel colours of a seaside town: prawn pink, salmon peach, oyster grey, seaweed green, cracking paintwork



**Fail to Plan Plan to Fail!**

**Mind maps/spider diagrams, allow you to jot down content ideas in no particular order and then decide on the best order to write them up in – so they're ideal for non-fiction writing. Each leg = a paragraph**



**Linear flow and vertical charts are useful for planning writing that has to follow a step-by-step process. Each section/shape = a paragraph.**



train victim moving across railway line past houses towards destination - personify - victim, alliteration, metaphor: A caterpillar, the train sways and pitches precariously along the track to its daily destination. Snatching bites, the sea salt nips at its metal skin as it passes, eating away at it, killing it. Rattles. Will it survive?

**Best for planning descriptions from a picture: Boxing/framing sections of a picture forces you to focus your description on specific areas within the image, zooming in on specific detail and then out again to focus on another area. Each boxed area = a paragraph:**

# (Chocolate) Writing Purposes



<b>Inform</b> someone about the benefits and delights of eating chocolate.	Tell the reader <u>what</u> they want or need to know.	<ul style="list-style-type: none"> <li>➤ include interesting facts and details;</li> <li>➤ use brackets to explain technical terms.</li> </ul>
<b>Explain</b> your reasons for liking chocolate.	Tell the reader <u>how</u> and <u>why</u> .	<ul style="list-style-type: none"> <li>➤ use 'as a result', 'because', 'so that';</li> <li>➤ use sequence connectives – Eventually, After this, Another, Furthermore.</li> </ul>
<b>Advise</b> the reader about the dangers of eating too much chocolate.	Help <u>warn</u> and <u>guide</u> your reader, but <u>reassure</u> them with your structured and carefully considered advice.	<ul style="list-style-type: none"> <li>➤ use imperative verbs (stop, do, don't, wait etc.);</li> <li>➤ use second person (you, your);</li> <li>➤ use modal verbs (you could, you might, you should).</li> </ul>
<b>Persuade</b> someone to buy a particular bar of chocolate.	Try to get the reader to do as you ask/agree with you.	➤ use rhetorical questions, triples, direct address, personal pronouns, anecdote, repetition.
<b>Argue</b> the 'for' or 'against' chocolate being bad for you.	Present two sides of the argument but make sure your side appears the strongest.	<ul style="list-style-type: none"> <li>➤ use 'Some people believe ..', 'However, most people would agree that', 'On the other hand';</li> <li>➤ use anecdote, triples, statistics, quote experts, emotive language.</li> </ul>
<b>Describe</b> the look of a chocolate bar and the sensation of eating it.	Help the reader to <u>picture</u> it and imagine the experience.	➤ use similes, metaphors, personification, interesting adjectives/verbs, sensory description.
<b>Narrate</b> a tale where a chocolate bar plays an important role.	Tell the reader a tale that will have them hanging on your every word.	<ul style="list-style-type: none"> <li>➤ use the story mountain: exposition, rising action, climax, falling action, resolution but with a cliff hanger ending;</li> <li>➤ use some description;</li> <li>➤ use three lines of direct speech.</li> </ul>

Most Often

## Mis spelled

words

argument	politician
basically	propaganda
beginning	publicly
business	really
completely	religious
definitely	remember
disappear	sense
embarrass	separate
environment	successful
friend	surprise
government	tomorrow
independent	tongue
knowledge	truly
necessary	unfortunately
occurred	until
occasion	wherever

When writing, use sophisticated vocabulary:

Vocabulary	Meaning
indolent	
insatiable	
lithe	
modicum	
morose	
myriad	
nominal	
panacea	
penchant	
plethora	
quaint	
salient	
vociferous	



Geometry and Measures - Foundation

Trigonometry

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

Example – finding a side:

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

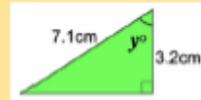
$$x = 5 \times \sin 37^\circ$$



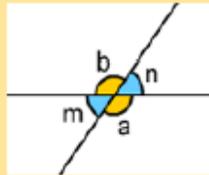
Example – finding a side:

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

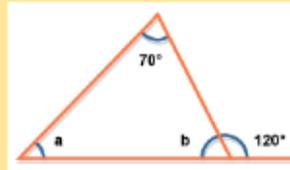
$$y = \tan^{-1}\left(\frac{3.2}{7.1}\right)$$



Angle Facts



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

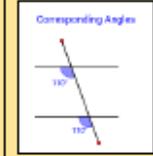


Angles in a triangle sum to  $180^\circ$ .

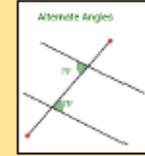
Angles on a straight line sum to  $180^\circ$ .

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

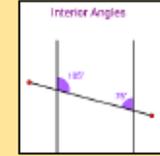
Angles in parallel lines



Corresponding angles are equal



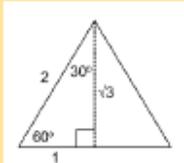
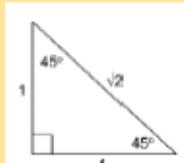
Alternate angles are equal



Co-interior angles are equal

Exact Trig values

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

$$\begin{pmatrix} 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 7 \\ -2 \end{pmatrix} = \begin{pmatrix} 9 \\ 2 \end{pmatrix}$$

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

Volume & surface area

Volume = area of cross section x 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 =  $180^\circ$

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

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



Number Ratio and Proportion - Foundation 1

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



## Year 11 Maths Foundation

### Number Ratio and Proportion - Foundation 2

<p><b>Growth &amp; Decay / Compound interest</b></p> <p style="text-align: center;"><i>original amount</i> <math>\times</math> <i>multiplier</i><sup>time</sup></p> <p>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</p>	<p><b>Dividing by decimals:</b></p> <ol style="list-style-type: none"> <li>Write the calculation as a fraction</li> <li>Form an equivalent fraction to makes integers (multiply by powers of 10)</li> <li>Use short division (bus stop) to calculate</li> </ol> <p>e.g. <math>460 \div 0.4 = \frac{460}{0.4} = \frac{4600}{4} = 1150</math></p>	<p><b>Conversions</b></p> <table style="width: 100%; border: none;"> <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>1000cm<sup>3</sup> = 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 <sup>3</sup> = 1 litre	1000g = 1 kilogram	1000ml = 1 litre	1000kg = 1 tonne
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1000cm <sup>3</sup> = 1 litre	1000g = 1 kilogram											
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<p><b>Compound Units (rearrange as necessary)</b></p> $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$ $\text{Area} = \frac{\text{Force}}{\text{Pressure}}$ $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$	<p><b>Error Intervals</b> least possible value <math>\leq x &lt;</math> greatest possible value</p> <p>e.g. A fence is 30 m long to the nearest 10 m. <math>25 \text{ m} \leq l &lt; 35 \text{ m}</math></p> <p><b>Truncation</b> Truncation is a method of approximating a decimal number by dropping all decimal places past a certain point without rounding.</p> <p>e.g. Truncate 3.14159265 to 4 decimal places. = 3.1415</p>	<p><b>Negative numbers</b> <u>Adding and subtracting: (vertical number lines help)</u></p> <p><math>-3 - 5 = -8</math> <math>-3 + 5 = 2</math> <math>-3 - -5 = -3 + 5 = 2</math> <math>-3 - +5 = -3 - 5 = -8</math> <math>-3 + -5 = -3 - 5 = -8</math></p> <p><u>Multiplying and dividing:</u> Different signs – answer will be negative <math>+ \times - = -</math>, <math>- \times + = -</math> Same signs – answer will be positive <math>- \times - = +</math></p>										
<p><b>Ordering fractions</b> Calc: use division to write each fraction as a decimal Non-calc: write fractions with common denominators</p>	<p><b>Order of operations</b> Bracket Indices Division and Multiplication Addition and Subtraction</p>	<p><b>Rounding to significant figures</b> Start from the first <b>non-zero</b> 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</p>										
<p><b>Index Laws</b></p> $a^n \times a^m = a^{n+m}$ $a^n \div a^m = a^{n-m}$ $(a^n)^m = a^{nm}$ $a^0 = 1$ $a^{-n} = \frac{1}{a^n}$ $a^{\frac{n}{m}} = \sqrt[m]{a^n}$	<p><b>Prime Factorisation</b></p> <div style="text-align: center;"> </div>	<p><b>HCF and LCM of 90 and 120 (Factor Tree &amp; Venn Diagram)</b> HCF is the product of common factors LCM is the product of common factors and remaining factors.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">HCF: <math>2 \times 3 \times 5</math> LCM: <math>2^3 \times 3^2 \times 5</math></p>										



# Year 11 Maths Foundation

## Probability and Statistics - Foundation

### Averages

Mode: most common piece of data

Mean: Sum of the data ÷ total frequency

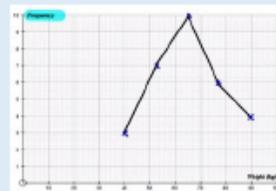
Median: order the data and find the middle value

Range: Highest value – lowest value

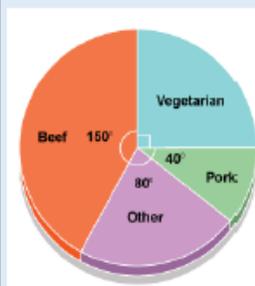
### Frequency Polygons

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.

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

### Averages from a frequency table

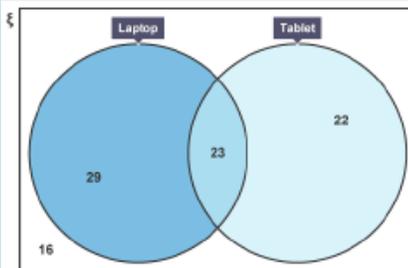
Mean:  $\frac{\sum fw}{\sum f}$ ; where,  $w$  is the midpoint of the group.

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

E.G. in this table 51.5<sup>th</sup> 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.

### Probability Definitions

Total probability: adds to 1

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

Independent events: one event doesn't impact the other

### Expected outcomes

$\text{Expected outcome} = \text{probability} \times \text{number of trials}$

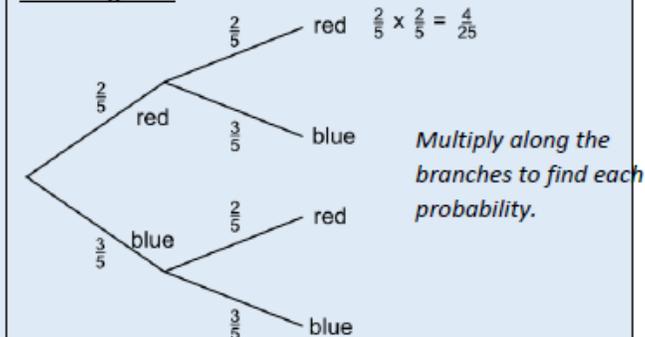
E.g. A biased spinner is spun 800 times. The probabilities it lands on each colour is below. The probability of it landing on red is the same as the probability of it landing on green. How many times would you expect yellow to come up.

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 =  $P(RB) + P(BR) = \frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{2}{5} = \frac{12}{25}$



Algebra - Foundation

Notation

$ab = a \times b$   
 $a^2 = a \times a$   
 $(2a)^3 = 2a \times 2a \times 2a$   
 $(a + b)^2 = (a + b)(a + b)$

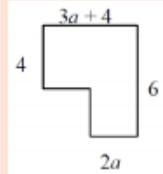
Definitions

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.

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

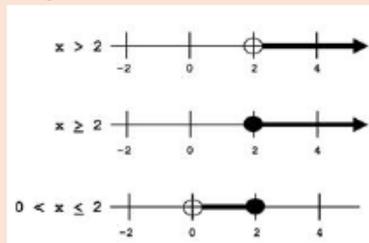


Typical Exam Q: Create an expression for the perimeter of the shape by adding and collecting like terms.  
 If the perimeter is given as 20cm, for example, you can create an equation:  
 $4 + 3a + 4 + 6 + 2a = 20$   
 $5a + 14 = 20$

Simplifying expressions multiplication and division

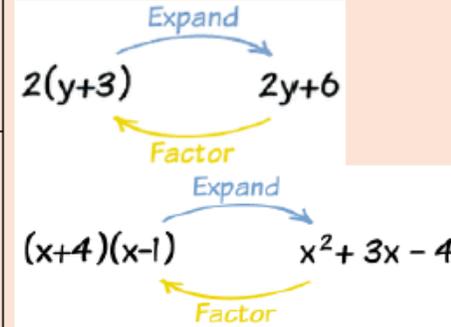
$$2ma^2 \times 7ma = 14m^2a^3 \qquad \frac{18b^6}{3ab^2} = \frac{6b^4}{a}$$

Inequalities



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

Factorising and expanding



Straight line graphs

$y = mx + c$   
 $m = \text{gradient}$   
 $c = y - \text{intercept}$



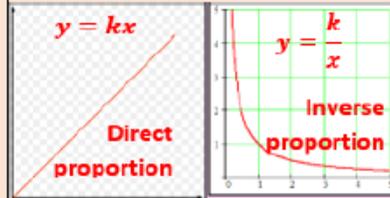
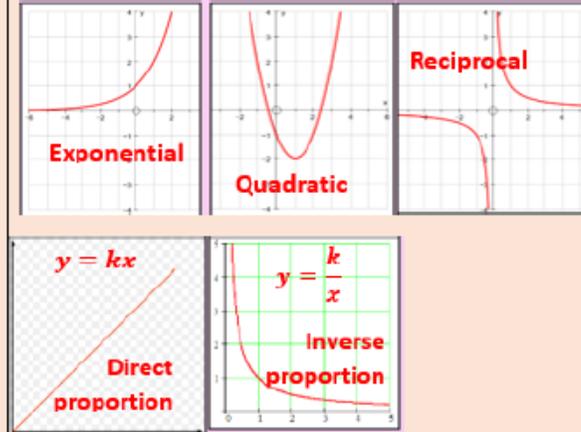
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in } y}{\text{change in } x}$$

Parallel lines – have equal gradients

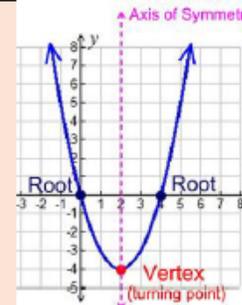
Distance / Time Graphs



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, ...

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



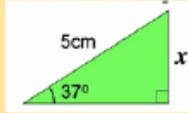
Geometry and measure - Higher 1

Trigonometry

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

Example – finding a side:

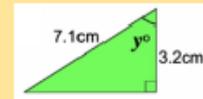
$$\sin 37^\circ = \frac{x}{5}$$



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

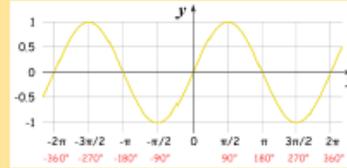
Example – finding an angle:

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

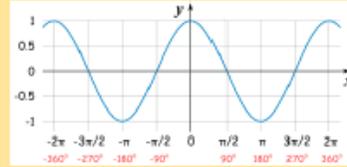


$$y = \tan^{-1}\left(\frac{3.2}{7.1}\right)$$

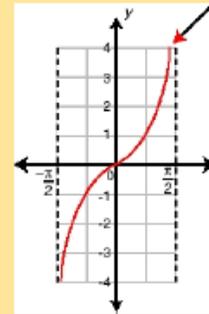
Sine Curve



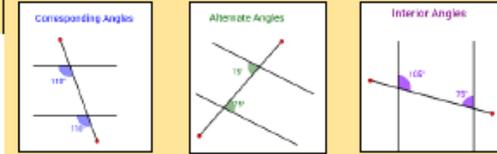
Cosine Curve



Tangent Curve



Angles in parallel lines



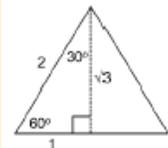
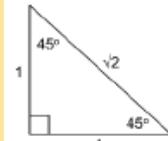
Corresponding angles are equal

Alternate angles are equal

Co-interior angles are equal

Exact Trig values

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

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

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

Volume & surface area

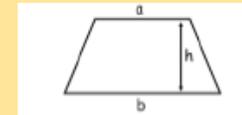
Learn the cylinder

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

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

Area of a trapezium

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

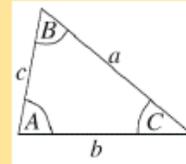


Transformation of a graph

Sine rule

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

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



Cosine rule

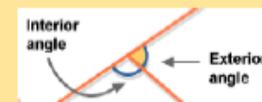
$$a^2 = b^2 + c^2 - 2bc \cos A$$

Area of a triangle

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

Angles in regular polygons

$n$  = number of sides



Interior angle + exterior angle =  $180^\circ$

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

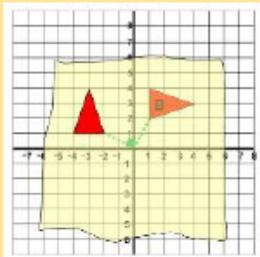
$$n = \frac{360}{\text{Exterior angle}}$$



# Year 11 Maths Higher

## Geometry and measure - Higher 2

### 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

<p>SSS (Side – Side – Side)</p> <p>3 sides are respectively equal</p>	<p>SAS (Side – Angle – Side)</p> <p>2 sides and the included angle are respectively equal</p>
<p>ASA (Angle – Side – Angle)</p> <p>2 angles and the included side are respectively equal</p>	<p>RHS (Right angle – Hypotenuse – Side)</p> <p>Hypotenuse and one side are respectively equal</p>

### Similar shapes

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

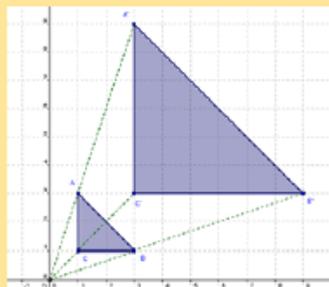
Length scale factor =  $x$

Area scale factor =  $x^2$

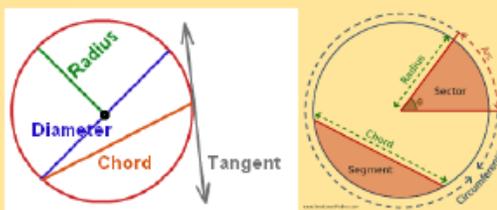
Volume scale factor =  $x^3$

### 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

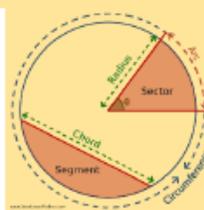


### Circles



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

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



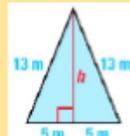
$$\text{Sector Area} = \frac{\theta}{360} \pi r^2$$

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

### Pythagoras' Theorem

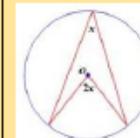
$$a^2 + b^2 = c^2$$

Only applies to right angled triangles.  
Can be used to find the height of an isosceles triangle

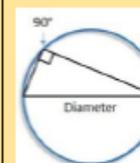


Can be used to find the length distance between two coordinates

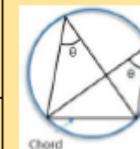
### Circle Theorems



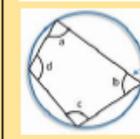
Angle at the centre is twice the angle at the circumference



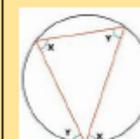
Angles in a semicircle are  $90^\circ$ .



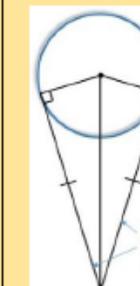
Angles in the same segment are equal.



Opposite angles of a cyclic quadrilateral add up to 180).



Alternate segment theorem.



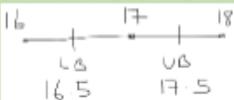
Tangents from an external point are equal in length.

The tangent to a circle is perpendicular ( $90^\circ$ ) to the radius



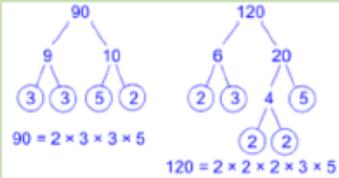
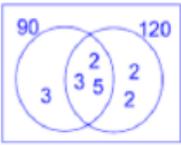
# Year 11 Maths Higher

## Number Ratio and Proportion - Higher 1

<b>Estimate</b> Round each value to one significant figure	<b>Recurring Decimals</b> Form two equations where the digits following the decimal point are the same, and therefore can be cancelled	<b>Percentages</b>  <b>Finding percentages of an amount</b> 1%    ÷100 5%    ÷20 20%   ÷5 25%   ÷4 50%   ÷2
<b>Standard form</b> $a \times 10^n$ , where $1 \leq a < 10$	<b>Upper and lower bounds</b> 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	<b>Multipliers:</b> 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
<b>Reciprocal</b> Reciprocal of 7 is $\frac{1}{7}$ , reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ etc	<b>Fractions</b>  <b>Add and Subtract</b> – ensure the fractions have the same denominator before adding numerators $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$  <b>Multiply</b> – multiply numerators and denominators $\frac{4}{5} \times \frac{1}{3} = \frac{4}{15}$  <b>Divide</b> – take reciprocal of the second fraction and then multiply the new numerators and denominators $\frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \frac{3}{1} = \frac{12}{5} = 2\frac{2}{5}$	<b>Increasing and decreasing a given amount</b> Calculator: <i>Original Amount x multiplier = new amount</i>  Non-calculator: find the increase or decrease and add to the original amount  <b>Finding percentage increase or decrease (profit/loss)</b> $\frac{\text{value of increase/decrease}}{\text{Original}} \times 100$  <b>Writing an amount as a percentage of the original</b> $\frac{\text{Amount}}{\text{Original}} \times 100$  <b>Reverse Percentage</b> – finding the original amount  $\text{Original Amount} = \frac{\text{New Amount}}{\text{multiplier}}$
<b>Simplifying Surds</b> Find a factor that is a square number $\sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$  <b>Manipulating surds</b> $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$  <b>Rationalising Surds</b> Rationalise by removing any surds from the denominator E.G with surd. $\frac{2\sqrt{3}}{\sqrt{5}} = \frac{2\sqrt{3} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{2\sqrt{3} \times \sqrt{5}}{\sqrt{5 \times 5}} = \frac{2\sqrt{15}}{\sqrt{25}} = \frac{2\sqrt{15}}{5}$ E.G with surd expressions multiply by top and bottom by the denominator with the opposite sign. $\frac{5}{3 + \sqrt{2}} = \frac{5 \times (3 - \sqrt{2})}{(3 + \sqrt{2}) \times (3 - \sqrt{2})} = \frac{5(3 - \sqrt{2})}{9 - \sqrt{4}} = \frac{5(3 - \sqrt{2})}{7}$		



Number Ratio and Proportion - Higher 2

<p><b>Growth &amp; Decay / Compound interest</b></p> <p><math>original\ amount \times multiplier^{time}</math></p> <p>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</p>	<p><b>Dividing by decimals:</b></p> <ol style="list-style-type: none"> <li>Write the calculation as a fraction</li> <li>Form an equivalent fraction to makes integers (multiply by powers of 10)</li> <li>Use short division (bus stop) to calculate</li> </ol> <p>e.g. <math>460 \div 0.4 = \frac{460}{0.4} = \frac{4600}{4} = 1150</math></p>	<p><b>Conversions</b></p> <p>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<sup>3</sup> = 1 litre    1000g = 1 kilogram          1000ml = 1 litre    1000kg = 1 tonne</p>
<p><b>Compound Units (rearrange as necessary)</b></p> $Speed = \frac{Distance}{Time}$ $Area = \frac{Force}{Pressure}$ $Density = \frac{Mass}{Volume}$	<p><b>Error Intervals</b> least possible value <math>\leq x &lt;</math> greatest possible value</p> <p>e.g. A fence is 30 m long to the nearest 10 m. <math>25\ m \leq l &lt; 35\ m</math></p> <p><b>Truncation</b> Truncation is a method of approximating a decimal number by dropping all decimal places past a certain point <b>without</b> rounding.</p> <p>e.g. Truncate 3.14159265 to 4 decimal places. = 3.1415</p>	<p><b>Negative numbers</b> <u>Adding and subtracting: (vertical number lines help)</u>  <math>-3 - 5 = -8</math>  <math>-3 + 5 = 2</math>  <math>-3 - -5 = -3 + 5 = 2</math>  <math>-3 - +5 = -3 - 5 = -8</math>  <math>-3 + -5 = -3 - 5 = -8</math></p> <p><u>Multiplying and dividing:</u>          Different signs – answer will be negative  <math>+x - -</math>, <math>-x + -</math>          Same signs – answer will be positive  <math>-x - +</math></p>
<p><b>Product rule</b> If there are <math>m</math> ways to do one thing and <math>n</math> ways to do another, then there are <math>m \times n</math> ways to do <b>both</b></p>	<p><b>Order of operations</b>          Bracket          Indices          Division and Multiplication          Addition and Subtraction</p>	<p><b>Rounding to significant figures</b> Start from the first <b>non-zero</b> number and round as normal, but ensure the place value is correct e.g. 345,635 to 2SF = 350,000 0.0060821 to 3SF = 0.006</p>
<p><b>Index Laws</b></p> $a^n \times a^m = a^{n+m}$ $a^n \div a^m = a^{n-m}$ $(a^n)^m = a^{nm}$ $a^0 = 1$ $a^{-n} = \frac{1}{a^n}$ $\frac{n}{a^m} = \frac{1}{\frac{a^m}{n}}$	<p><b>Prime Factorisation</b></p>  <p><math>90 = 2 \times 3 \times 3 \times 5</math>  <math>120 = 2 \times 2 \times 2 \times 3 \times 5</math></p>	<p><b>HCF and LCM of 90 and 120 (Factor Tree &amp; Venn Diagram)</b>          HCF is the product of common factors          LCM is the product of common factors and remaining factors.</p>  <p>HCF: <math>2 \times 3 \times 5</math>          LCM: <math>2^3 \times 3^2 \times 5</math></p>

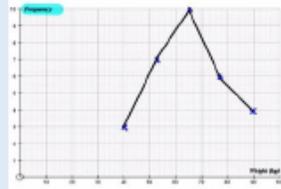


Probability and Statistics - Higher

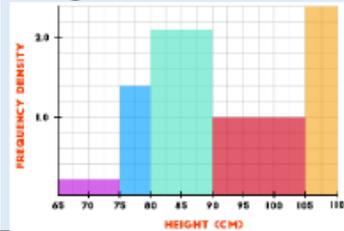
Frequency Polygons

- Plot frequency at the mid-point
- 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



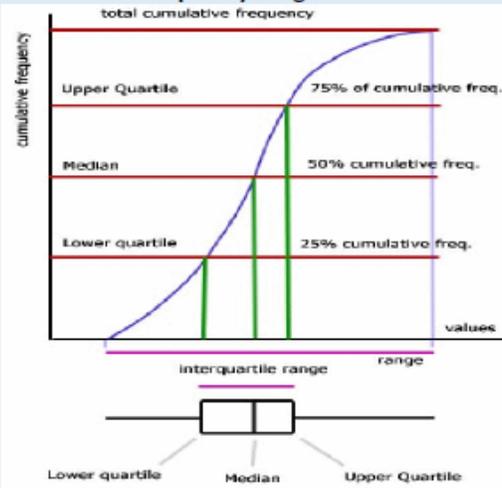
Histograms



FD = Frequency density

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

Cumulative Frequency Diagrams and Box Plots



Averages from a frequency table

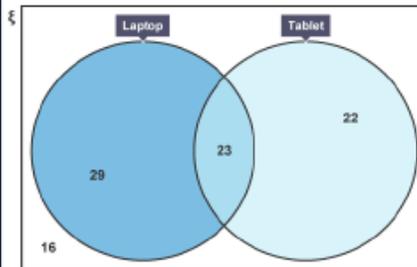
Mean:  $\frac{\sum fw}{\sum f}$ ; where,  $w$  is the midpoint of the group.

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

E.G. in this table 51.5<sup>th</sup> 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 ∪ B – all the elements in A or B or both
- A ∩ B – all the elements in both A and B

Expected outcomes

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

Expected outcome = probability x number of trials

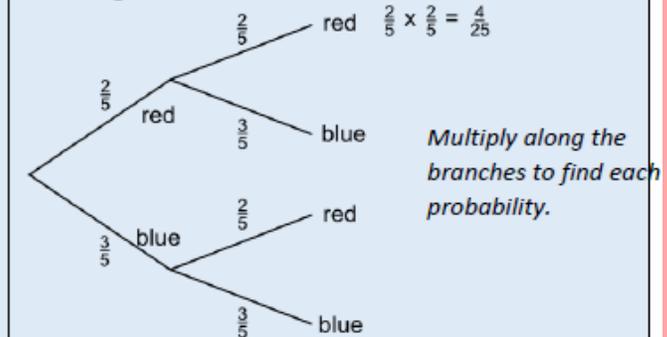
E.g. A biased spinner is spun 800 times. The probabilities is lands on each colour is below. The probability of it landing on red is the same as the probability of it landing on green. How many times would you expect yellow to come up.

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



- Probability that a red counter is picked both times  $P(RR) = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$
- Probability that the counters are different colours =  $P(RB) + P(BR) = \frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{2}{5} = \frac{12}{25}$



Algebra - Higher

<p>Quadratic Formula</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	<p><b>Algebraic proof – toolkit</b></p> <p>Even numbers: <math>2n, 2n+2, 2n+4, \dots</math>                  Odd numbers: <math>2n+1, 2n+3, 2n+5, \dots</math></p> <p>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</p>	<p><b>Straight line graphs</b></p> <p><math>y = mx + c</math>  <math>m = \text{gradient}</math>  <math>c = y - \text{intercept}</math></p> <p>positive gradient      negative gradient</p> $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{change in } y}{\text{change in } x}$
<p><b>Linear Inequalities</b></p> <p>Open circle: <math>&lt;/&gt;</math>                  Closed circle: <math>\leq/\geq</math></p>	<p><b>Completing the square</b></p> <p>Quadratic expression factorised by completing the square:</p> $(x + a)^2 + b$ <p>Turning point of graph occurs at <math>(-a, b)</math></p>	<p>Parallel lines – have equal gradients</p> <p>Perpendicular lines – If <math>L_1</math> and <math>L_2</math> are perpendicular then <math>m_2 = -\frac{1}{m_1}</math></p>
<p><b>Velocity / Time Graphs</b></p> <p>Gradient = acceleration                  Area = distance travelled</p>	<p><b>Solve quadratic inequalities</b></p> <p>e.g solve <math>x^2 + 5x - 24 \geq 0</math></p> <ol style="list-style-type: none"> <li>Factorise: <math>(x + 8)(x - 3) \geq 0</math></li> <li>Solve: <math>x = -8, x = 3</math></li> <li>Sketch the graph </li> <li>Values that satisfy the inequality <math>x \leq -8, x \geq 3</math></li> </ol>	<p><b>Graphs that need to be recognised:</b></p>
<p><b>Iteration – showing a root lies between 2 points:</b></p> <p>If there is a <b>change in sign</b> for <math>y</math> for two particular values of <math>x</math> then we can say there is a root between these values of <math>x</math> and we can say that the equation <math>f(x) = 0</math> will have a solution between these two values of <math>x</math>.</p>	<p><b>Turning point and roots of a quadratic equation</b></p>	
<p><b>Gradients of curves</b></p> <p>Gradient of a curve at a point = gradient of the tangent at the point</p>	<p><b>Equation of a circle centre (0, 0)</b></p> $x^2 + y^2 = r^2$	<p><b>Functions</b></p> <p><math>f(4)</math>: Substitute 4 into the function</p> <p><math>f(g(x))</math>: Substitute <math>g(x)</math> into <math>f(x)</math> i.e. replace all values of <math>x</math> in <math>f(x)</math> with the <u>entire</u> function <math>g(x)</math></p> <p>e.g. <math>f(x) = 2x + 3, g(x) = x - 3, fg(x) = 2(x-3) + 3</math></p>

Please only use when directed by your teacher



## KS4 Biology: B10

### Homeostasis, The Nervous System, The Brain, The Eye

Keyword	Definition
Central Nervous System (CNS)	The brain and spinal cord, it is where reflexes and actions are coordinated.
Coordination Centre	An organ that processes information from receptors and organises a response from the effectors.
Effectors	Either a muscle or gland that responds to nervous impulses.
Enzymes	A protein that acts as a biological catalyst.  Eg) Protease, lipase, amylase
Eukaryote Cell	Complex cell such as a plant or animal cell.
Glycogen	A molecule that acts as a store of glucose in liver and muscle cells.
Homeostasis	Regulation of a constant internal environment
Negative Feedback	A mechanism that restores a level back to optimum in a system.
Optimum Level	A level of something that enables the body to work at its best.
Peripheral Nervous System	

### Homeostasis

- Is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function, in response to internal and external changes.
- Important for maintaining optimal conditions for enzyme action and all cell functions.
- In the human body homeostasis includes control of blood glucose concentration, body temperature and water levels.
- The automatic control systems may involve nervous or chemical responses.
- All control systems include receptors coordination centres and effectors.

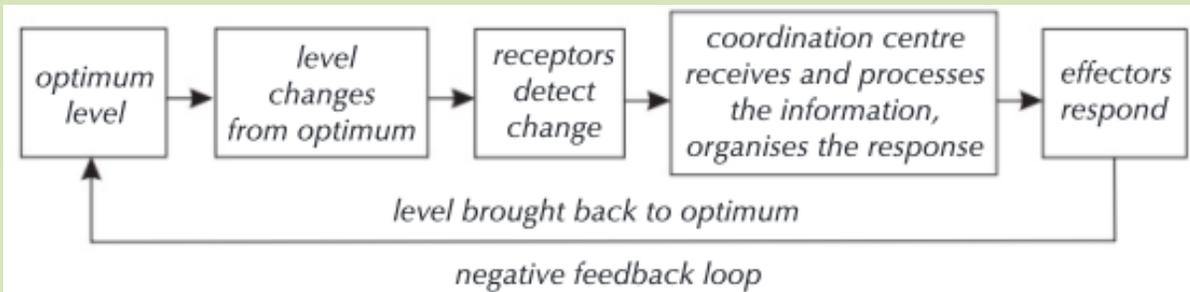


Figure 1: A negative feedback mechanism.

**Tip:** A negative feedback system responds when a level changes from its optimum point, in order to bring the level back to optimum. It's a continuous, looping process.

### Example

Body temperature is usually kept within 0.5 °C above or below 37 °C.

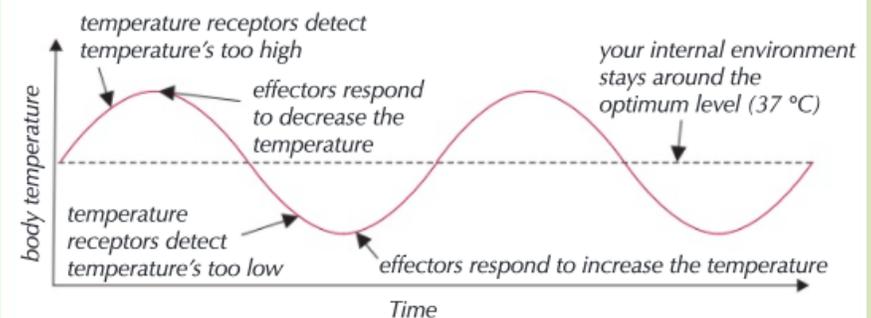
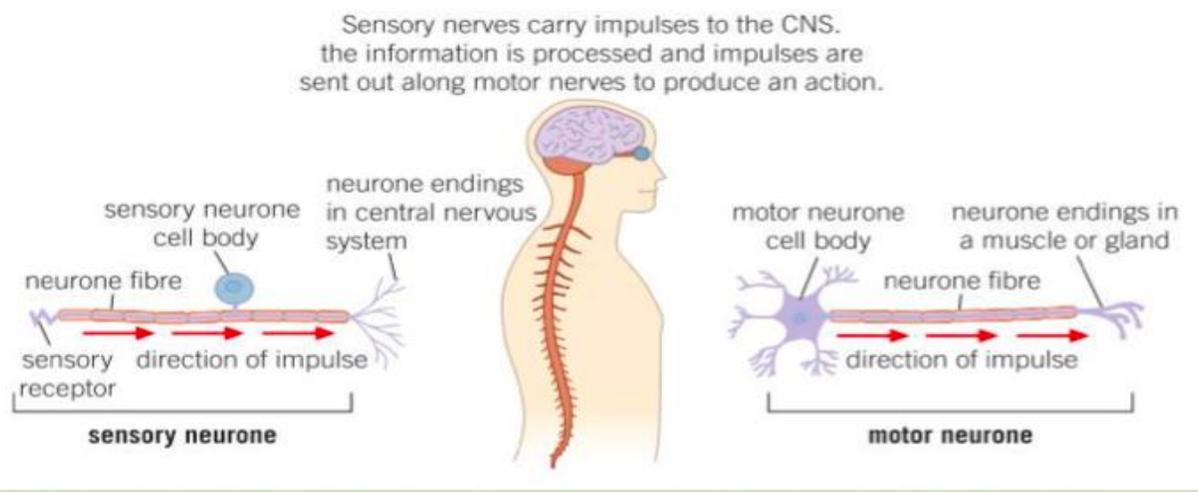
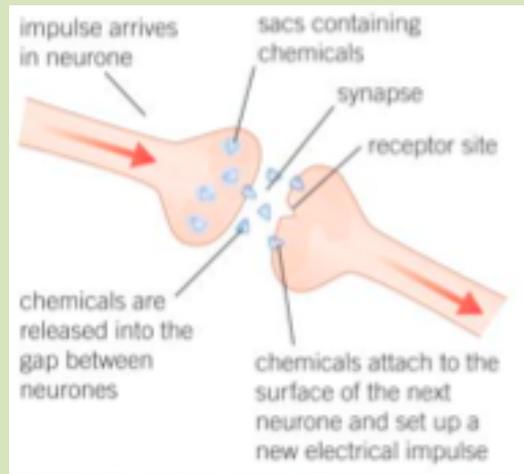


Figure 2: Control of body temperature via negative feedback.



**KS4 Biology: B10**  
**Homeostasis, The Nervous System, The Brain, The Eye**

Keyword	Definition
Moto Neurones	A nerve cell that carries electrical impulses from the CNS to effectors.
Sensory Neurones	A nerve cell that carries electrical impulses from the receptors in the sense organs to the CNS.
Stimulus	A change in the environment.

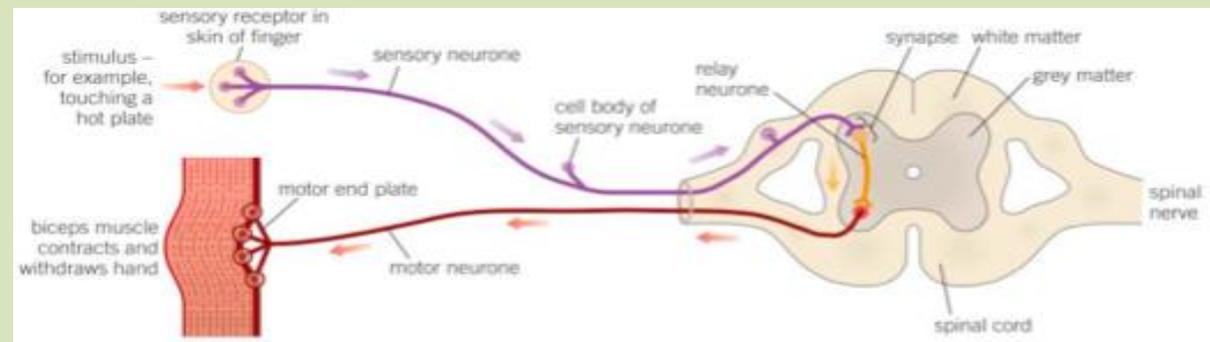


**The Nervous System**

- The nervous system uses electrical impulses to enable you to react quickly to your surroundings and coordinate your behaviour.
- Cells called receptors detect stimuli.
- Impulses from receptors pass along sensory neurones to the CNS. The brain coordinates the response, and impulses are sent along motor neurones from the brain to the effector organs.

**Reflexes**

- Reflex actions are automatic and rapid and do not involve the conscious parts of the brain.
- Reflexes involve sensory, relay and motor neurones.
- Reflex actions control everyday bodily functions, such as breathing and digestion and help avoid danger.



Please only use when directed by your teacher



## KS4 Biology: B10

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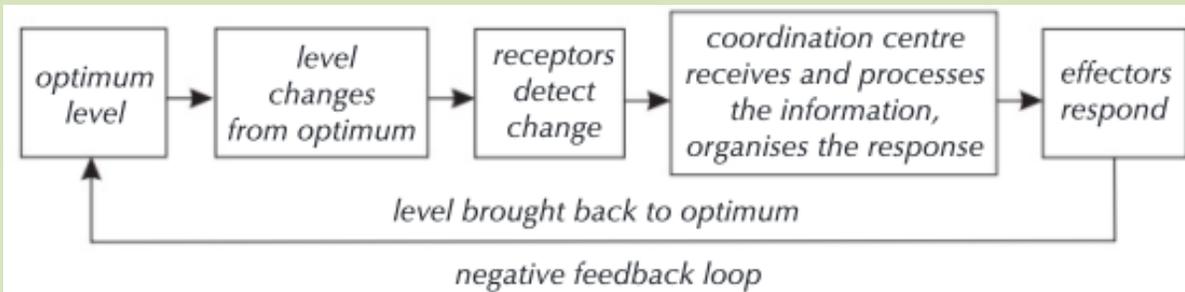


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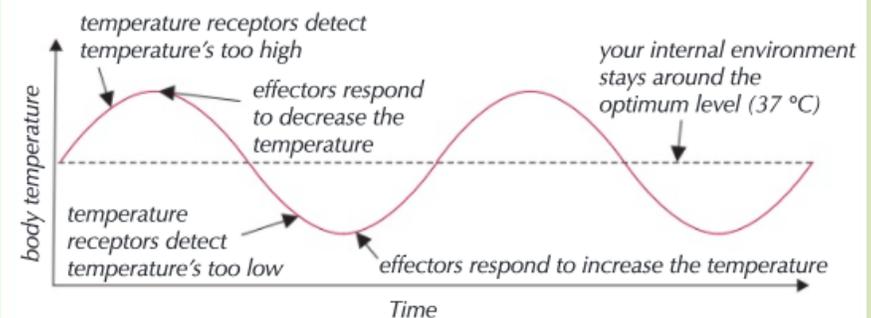
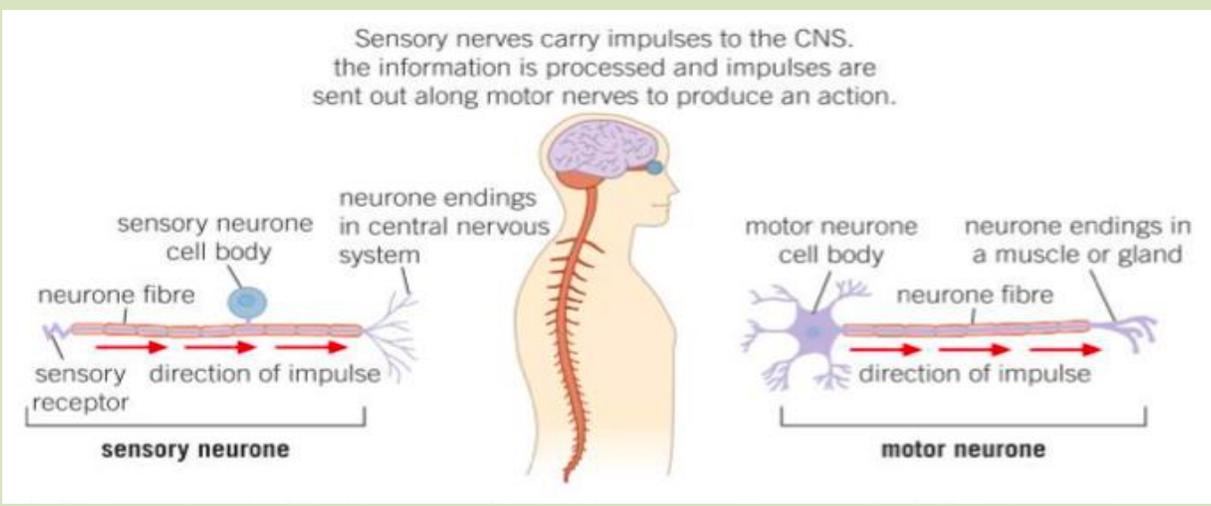


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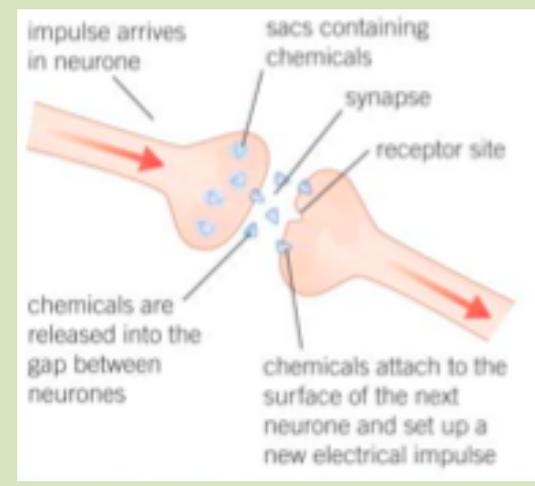
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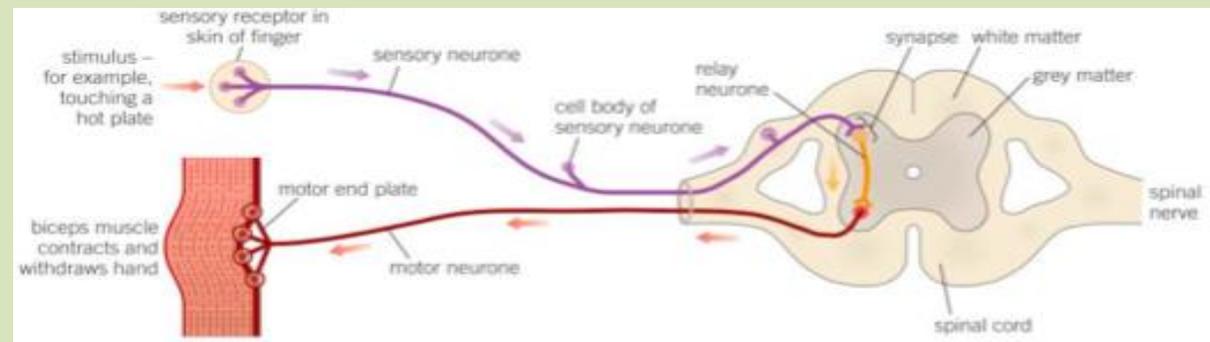
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**KS4 Biology: B10**  
**Homeostasis, The Nervous System, The Brain, The Eye**

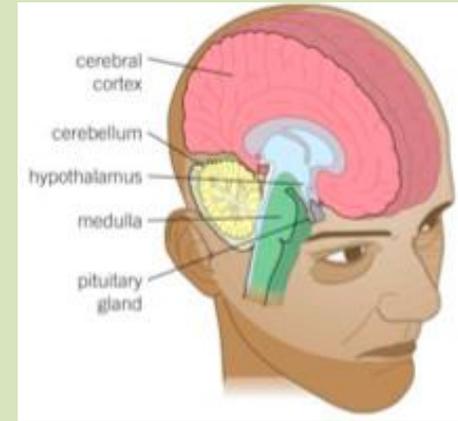
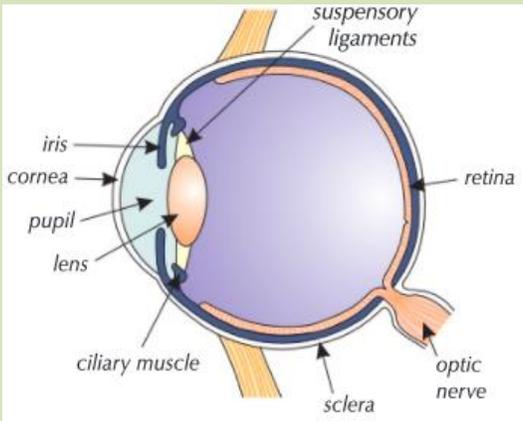
Keyword	Definition
Accommodation	The ability of focusing on near or distant objects by changing the shape of the lens in the eye.
Cerebral Cortex	Part of the brain concerned with consciousness, intelligence, memory and language.
Cerebellum	Part of the brain concerned mainly with coordinating muscular activity and balance.
Medulla	Part of the brain concerned with unconscious activities, such as controlling the heartbeat, the movements of the gut and breathing.
MRI	A tube like machine that can be used to produce a very detailed picture of the brain's structures.
Magnetic Resonance Imaging	

**The Eye**

- A sense organ containing receptors in the retina that are sensitive to light intensity and colour.

**The Brain**

- The brain is made up of billions of interconnected neurones that control complex behaviour.
- It has different regions with important functions.
- Scientists map regions of the brain to their functions by studying patients with brain damage, by electrically stimulating different areas of the brain and using MRI scanning techniques.



The eye has the following parts:

- **Sclera** — the tough, supporting wall of the eye.
- **Cornea** — the transparent outer layer found at the front of the eye. It refracts (bends) light into the eye.
- **Pupil** — the hole in the centre of the eye, through which light enters.
- **Iris** — contains muscles that allow it to control the diameter of the pupil and therefore how much light enters the eye.
- **Retina** — the layer at the back of the eye that contains two types of light receptor cells. One type is sensitive to light intensity and the other is sensitive to colour.
- **Lens** — focuses the light onto the retina.
- **Ciliary muscles and suspensory ligaments** — control the shape of the lens — see next page.
- **Optic nerve** — carries impulses from the receptors on the retina to the brain.

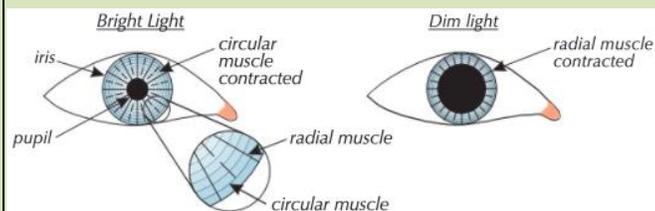


**KS4 Biology: B10**  
**Homeostasis, The Nervous System, The Brain, The Eye**

**Common defects of the eye**

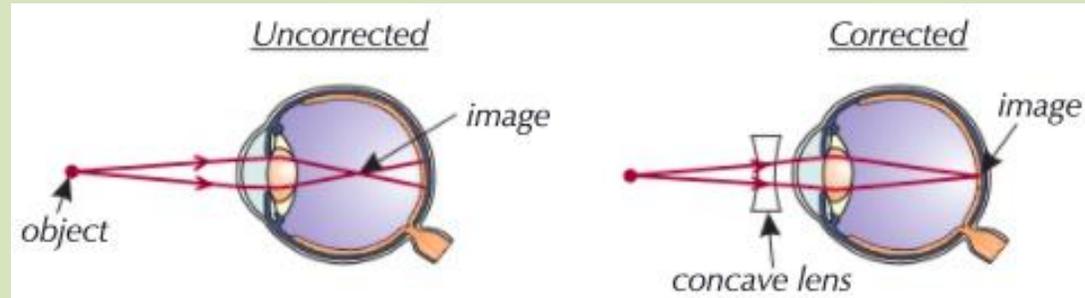
- To focus on close objects the ciliary muscles contract, the suspensory ligaments loosen and the lens becomes thicker so it can refract light rays strongly.
- To focus on distant objects the ciliary muscles relax, the suspensory ligaments are pulled tight and the lens is pulled thin so it only refracts the light rays slightly.
- Sight defects can be treated using spectacle lenses, hard and soft contact lenses, laser surgery and replacement lenses in the eye.

**The Iris Reflex**



**Myopia**

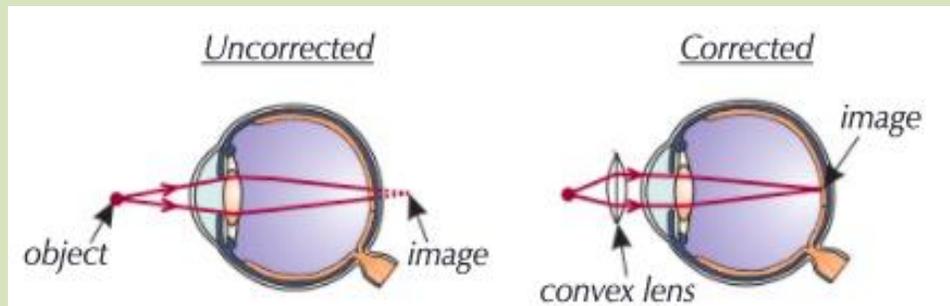
- Short-sightedness, unable to focus on distant objects.
- The lens is the wrong shape and refracts the light too much or the eyeball is too long.



**Figure 3:** Diagram showing the focussing of a short-sighted eye before and after a corrective lens is used.

**Hyperopia**

- Long-sightedness, unable to focus on near objects.
- Lens is the wrong shape and doesn't refract the light enough, the objects are brought into focus behind the retina.



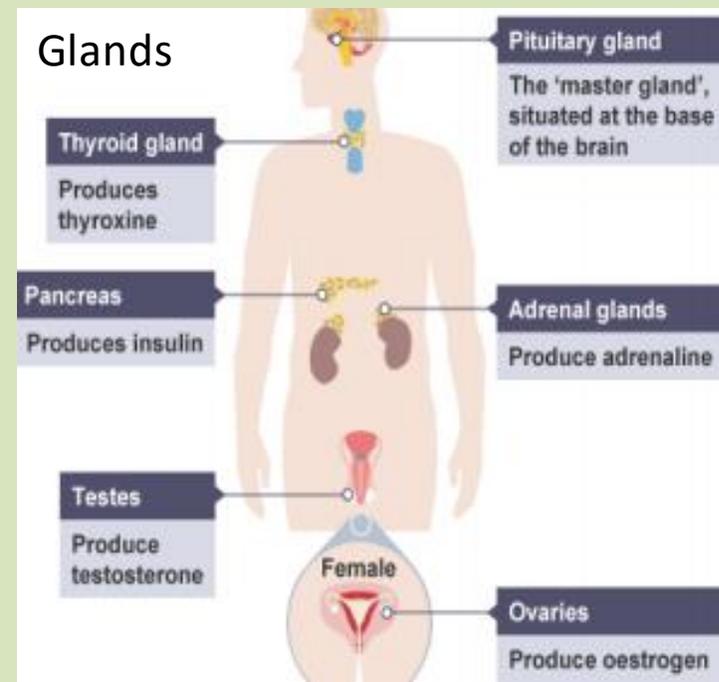
**Figure 1:** Diagram showing the focussing of a long-sighted eye before and after a corrective lens is used.



# KS4 TRILOGY Biology: B11 Hormonal Coordination

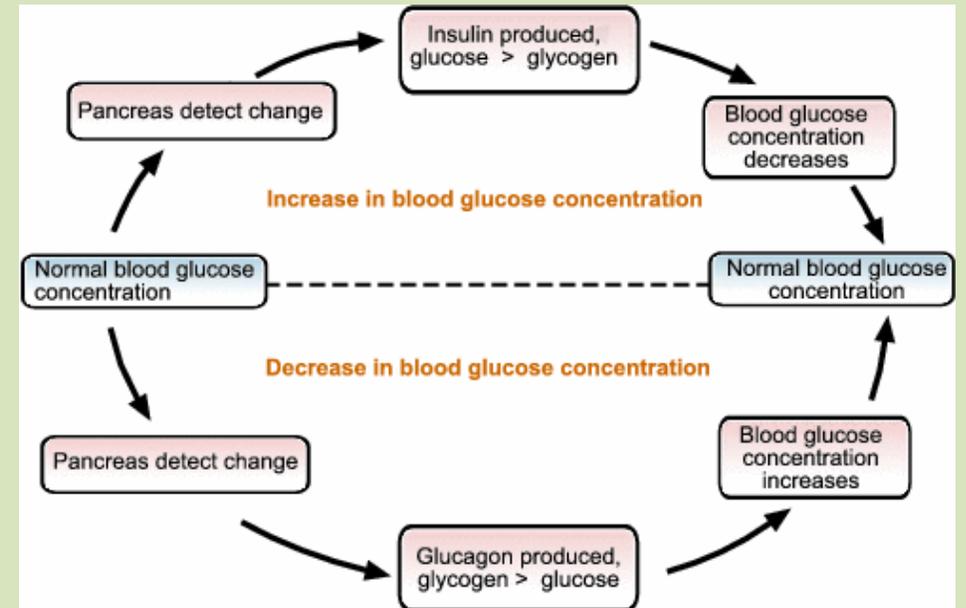
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## Glands



Key word	Definition
Homeostasis	Maintaining the body's conditions within narrow physical and chemical limits so <b>enzymes</b> and cell functions can work. Eg blood glucose levels, temperature, water levels.
Endocrine system	The <b>glands</b> that produce <b>hormones</b> .
Hormones	Chemicals made in <b>glands</b> that travel through the blood to effect the function of another part of the body.
Stimulus	Change in the environment eg sound, heat, light.
Receptors	Detect <b>stimuli</b> .
Coordination centre	Eg <b>brain, spinal cord, pancreas</b> . These receive and process information from the <b>receptors</b> .
Effector	<b>Muscles</b> or <b>glands</b> which bring about response. (Muscles contract) (Glands secrete/release hormones).

## Blood glucose concentration



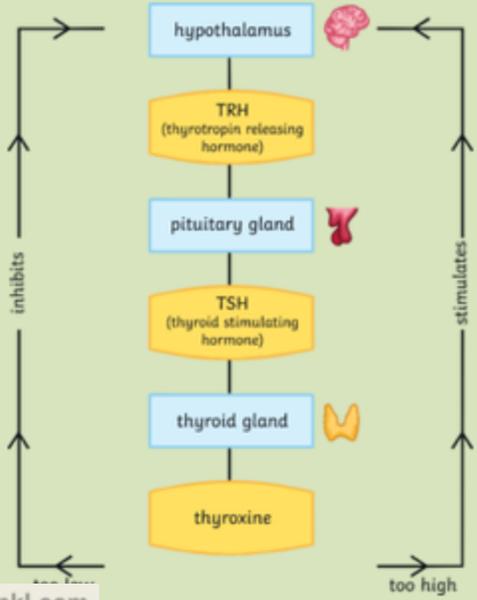
Type 1 diabetes	Disorder where the <b>pancreas does not produce enough insulin</b> to control blood glucose levels. Treated with injections of insulin.
Type 2 diabetes	Disorder of effector cells which <b>do not respond to insulin</b> released from the pancreas. Managed through carbohydrate controlled diet and exercise. Higher risk if BMI >30.
Insulin	Reduces blood glucose by causing cells to absorb glucose for use in <b>respiration</b> and for storage as <b>glycogen</b> .
Glucagon	Increases blood glucose by releasing <b>glucose</b> from <b>glucagon storage</b> .
Glycogen	Human storage polymer for <b>glucose</b> .



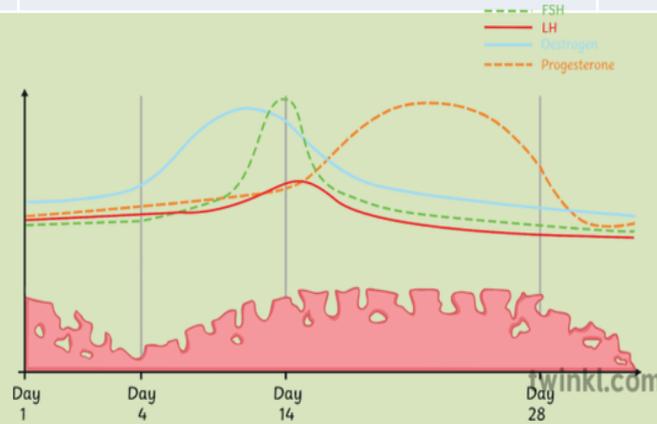
# KS4 Biology: B11 Hormonal coordination

Hormone	Where is it produced	Response caused	Interaction with other hormones [HT only]
FSH	Pituitary gland	Matures the egg.	Stimulates the production of oestrogen.
Oestrogen	Ovaries	Thickens the lining of the uterus.	Stimulates production of LH. Inhibits the production of FSH.
LH	Pituitary gland	Ovulation (at around day 14 of the cycle).	Indirectly stimulates the production of progesterone.
Progesterone	Ovaries	Maintains the lining of the uterus.	Inhibits the production of LH

## [HT only] negative feedback thyroxine



Adrenaline is a hormone produced by the adrenal gland, released in response to stress or fear. Acts on lungs and heart and vasodilation to increase oxygen supply for respiration in muscles – fight or run away.



## [HT only] Infertility

FSH and LH given to stimulate normal ovulation. IVF: FSH and LH stimulate eggs to mature. They are collected before ovulation. Fertilised using sperm in a lab. Embryos inserted into woman's uterus for implantation. If successful it's a normal pregnancy!

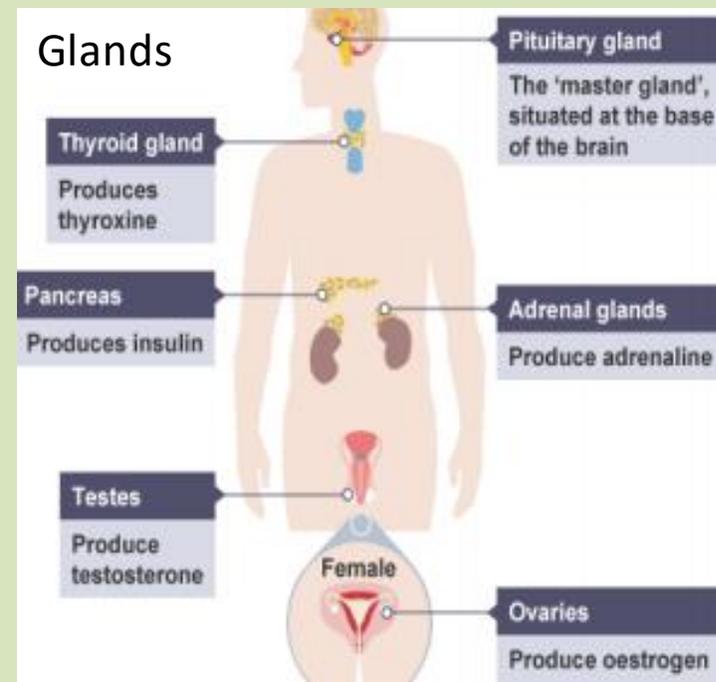
Method	How it works	Pros/Cons
The pill (hormone oral)	Oestrogen/progesterone in the pill inhibits FSH so no eggs mature.	☺ Easy to take, can be easily reversed. ☹ Mild side effects, can lead to pregnancy if not taken. No STI protection.
Injection, implant, skin patch	Contains progesterone to inhibit LH release so no ovulation.	☺ Given by GP, reliable. ☹ Can take time to reverse the effects. No STI protection.
Condoms	Physical barrier to prevent sperm reaching the egg.	☺ Easy to use, reliable, protects against most STIs. ☹ Can fail.
Intrauterine device (coil)	Inserted into uterus by GP/nurse. Can release hormones, prevents implantation of the embryo in the uterus.	☺ Requires little or not aftercare, very reliable. ☺ No STI protection.
Spermicide	Kill or immobilise sperm.	☺ Easy to use. ☹ Less effective when used alone. No STI protection.
Abstaining for sex	No sex near time of ovulation, reduce likelihood of fertilisation	☺ Inexpensive ☹ not always reliable.
Surgery	Males – tie tubes delivering sperm. Females – block oviducts.	☺ Risks from surgery. ☺ Difficult/impossible to reverse.



# KS4 Biology: B11 Hormonal Coordination

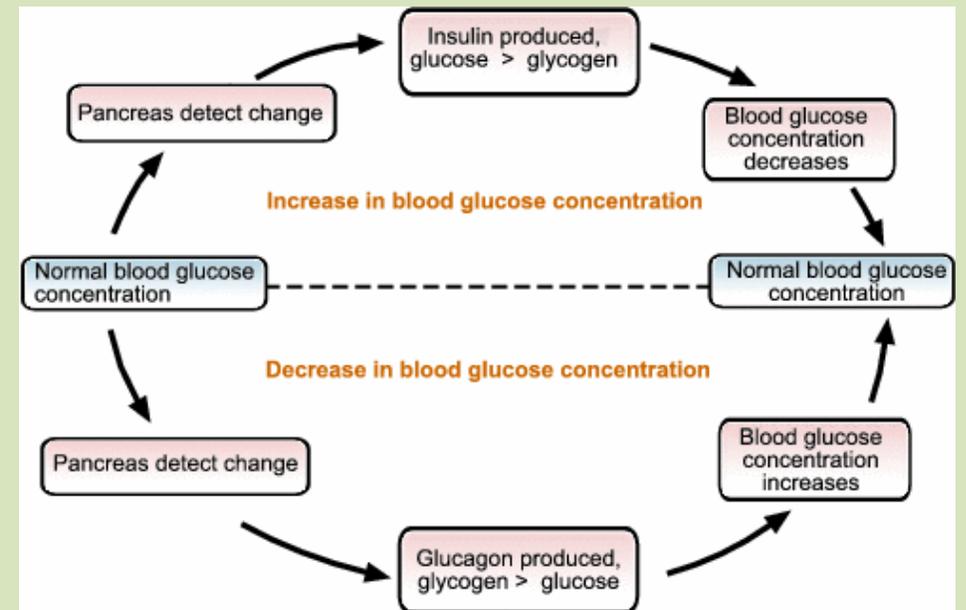
Please only use when directed by your teacher

## Glands



Key word	Definition
Homeostasis	Maintaining the body's conditions within narrow physical and chemical limits so enzymes and cell functions can work. Eg blood glucose levels, temperature, water levels.
Endocrine system	The glands that produce hormones.
Hormones	Chemicals made in glands that travel through the blood to effect the function of another part of the body.
Stimulus	Change in the environment eg sound, heat, light.
Receptors	Detect stimuli.
Coordination centre	Eg brain, spinal cord, pancreas. These receive and process information from the receptors.
Effector	Muscles or glands which bring about response. (Muscles contract) (Glands secrete/release hormones).

## Blood glucose concentration



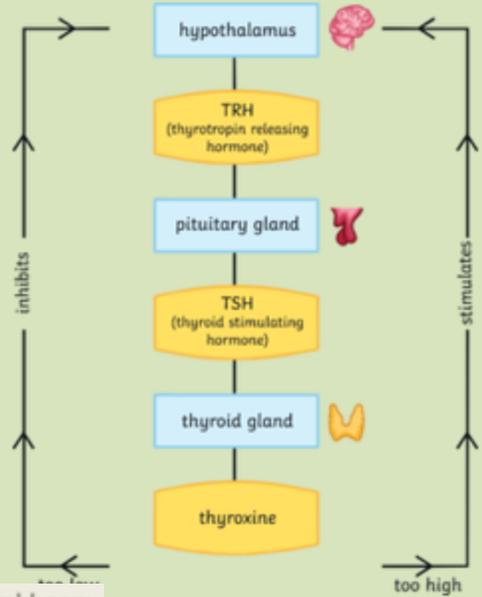
<b>Type 1 diabetes</b>	<b>Disorder where the pancreas does not produce enough insulin to control blood glucose levels. Treated with injections of insulin.</b>
Type 2 diabetes	Disorder of effector cells which do not respond to insulin released from the pancreas. Managed through carbohydrate controlled diet and exercise. Higher risk if BMI >30.
Insulin	Reduces blood glucose by causing cells to absorb glucose for use in respiration and for storage as glycogen.
Glucagon	Increases blood glucose by releasing glucose from glucagon storage.
Glycogen	Human storage polymer for glucose.



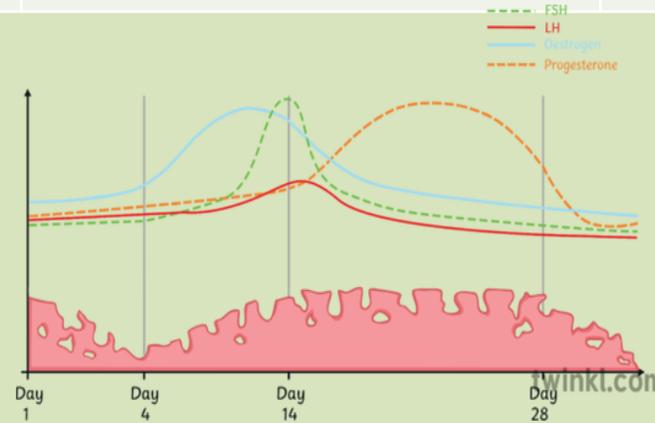
# KS4 Biology: B11 Hormonal coordination

Hormone	Where is it produced	Response caused	Interaction with other hormones [HT only]
FSH	Pituitary gland	Matures the egg.	Stimulates the production of oestrogen.
Oestrogen	Ovaries	Thickens the lining of the uterus.	Stimulates production of LH. Inhibits the production of FSH.
LH	Pituitary gland	Ovulation (at around day 14 of the cycle).	Indirectly stimulates the production of progesterone.
Progesterone	Ovaries	Maintains the lining of the uterus.	Inhibits the production of LH

## [HT only] negative feedback thyroxine



Adrenaline is a hormone produced by the adrenal gland, released in response to stress or fear. Acts on lungs and heart and vasodilation to increase oxygen supply for respiration in muscles – fight or run away.



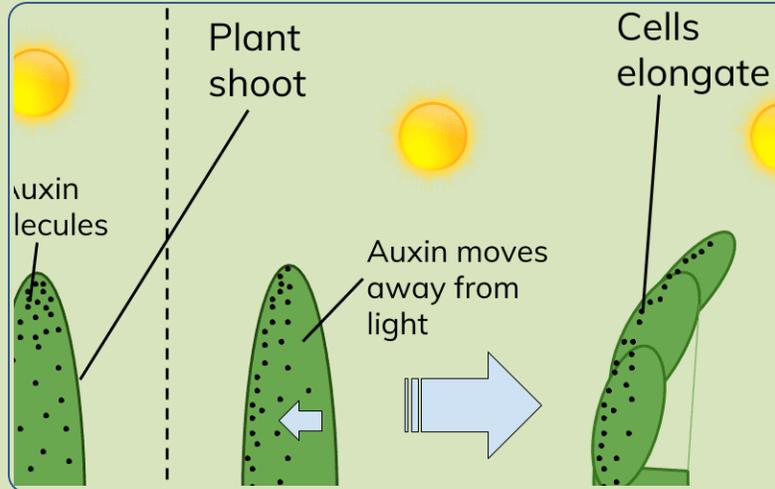
## [HT only] Infertility

FSH and LH given to stimulate normal ovulation. IVF: FSH and LH stimulate eggs to mature. They are collected before ovulation. Fertilised using sperm in a lab. Embryos inserted into woman's uterus for implantation. If successful it's a normal pregnancy!

Method	How it works	Pros/Cons
The pill (hormone oral)	Oestrogen/progesterone in the pill inhibits FSH so no eggs mature.	☺ Easy to take, can be easily reversed. ☹ Mild side effects, can lead to pregnancy if not taken. No STI protection.
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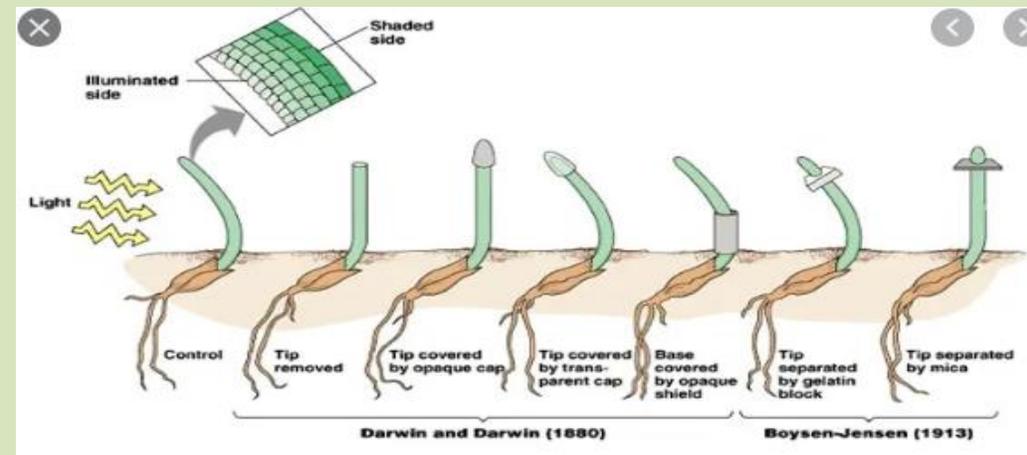


# KS4 Biology: B11 Hormonal coordination



**Auxins:** plant hormones that control plant growth. **Auxins** are found in the **tips (meristems)**, roots and shoots and are sensitive to **light**.

**Phototropism** – a plant’s response to light. **Auxins** move away from light so become unequally distributed. **Auxin** causes **SHOOT CELLS to GROW QUICKER** so the shoot grows **TOWARDS THE LIGHT**.



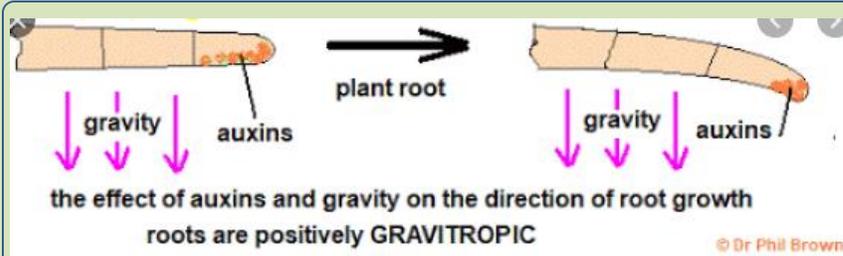
**REQUIRED PRACTICAL:** Investigate the effect of light or gravity on newly germinated seedlings.  
**IV:** light intensity (windowsill or dark cupboard)  
**DV:** Height of seedling (mm)  
**CV:** Volume of water, type of seed, number of seeds.

Method – germination of seedlings.

1. Place 10 seeds in a Petri dish of cotton wool.
2. Add 10ml water.
3. Place in a warm place to germinate.
4. Water with same volume if necessary

Method – growth of seedling

1. Once germinated ensure there is the same number of seedlings (some may not have germinated so others may need to be removed).
2. Place Petri dish in a dark, partially shaded or light area.
3. Every day for 5 days measure the height of the seedlings.
4. Calculate a mean height each day.



**Geotropism** – a plant’s response to gravity.

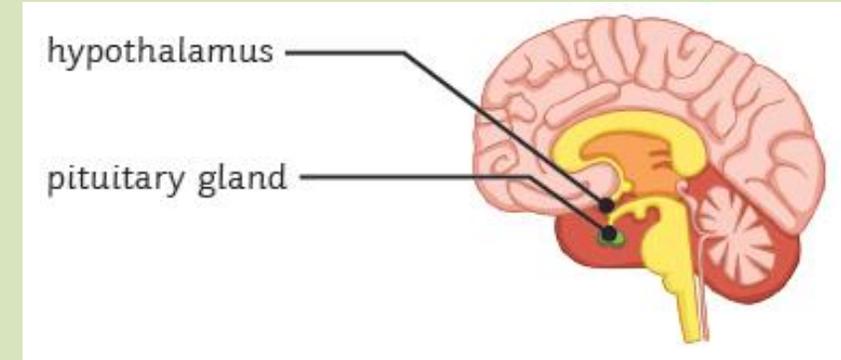
**Auxins** are **heavy** so become unequally distributed in new roots and shoots. **Auxin** causes **ROOT CELLS to GROW SLOWER** so the root grows downwards.

Auxin causes **SHOOT** cells to grow faster so shoots grow upwards (until they go above the soil when phototropism takes over).

Hormone	Uses	Commercial uses
Auxins	Controlling plant growth	Kill broad leaved plants eg weeds in lawn but not kill grass. Growing plants from cuttings using auxin rooting powder. Tissue culture medium containing auxin.
Gibberellin	Start seed germination, and flowering	Add gibberellin to seeds to make them germinate at a specific time of the year – makes them all germinate at the same time
Ethene	A gas produced when a plant ages. It controls cell division, growth and fruit ripening	Use to speed up ripening of fruit. Pick fruit when unripe – ship it around the world then add ethane at destination to ripen fruit ready for sale on the supermarket shelf eg bananas.



## Controlling body temperature – 37°C



Body temperature is monitored and controlled by the **thermoregulatory** centre in the brain.

The skin contains temperature **receptors** and sends nervous impulses to the **thermoregulatory** centre.

If the body **temperature is too high**:

- blood vessels dilate (**vasodilation**)
- sweat is produced from the sweat glands
- Both these mechanisms cause a transfer of energy from the skin to the environment.

If the body **temperature is too low**:

- blood vessels constrict (**vasoconstriction**)
- sweating stops
- skeletal muscles contract (shiver) (more respiration which is **exothermic**).

HINT: never say that capillaries dilate or constrict – they can't as they have no muscle layer,. The blood vessels that supply capillaries dilate and constrict (arterioles).

Key word	Definition
Thermoregulatory centre	The area of the brain that is sensitive to the temperature of the blood.
Receptor	Cells that detect <b>stimuli</b> .
Stimuli	Changes in the <b>internal or external</b> environment.
Vasodilation	The <b>dilation</b> or opening up of the blood vessels.
Vasoconstriction	The constriction or narrowing of the blood vessels.
Exothermic	Reactions that transfer energy to the surroundings and the temperature of the surroundings increases.
Urea	The <b>nitrogenous</b> waste produced by the breakdown of <b>excess amino acids</b> in your <b>liver</b> .
Urine	Excess mineral ions, water and urea are removed from the body in urine.
Selective reabsorption	The process in the <b>kidney</b> where the materials needed in the body such as glucose, some mineral ions and water are reabsorbed back into the blood from the filtrate.
ADH	Anti-diuretic hormone helps control the water balance of the body and affects the amount of urine produced by the kidney.
Dialysis	The process of cleansing the blood through a dialysis machine when the kidneys fail.
Osmosis	Movement of water from a dilute to a concentrated solution.

## Homeostasis of water:

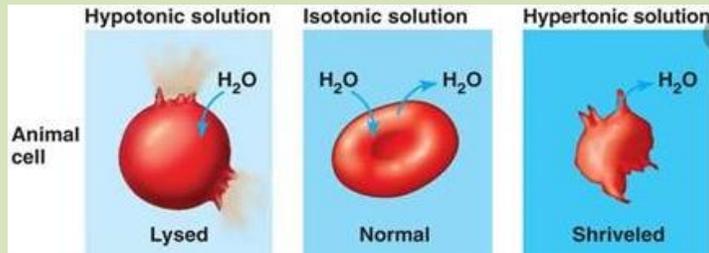
Water leaves the body via the lungs during exhalation (breathing out).

Water, ions and urea are lost from the skin in sweat.

There is no control over water, ion or urea loss by the lungs or skin.

Excess water, ions and urea are removed via the kidneys in the urine.

**If body cells lose or gain too much water by osmosis they do not function efficiently.**



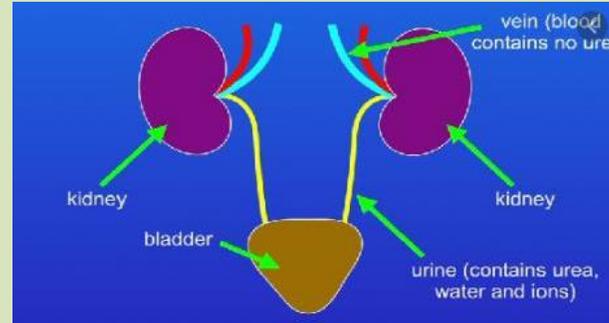
**[HT only]** The water level in the body is controlled by the hormone ADH which acts on the kidney tubules.

ADH is released by the pituitary gland when the blood is too concentrated and it causes more water to be reabsorbed back into the blood from the kidney tubules.

This is controlled by negative feedback.

**[HT ONLY]** The digestion of proteins from the diet results in excess amino acids which need to be excreted safely.

In the liver these amino acids are **deaminated to form ammonia**. **Ammonia is toxic** and so it is immediately converted to **urea** for safe excretion.



If both kidneys fail, **dialysis** or a **kidney transplant** is needed. Dialysis is time consuming and is used while a kidney donor can be found – but no rejection problems or operation like transplants – transplants are cheaper overall.

**Unfiltered blood** is taken from the patient and is **pumped into the dialysis machine** – it is kept separate from the dialysis fluid by a **partially permeable membrane**.

The blood flows in the opposite direction to the dialysis fluid to maintain the concentration gradient.

**The dialysis fluid contains glucose, ions and no urea.**

**Urea moves across the membrane by diffusion. The glucose and ion concentration are similar to required concentrations so only excess ions leave the blood and no glucose.**

## Filtration of the blood

1. As the blood passes through the kidney, the small molecules are filtered out and pass into the kidney.

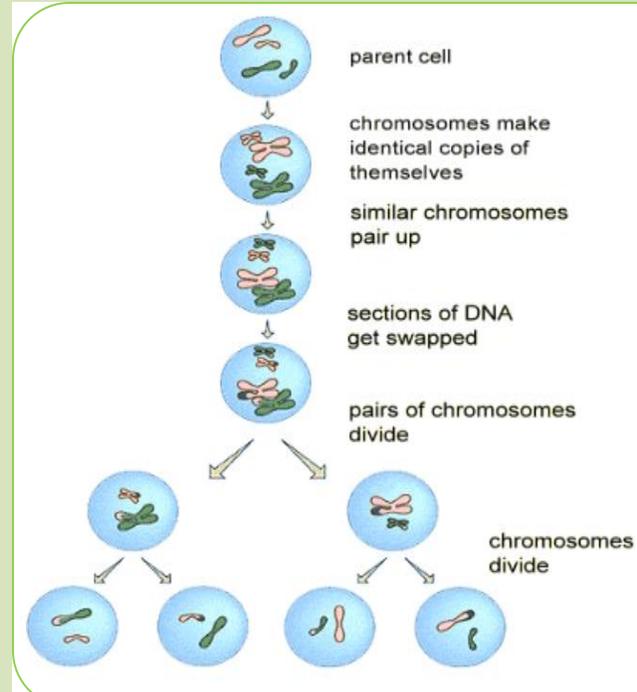
- The small molecules filtered out include: glucose, urea, ions and water.
- Large molecules such as protein are too big so stay in the blood.

2. Selective reabsorption – useful substances are reabsorbed back into the blood.

- All of the glucose by diffusion and active transport.
- Some of the water as needed by the body by osmosis.
- Some of the ions as needed by the body by active transport.



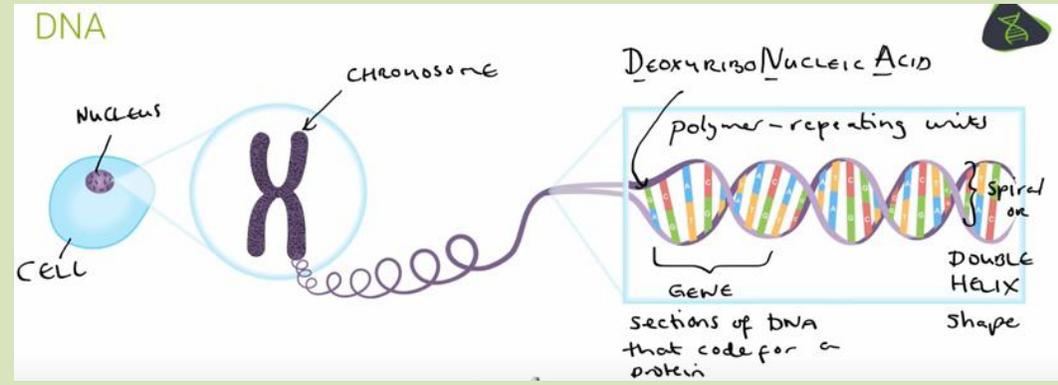
Key word	Definition
Sexual reproduction	Two parents, mixing of genetic information which leads to variety in the offspring. Involves the formation of <b>gametes</b> by <b>meiosis</b> .
Asexual reproduction	One parent, no fusion of <b>gametes</b> . No mixing of genetic information. Genetically identical offspring ( <b>clones</b> ). <b>Only mitosis involved</b> .
Gamete	Sex cells, sperm and eggs (animals) pollen eggs (flowering plants). Formed by <b>meiosis</b> .
Meiosis	Cell division to make non-identical cells with half the number of chromosomes.
Mitosis	Cell division to make identical cells for Growth, Repair, Replace,
Fertilisation	Fusion of gametes to restore the full number of chromosomes. After fertilisation, <b>mitosis</b> occurs and cells <b>differentiate</b> to form an embryo
Differentiate	The process in which cells become specialised for a particular function.
DNA	A polymer made up of two strands forming a double helix. DNA is contained in structures called chromosomes.
Gene	A small section of <b>DNA</b> on a <b>chromosome</b> . Each <b>gene codes</b> for a particular sequence of <b>amino acids</b> to make a specific <b>protein</b> .
Chromosome	Found in pairs, one inherited from your father and one from your mother. Humans should have 46 chromosomes in each body cell.
Genome	The entire genetic material of that organism.
Amino acid	The monomers for proteins. Three bases code for one amino acid.
Protein	Molecules that contain carbon, hydrogen, oxygen and nitrogen and are made of long chains of <b>amino acids</b> . They are used for building cells and tissues of the body eg collagen and to form enzymes.



**Meiosis**

1. Copies of genetic information are made.
2. The cell divides **twice** to form four gametes each with a single set of chromosomes.

**All gametes are different to each other – variety in offspring.**  
 Eg. A body cell has 46 chromosomes, the gamete has 23 chromosomes.



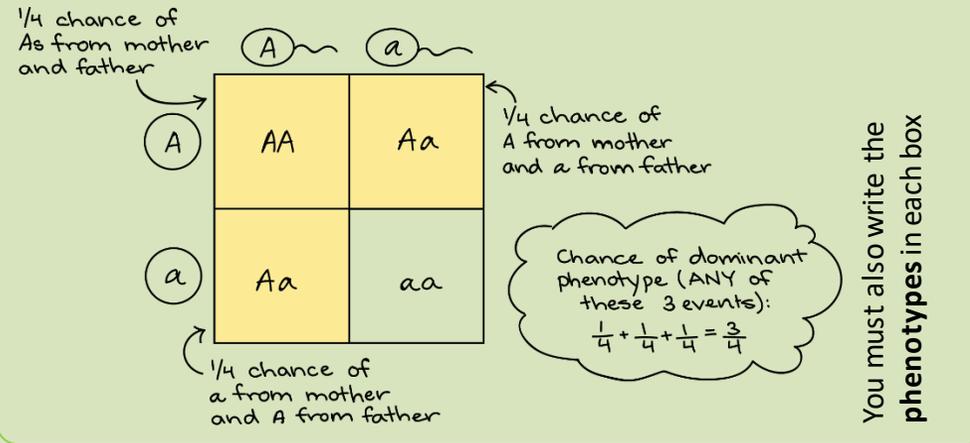
The human **genome** was sequenced in a world wide collaboration in 2003. It is available for all scientists to use to study:

- The genes linked to different types of disease
- Understanding the treatment of inherited disorders
- Use in tracing human migration patterns from the past



# KS4 Biology: B12 Reproduction TRILOGY

Most characteristics are controlled by more than one gene, you only need to know about single gene inheritance.



Key word	Definition
Mutation	A change in the genetic material of an organism.
Enzyme	A biological catalysts which speed up chemical reactions.
Allele	Different forms of the same gene, can be <b>dominant</b> eg A or <b>recessive</b> eg a
Dominant allele	The <b>phenotype</b> will be apparent in the offspring even if only one copy is inherited. Eg AA or Aa
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Homozygous	Two identical <b>alleles</b> for a characteristic eg AA or aa
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Genotype	The genetic makeup of an individual for a particular characteristic, eg eye colour <b>alleles</b> Bb or BB
Phenotype	The physical appearance/biochemistry of an individual for a particular characteristic eg eye colour brown eyes

## Sex determination: Male or female?

Ordinary human body cells contain 46 chromosomes (23 pairs).

22 pairs control characteristics only, but one pair carries the genes that determine sex.

- Females the sex chromosomes are XX
- Males the sex chromosomes are XY

	X	X
X	XX	XX
Y	XY	XY



## Inherited disorders

- Polydactyly (having extra fingers or toes) is caused by a **dominant allele**.
- Cystic fibrosis (a disorder of a cell membrane protein) is caused by a **recessive allele**.

Embryo screening – cells are harvested from the embryo and screened for genetic diseases.

PROS: parents are informed of any diseases so can make a choice to terminate.

Costly to society to support a disabled person so screening may help prevent these costs.

CONS: The harvesting risks miscarriage, so in some rare cases a healthy fetus can be terminated.

Screening is expensive.

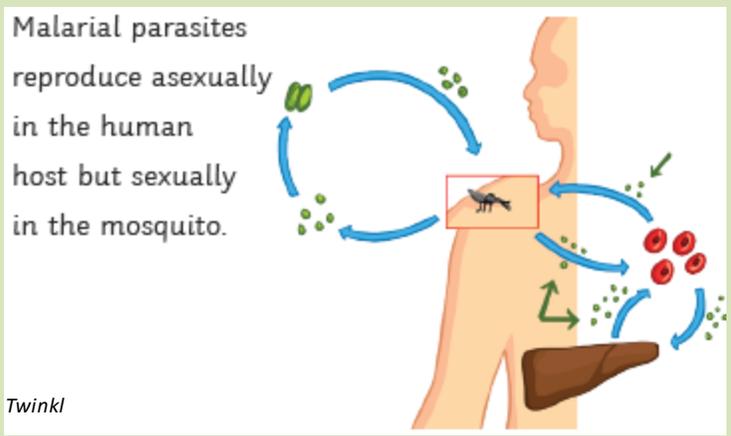
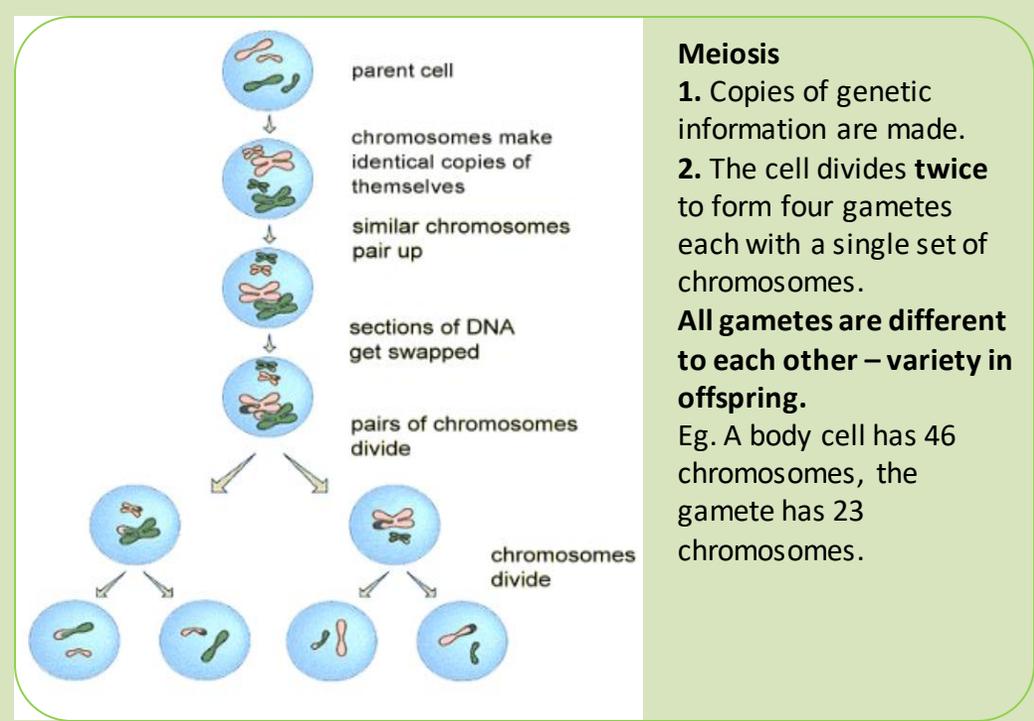
Difficult emotional/religious choices to terminate.



# KS4 Biology: B13 Reproduction

Please only use when directed by your teacher

Key word	Definition
Sexual reproduction	Two parents, mixing of genetic information which leads to variety in the offspring. Involves the formation of <b>gametes</b> by <b>meiosis</b> .
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Differentiate	The process in which cells become specialised for a particular function.



Twinkl

Many fungi reproduce asexually by spores but also reproduce sexually to give variation.



Strawberry plants can reproduce sexually and send off runners to reproduce asexually.

Daffodils can reproduce sexually or by bulb division (asexual).

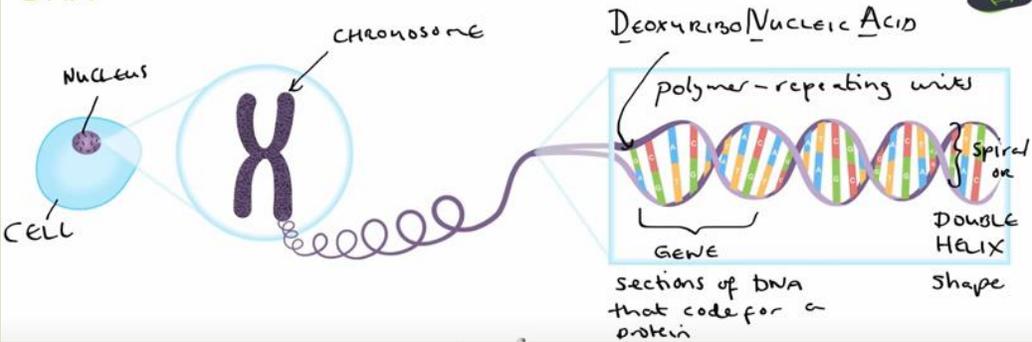


Advantages of sexual reproduction	Advantages of asexual reproduction
Produces variation in offspring.	Only one parent needed.
If the environment changes, variation gives survival advantage by natural selection.	More time and energy efficient as do not need to find a mate.
Natural selection can be speeded up by humans in <b>selective breeding</b> to increase food production. (See topic B14 KO).	Many identical offspring can be produced when conditions are favourable.
	Faster than sexual reproduction.



# KS4 Biology: B13 Reproduction

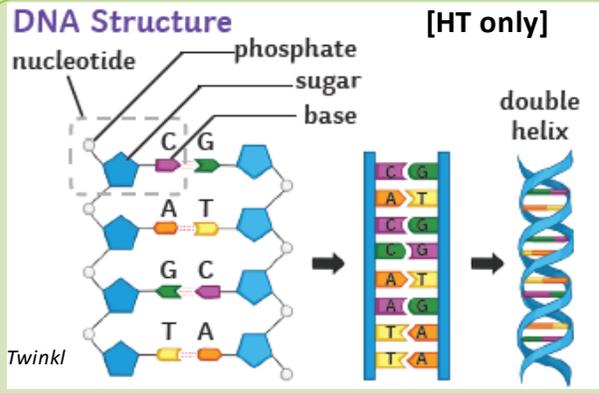
## DNA



The human **genome** was sequenced in a world wide collaboration in 2003. It is available for all scientists to use to study:

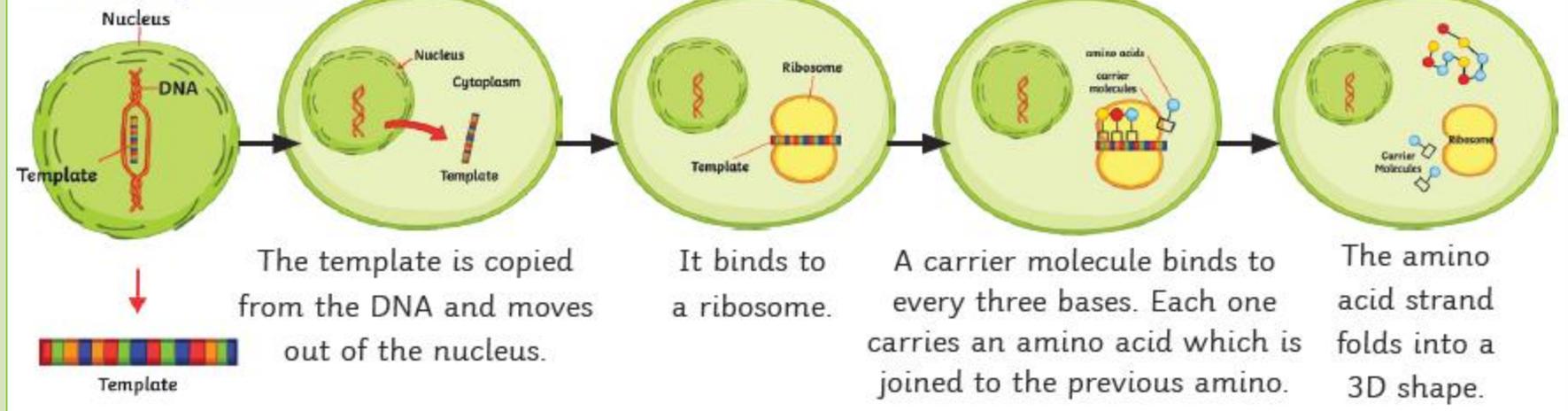
- The genes linked to different types of disease
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Chromosome	Found in pairs, one inherited from your father and one from your mother. Humans should have 46 chromosomes in each body cell.
Genome	The entire genetic material of that organism.
Nucleotide	A molecule made up a sugar, a phosphate group and one of four different <b>bases</b> .
Bases	Bases make up part of a <b>nucleotide</b> which make up <b>DNA</b> and <b>RNA</b> . They are represented by the letters A, T, G and C.
Amino acid	The monomers for proteins. Three bases code for one amino acid.
Protein	Molecules that contain carbon, hydrogen, oxygen and nitrogen and are made of long chains of <b>amino acids</b> . They are used for building cells and tissues of the body eg collagen and to form enzymes.



In the complementary strands a C is always linked to a G on the opposite strand and a T to an A. A change in coding DNA can alter the activity of a protein and in non-coding DNA by altering how genes are expressed.

## Protein Synthesis / Expression [HT only]





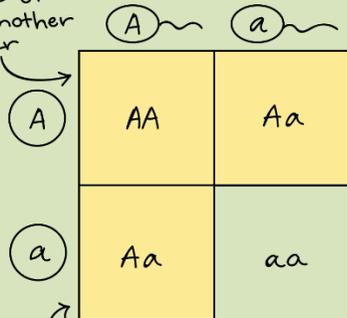
# KS4 Biology: B13 Reproduction

### [HT only]

- **Mutations** occur continuously. Most do not alter the **protein** only alter it slightly so that its appearance or function is not changed.
- A few **mutations** code for an altered **protein** with a different shape. An **enzyme** may no longer fit the substrate in its active site or a structural protein may lose its strength.
- Not all parts of **DNA** code for **proteins**. Non-coding parts of DNA can switch genes on and off, so variations in these areas may affect how genes are expressed.

Most characteristics are controlled by more than one gene, you only need to know about single gene inheritance.

1/4 chance of As from mother and father



1/4 chance of A from mother and a from father

1/4 chance of a from mother and A from father

Chance of dominant phenotype (ANY of these 3 events):  
 $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

You must also write the **phenotypes** in each box

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Costly to society to support a disabled person so screening may help prevent these costs.

CONS: The harvesting risks miscarriage, so in some rare cases a healthy fetus can be terminated.

Screening is expensive.

Difficult emotional/religious choices to terminate.



# KS4 Biology: B13 Variation and evolution TRILOGY

Please only use when directed by your teacher

Variation in a population may be due to differences in:

- The **genes** they have inherited eg eye colour
- **Environmental** conditions eg scars from accidents
- A combination of **genes and environment** eg skin colour

There is usually extensive genetic variation within a population species. Variation arises from **mutations**: most **mutations** have no effect on the **phenotype**; some influence the **phenotype**; very few change the **phenotype**.

Mutations occur continuously. If a **mutation changes the phenotype and the phenotype is suited to an environment change it can change the population of a species rapidly**.

### Theory of evolution by natural selection:

- Variation in the population due to mutation.
- Those individuals best suited to the environment are more likely to **survive, reproduce and pass on their genes**.

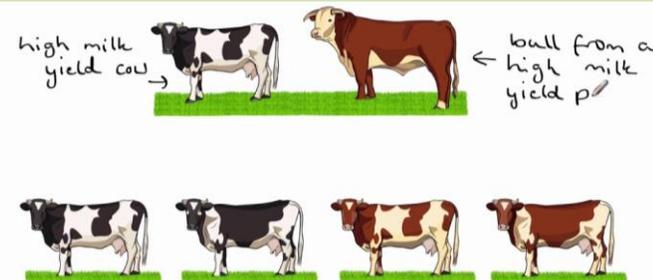
### Selective breeding

- Has been done for thousands of years to breed food crops and domesticated animals.
- Choose characteristics for:
  - Disease resistance in food crops
  - Animals that produce more meat or milk
  - Domestic dogs with a gentle nature
  - Large or unusual flowers

- Selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects eg brain swelling in pugs



Key word	Definition
Phenotype	The physical appearance/biochemistry of an individual for a particular characteristic eg eye colour - brown eyes
Gene	A small section of <b>DNA</b> on a <b>chromosome</b> . Each <b>gene codes</b> for a particular sequence of <b>amino acids</b> to make a specific <b>protein</b> .
Genome	The entire genetic material of that organism.
Species	Organisms that have similar characteristics that can breed together and produce fertile offspring.
Mutation	A change in the genetic material of an organism.
Variation	Differences in the characteristics of individuals in a population.
Evolution	A change in the inherited characteristics of a population over time through a process of <b>natural selection</b> .
Theory of evolution by natural selection	States that all species of living things have evolved from simple life forms that first developed <b>three billion years ago</b> . Developed by Charles Darwin.
Selective breeding	The process where humans breed plants and animals for particular genetic characteristics from a mixed population. They are bred together. From the offspring those with desired characteristics are bred together. This is done over many generations until all offspring have desired characteristics.





## KS4 Biology: B13 Variation and evolution TRILOGY

### Genetic engineering

**Genes** 'cut out' from chromosomes of other organisms and transferred to cells of other organisms.

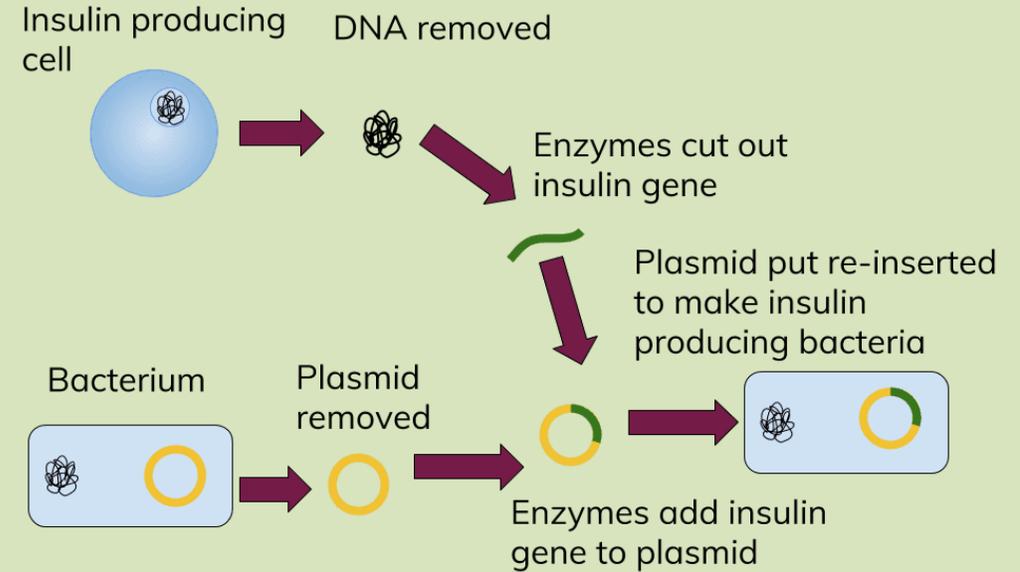
#### Benefits:

- Bacterial cells have been genetically engineered to produce useful substances eg human insulin to treat diabetes.
- Plant crops have been genetically engineered to be resistant to diseases or to produce bigger better fruits (**GM crops**).
- Modern medical research is exploring the possibility of genetic modification to overcome some inherited disorders.

#### Potential risks:

- **GM crops**, some concerns about the effect on populations of wild flowers and insects.
- Some people feel the effects of eating **GM crops** on human health have not been fully explored.

### [HT only]



- Enzymes are used to isolate the required gene; this gene is inserted into a vector, usually a bacterial plasmid or a virus.
- The vector is used to insert the gene into the required cells.
- Genes are transferred to the cells of animals, plants or microorganisms at **an early stage of development** so that they develop the desired characteristics.

Key word	Definition
Genetic engineering	Modifying the <b>genome</b> of an organism by introducing a <b>gene</b> from another organism to give a desired characteristic.
GM crops	Genetically modified crops that have generally increased <b>yield</b> as they can be resistant to insect attack or to herbicides.
Yield	How much product that is made usually in terms of being sold for profit.

<https://www.youtube.com/watch?v= LoPYfhTgel&safe=active>

<https://www.youtube.com/watch?v=99nEQd2k6k4&safe=active>

<https://www.youtube.com/watch?v=gu9T91GJXDo&safe=active>



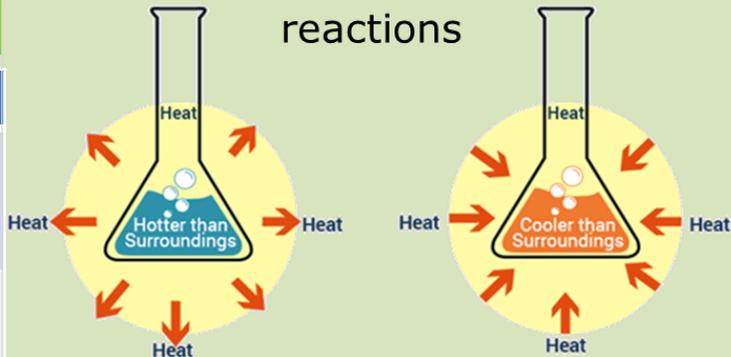
# KS4 Chemistry: Energy changes

Keyword	Definition
<b>Activation energy</b>	The amount of energy required for reactants to react successfully
<b>Bond energy</b>	the amount of energy needed to break one mole of a particular bond.
<b>Endothermic</b>	A reaction that takes in more energy from the surroundings than it gives out
<b>Exothermic</b>	A reaction that gives out more energy to the surroundings than it takes in
<b>ΔH</b>	The change in energy between reactants and products
<b>Electrical cell</b>	
<b>Fuel cell</b>	A device that produces voltage when supplied with fuel and oxygen
<b>Reaction profile</b>	Graph showing the energy in both reactants and products- including the difference between them

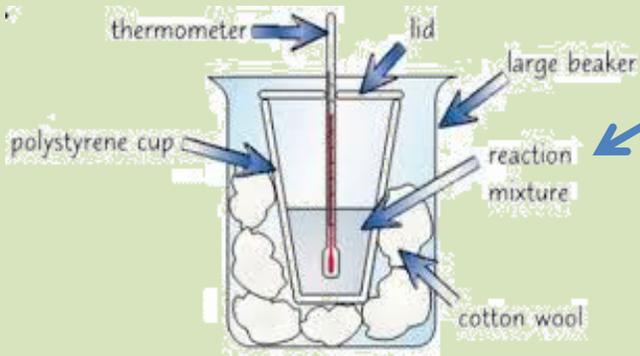
**Bond breaking**  
Bonds need to be broken between the reactants before bonds can be made to form the products. Energy has to be taken in to break a bond, so bond breaking is always endothermic.

**Bond making**  
To form bonds between the product molecules, energy is released, so bond making is always exothermic.

## Exothermic vs Endothermic reactions



Energy can not be created or destroyed- only transferred from one form to another. Heat is an example of energy, in Exothermic reactions heat is transferred to the surroundings from the reaction and in Endothermic reactions heat is transferred from the surroundings to the reactions

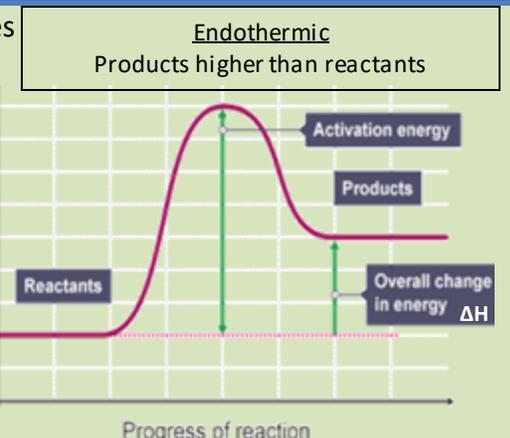
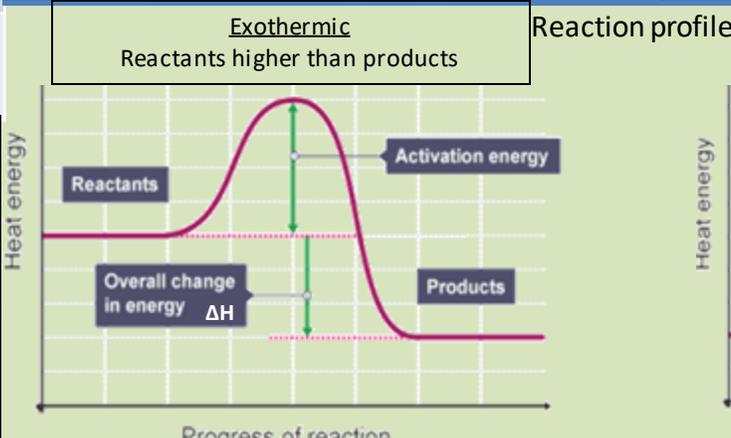


## Examples

Exothermic	Endothermic
Respiration	Photosynthesis
Neutralisation	Instant ice packs
Self heating cans	Thermal decomposition

When investigating exothermic and endothermic reactions- be sure to insulate the container and add a lid to prevent energy transfer to or from the outside of the container (giving you more accurate results)

## Reaction profiles





## Bond energy calculations (Higher)

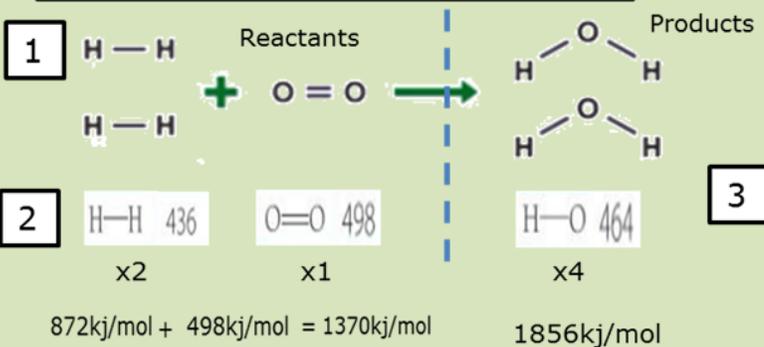
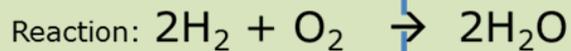
Bond energy calculations tell us the energy changes in a reaction. This ultimately determines if it is endothermic or exothermic.

We do this by working out the energy released from a bond and the energy required to break a bond

Bond	Bond energy in kJ/mol	Bond	Bond energy in kJ/mol
C—C	347	H—Cl	432
C—O	358	H—O	464
C—H	413	H—N	391
C—N	286	H—H	436
C—Cl	346	O=O	498
Cl—Cl	243	N≡N	945

1. Draw displayed formula for all molecules in the reaction.
2. Add up energy values for all bonds in reactants. (Bond breaking)
3. Add up energy values for all bonds in products. (Bond making)
4. Use the formula to calculate the energy change.

$$\text{Energy change} = \text{Energy of bond breaking (Reactants)} - \text{Energy of bond making (Products)}$$



$$\text{Energy change} = \text{Energy of bond breaking (Reactants)} - \text{Energy of bond making (Products)}$$

$$1370\text{kJ/mol} - 1856\text{kJ/mol} = -486\text{kJ/mol}$$

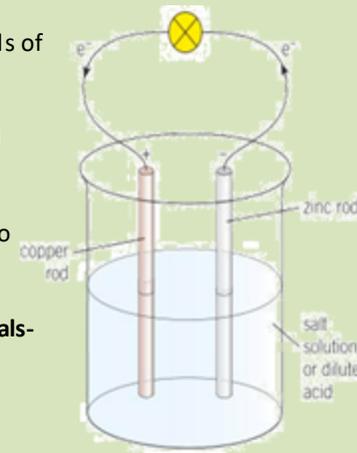
## Chemical and fuel cells (Chem only)

A chemical cell can be made by connecting 2 metals of different reactivity in an electrolyte solution.

The more reactive metal will lose its electrons and form a positive ion.

The potential difference in charge between the two metals creates voltage.

**The larger the gap in reactivity between the metals- the larger the voltage of the cell**



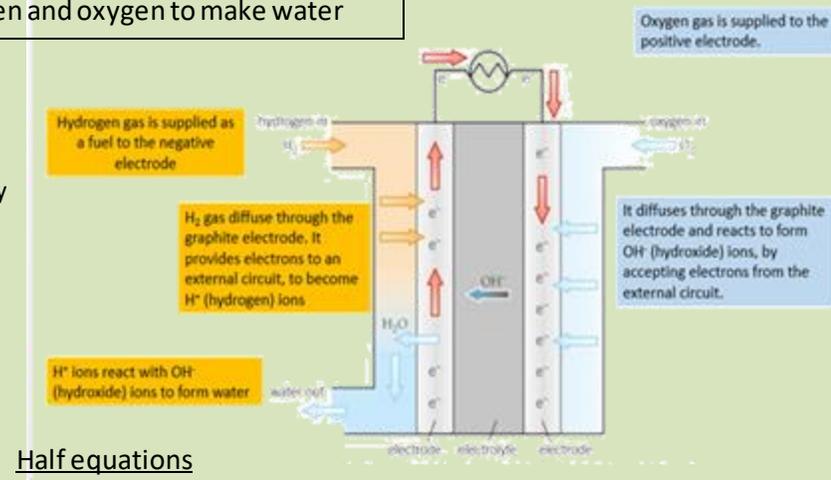
You can also make a cell by reacting hydrogen and oxygen to make water

### Pros

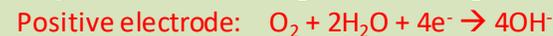
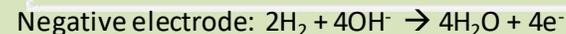
- Does not need to be electrically recharged
- No pollutants produced

### Cons

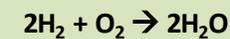
- Hydrogen is difficult to store
- Is highly flammable
- Is sometimes produced using finite resources



### Half equations



Full equation once spectator ions and water has been balanced out is



### Further reading

<https://www.bbc.co.uk/bitesize/guides/zsxn82p/revision/1>

<https://www.youtube.com/watch?reload=9&v=L7829UGifpM>

<https://www.bbc.co.uk/bitesize/guides/z2396yc/revision/1>

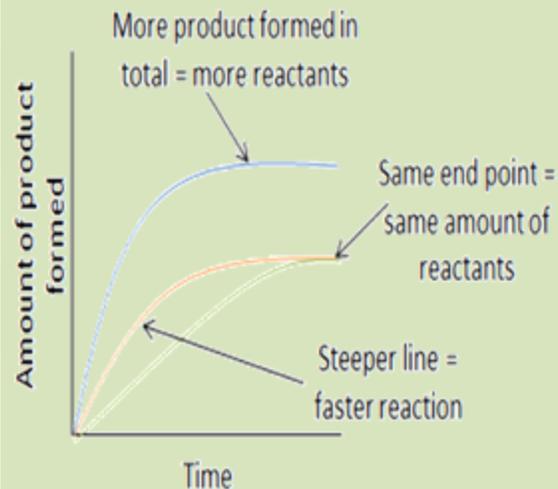


## KS4 Chemistry: Rates of reaction

Key word	Definition
Reactant	What is used in a chemical reaction
Product	What is produced during a reaction
Catalyst	A chemical that increases the rate of reaction without being used up in the reaction
tangent	A straight line that touches the curve on a graph at one point
Activation energy	The minimum energy required for a chemical reaction to take place
Collision theory	The theory that states for a chemical reaction to happen, particles must collide with sufficient energy
Le Chatelier's principle	A principle which states, "If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change"
Reversible reaction	A reaction that can form both products and reactants
Dynamic Equilibrium	An equilibrium where the forward and backward reactions are happening at the same rate
Rate of reaction	The speed at which products are formed
Closed system	A reaction that no reactants or products can escape, only heat can be exchanged freely

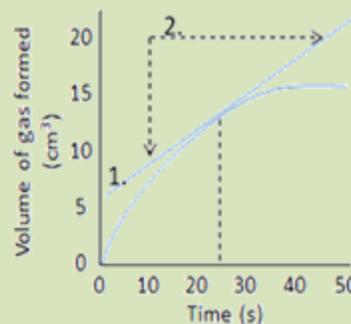
During chemical reactions- it is often important that we know the rate at which the reaction occurring- This is the "speed" at which reactants are turning into products.

This can be shown on a graph



You can calculate the rate of reaction using two main methods which are either the amount of reactant used or product formed  $\div$  time. OR you can take the gradient of a tangent using a graph- example shown below

To calculate the rate of reaction at 20 seconds:



$$\begin{aligned} \text{Rate of reaction} &= \text{change in } y \div \text{change in } x \\ &= (20 - 10) \div (45 - 10) \\ &= 0.29 \text{ cm}^3/\text{s} \end{aligned}$$

OR

1. Draw a tangent at the point you want to calculate rate.

2. Pick any two points along the tangent. Chose points that give easy to work with numbers.

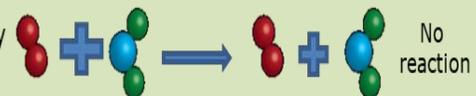
3. Calculate the change in x and y.

## Collision theory

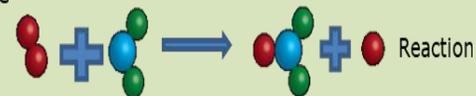
For a chemical reaction to happen:

- reactant particles must collide with each other
- the particles must have enough energy for them to react (this is called the activation energy)

Reactants do not have enough energy on collision



Reactants have or exceed activation energy on collision



Mean rate of reaction

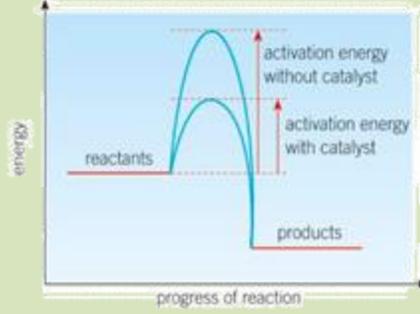
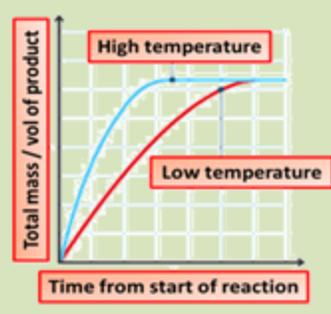
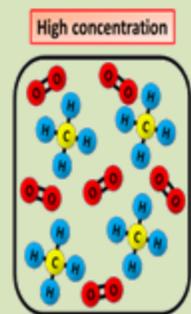
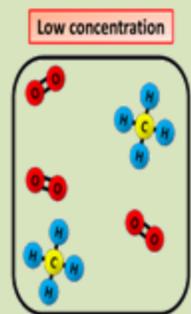
$$\begin{aligned} &\text{amount of product formed} \\ &\text{or} \\ &= \frac{\text{amount of reactant used}}{\text{time (s)}} \end{aligned}$$

There are 4 main factors you can change to affect the rate of reaction

- Temperature
- Pressure/concentration
- Surface area
- Using a catalyst

How these factors affect the rate is shown below

Effect of conditions on rate of reaction		
Temperature	Increase	Decrease
Effect on rate of reaction	Increase—more kinetic energy, more chance of collisions	Decrease—less kinetic energy, less chance of collisions
Pressure/concentration	Increase	Decrease
Effect on rate of reaction	Increases, more particles to collide in a smaller space	Decrease, less particles to collide in a larger space
Surface area of reactants	Increase	Decrease
effect on rate of reaction	More particles available to react	Less particles available to react
Catalyst	Present	Not Present
effect on rate of reaction	Faster, provides an alternative route with a lower activation energy	Slower

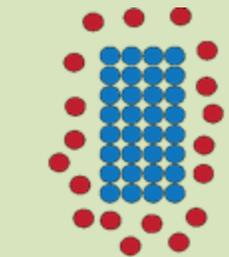


Reversible reactions

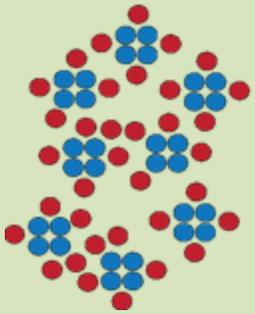
A reversible reaction is where the products can react together to form the reactants



We use this symbol to show the reaction is reversible

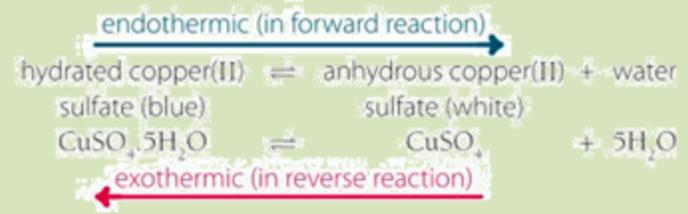


Smaller surface area - red reactants can't react with central blue atoms



Larger surface area - red reactants can react with all the blue atoms

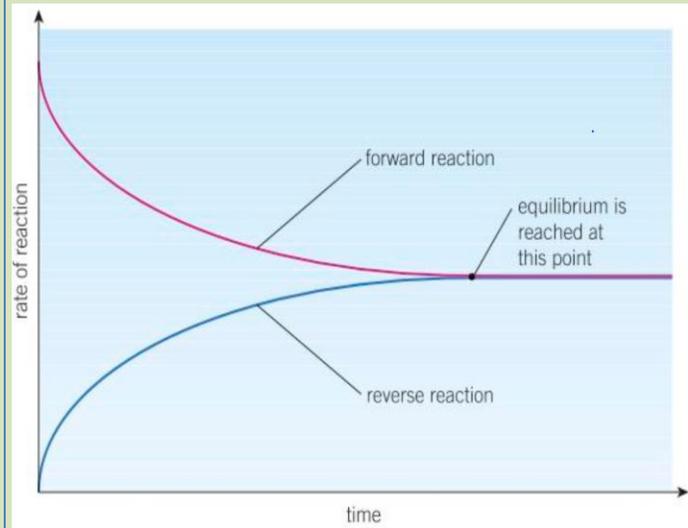
An example of a reversible reaction is shown below



Reactions will always have an exothermic reaction in one direction and an endothermic in the other (shown in example above). This energy transferred to or from the environment in either direction of the reaction is always equal

Dynamic equilibrium

In a reversible reaction, dynamic equilibrium happens once the forward reaction (making products) is equal in rate to the reverse reaction (forming reactants) an example is shown on the graph below





## Le Chatelier's principle (higher)

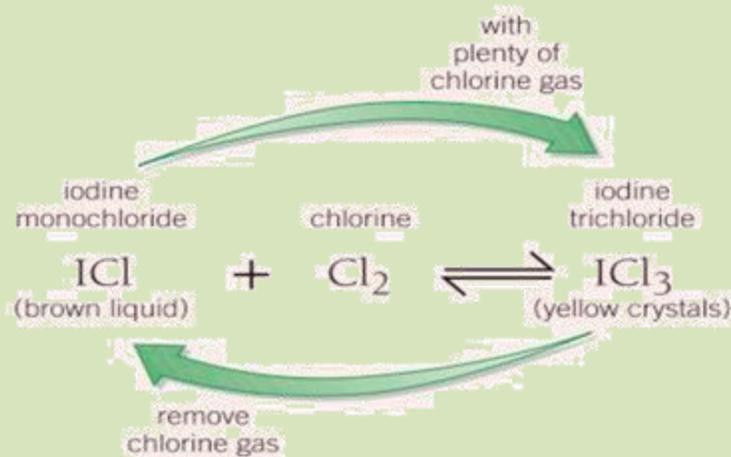
Le Chatelier's principle is a principle that a reversible reaction will "work against" any changes made to the reaction so that it is cancelled out. The changes made can be either

- Temperature
- Concentration
- Pressure

An example can be seen below with iodine monochloride and its reaction with chlorine gas

If you add a large concentration of chlorine gas then the forward reaction (producing iodine trichloride and no chlorine) is favoured due to Le Chatelier's principle. However, if the concentration of chlorine gas is lowered then the reverse reaction is favoured- producing more chlorine gas

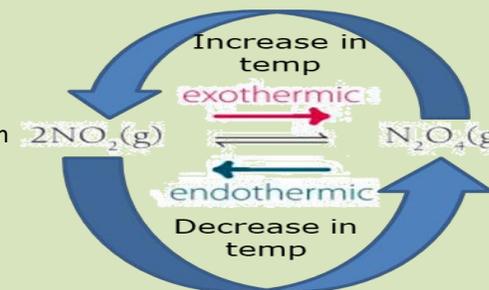
Le Chatelier's principle is important as we can use it in industry to change the conditions of a reaction to favour a product we wish to make



## Le Chatelier's principle- the effects of temperature and pressure on a reaction (higher)

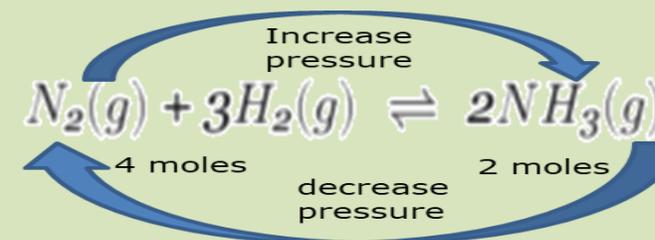
### Temperature

In a closed system- the effect of temperature on a reversible reaction depends on which reaction is exo or endo thermic. if the forward reaction is endothermic then increasing the temperature will decrease the amount of product formed and increase the amount of reactants formed. The opposite is true if the forward reaction is endothermic



### Pressure

If a balanced gaseous reaction has more moles of gas on one side than another then increasing the pressure will favour the reaction producing fewer moles



### Summary

If the forward reaction produces <i>more</i> molecules of gas ...	If the forward reaction produces <i>fewer</i> molecules of gas ...	If the forward reaction is exothermic ...	If the forward reaction is endothermic ...
... an increase in pressure decreases the amount of products formed.	... an increase in pressure increases the amount of products formed.	... an increase in temperature decreases the amount of products formed.	... an increase in temperature increases the amount of products formed.
... a decrease in pressure increases the amount of products formed.	... a decrease in pressure decreases the amount of products formed.	... a decrease in temperature increases the amount of products formed.	... a decrease in temperature decreases the amount of products formed.

### Further reading

<https://www.bbc.co.uk/bitesize/guides/z3nbqhv/revision/1>

<https://www.bbc.co.uk/bitesize/guides/zyhvw6f/revision/2>

<https://www.physicsandmathstutor.com/chemistry-revision/gcse-aqa/rate-and-extent-of-chemical-change/>

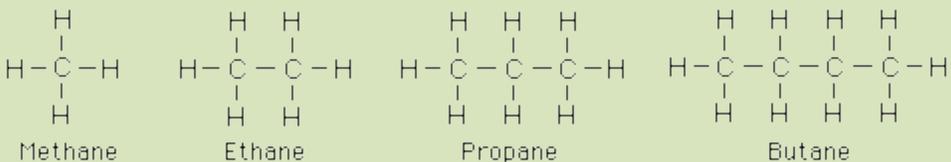
<https://www.youtube.com/watch?v=7i90fiz9SmY>



# KS4 Science – C9 Crude Oil and Fuels

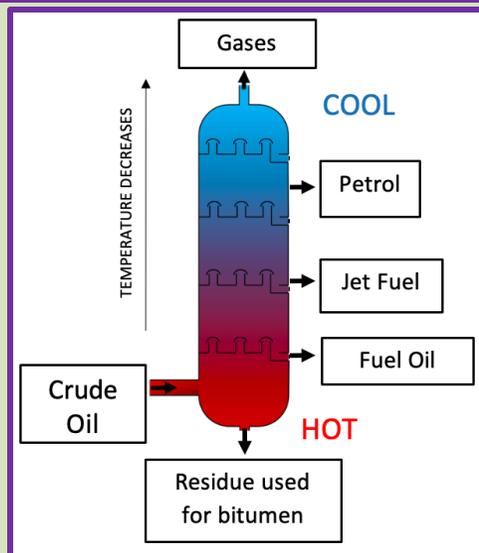
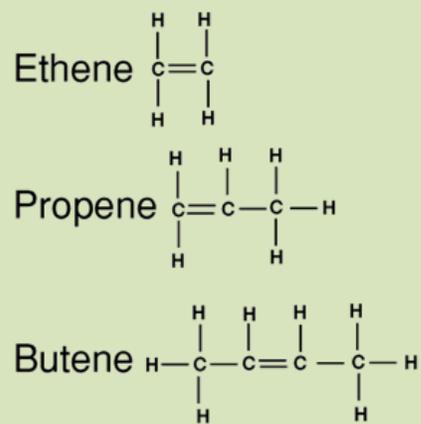
Crude oil is a mixture of hydrocarbon fractions with different boiling points.

The first 4 alkanes look like this:



You need to learn their names..

The alkenes all have a double bond between 2 carbon atoms.



The fractions are separated using the process of **FRACTIONAL DISTILLATION**. Each fraction has a different boiling point. The crude oil is **HEATED** until all the fractions are vaporised. Then each fraction **CONDENSES** at its boiling point. It is cooler at the top of the column.

The smaller molecules are **MORE VOLATILE** and have lower boiling points: they condense at the top of the column or come out as gases. The larger molecules are **MORE VISCOUS** and have higher boiling points. They condense at the bottom of the column.

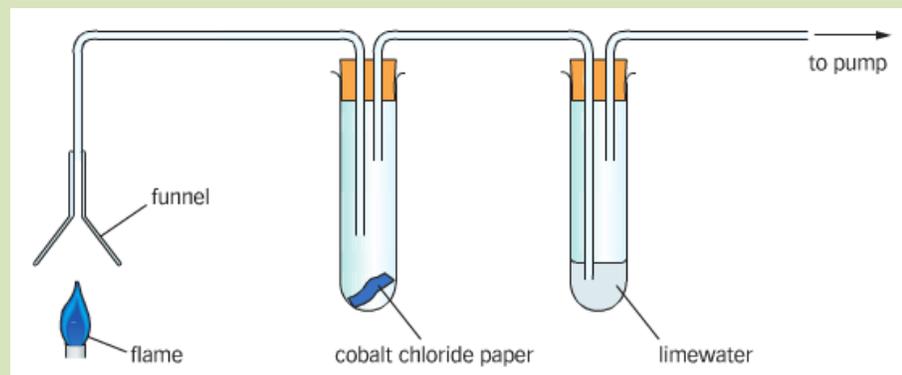
Key Word	Definition
Mixture	Made of two or more substances not chemically bonded together
hydrocarbon	A compound containing only hydrogen and carbon
Fraction	Hydrocarbons with similar boiling points separated from crude oil
Distillation	Separation of 2 or more liquids with different boiling points
Fractional Distillation	Using evaporation and condensation to separate liquids from a mixture
Alkane	Saturated hydrocarbon with the general formula $C_nH_{2n+2}$
Alkene	Unsaturated hydrocarbon containing a double C=C bond with the general formula $C_nH_{2n}$
Flammable	Easily ignited and capable of burning rapidly
Viscous	A liquid resistant to flow or pouring (or "thick") is called viscous
volatile	A liquid with a low boiling point is called volatile
Oxidised	Describes a substance that has had oxygen added to it, or has lost electrons
Complete combustion	The reaction that occurs when fuels are burnt in plenty of air, producing carbon dioxide and water as products
Incomplete combustion	The reaction that occurs when fuels are burnt in not enough oxygen, producing carbon monoxide and water as products
Cracking	The reaction that breaks down long hydrocarbons into smaller, more useful ones
Saturated	A hydrocarbon with only single bonds between its carbon atoms
Unsaturated	A hydrocarbon whose molecules contain at least one carbon-carbon double bond
Thermal decomposition	The breakdown of a compound by heating it
Bromine Water	An orange liquid that turns colourless in the presence of alkenes



## KS4 Science – C9 Crude Oil and Fuels

Fraction	BOILING POINT	VISCOSITY	FLAMMABILITY	CHAIN LENGTH
Refinery Gas	INCREASE	INCREASE	DECREASE	INCREASE
Petrol				
Naphtha				
Kerosine				
Diesel				
Lubricating Oil				
Fuel Oil				
Residue				

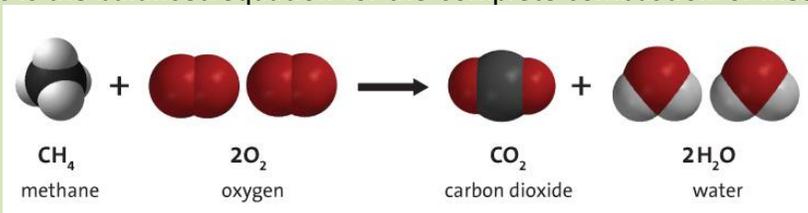
You can test for the products of combustion using the apparatus below:



Limewater changes colour from colourless to milky in the presence of carbon dioxide. Blue cobalt chloride paper turns pink in the presence of water. You can also use white anhydrous copper sulphate powder to test for water; it turns bright blue when it is hydrated.

### Complete Combustion

When there is sufficient oxygen, hydrocarbons burn to release water and carbon DIOXIDE. The carbon and water are completely oxidised. This is the balanced equation for the complete combustion of methane.



### Incomplete Combustion

When there is not enough oxygen, carbon monoxide (CO) is produced instead of CO<sub>2</sub>. CO is a toxic, colourless and odourless gas. This is the balanced equation for the incomplete combustion of methane



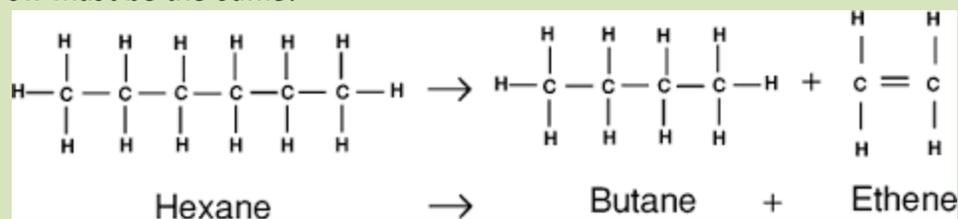
### Cracking

This is the process used to break large hydrocarbon molecules into smaller, more useful ones. Thermal decomposition is used in an oil refinery to split the large molecules into smaller ones. A heavy fraction is heated and vaporised. It is then either:  
1 – Passed over a hot catalyst OR  
2 – mixed with steam and heated to a very high temperature

Cracking produces saturated hydrocarbons, used as fuels, and unsaturated hydrocarbons (alkenes)

For example hexane could be cracked to produce butane and ethene.

TIP: The total number of Carbon and Hydrogen atoms on each side of the arrow must be the same!



An orange liquid called bromine water turns colourless in the presence of ALKENES



Other Useful Links:

<https://www.youtube.com/watch?v=CX21YWggEBc>  
<https://www.bbc.co.uk/bitesize/guides/zshw6f/test>  
<https://www.bbc.co.uk/bitesize/guides/zyc6fr/revision/1>

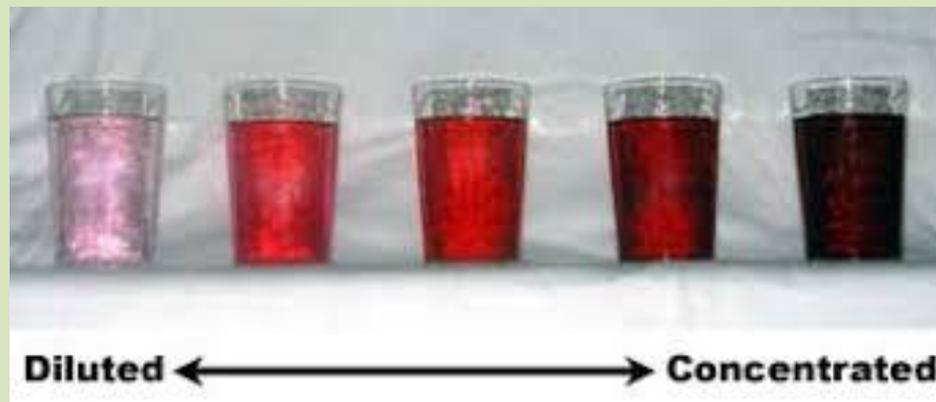
# KS4 Chemistry C4 Chemical Calculations (Combined Foundation)

Relative atomic mass, Ar.  
This is the large number  
on the Periodic Table.



Relative formula mass is all  
the atomic masses in a  
compound added up.  
E.g. CO<sub>2</sub> is 12+16+16 = 44

Concentration is a measure of how many  
particles there are.  
High concentration means lots of particles,  
low concentration means less.



Few drink particles.  
Lots of water particles.  
Low drink concentration.  
High water concentration

Lots of drink particles.  
Few water particles.  
High drink concentration.  
Low water concentration

$$\text{Concentration} = \frac{\text{mass (in g)}}{\text{volume (in dm}^3\text{)}}$$

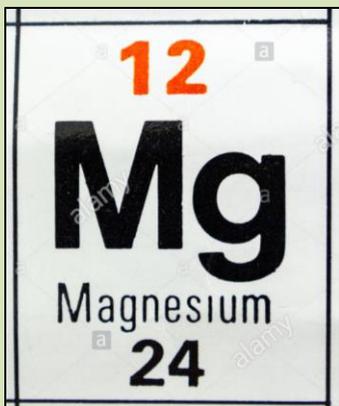
$$\text{Concentration} = \frac{\text{mass (in g)}}{\text{volume (in cm}^3\text{)}} \times 1000$$

$$\text{Mass} = \text{concentration} \times \text{volume}$$

Concentration is  
measured in g/dm<sup>3</sup>

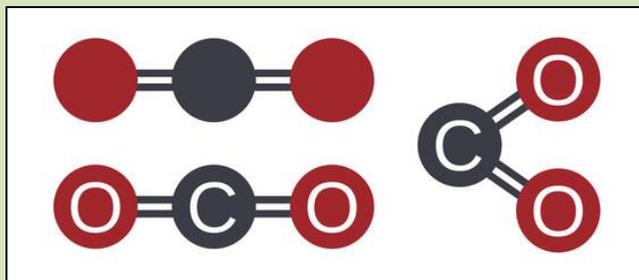
Carbon 12 is the standard atom.  
Carbon 12 has an atomic mass of 12.  
All atomic masses are calculated from 1/12 of a carbon 12 atom.

Relative atomic mass,  $A_r$ .  
This is the large number on the Periodic Table.



The atomic mass expressed as g is the mass of 1 mole of the element. E.g, 12g of magnesium is 1 mole of magnesium.

Relative formula mass,  $M_r$   
is all the atomic masses in a compound added up.  
E.g.  $\text{CO}_2$  is  $12+16+16 = 44$



Avogadro's constant is  $6.02 \times 10^{23}$   
This is the number of atoms in 1 mole  
(or the number of molecules in 1 mole).

Number of moles = mass / molecular mass

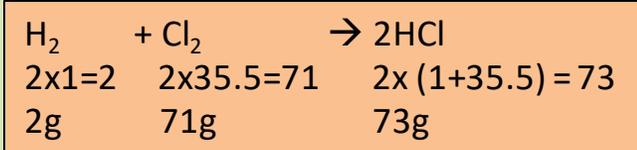
Molecular mass is the  $A_r$  for an element and  $M_r$  for a molecule.

E.g.  
There are 24g of Mg in 1 mole of atoms.  
41g of Mg has  $(41/24)$  1.7 moles of Mg atoms.

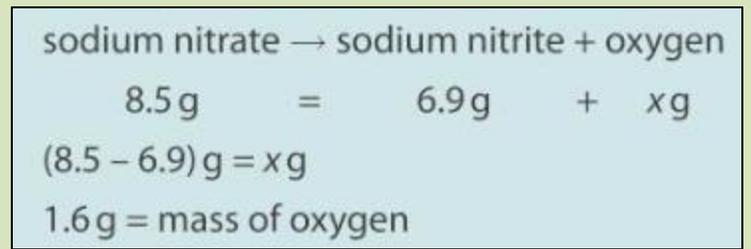
E.g.  
There are 98g of  $\text{H}_2\text{SO}_4$  in 1 mole of molecules.  
41g of  $\text{H}_2\text{SO}_4$  has  $(41/98)$  0.4 moles of  $\text{H}_2\text{SO}_4$  molecules.

Chemical equations need to be balanced so we can compare the amounts (number of moles) of each substance used or created.

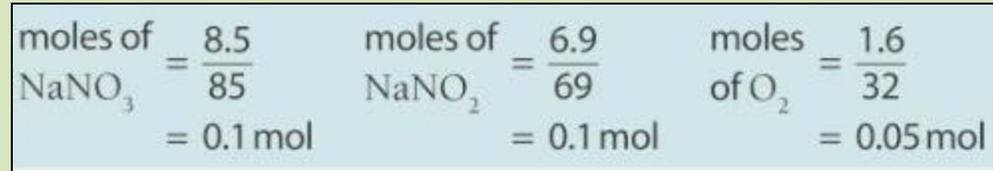
Balanced symbol equations are used to calculate the mass of reactants and the mass of products in reactions.



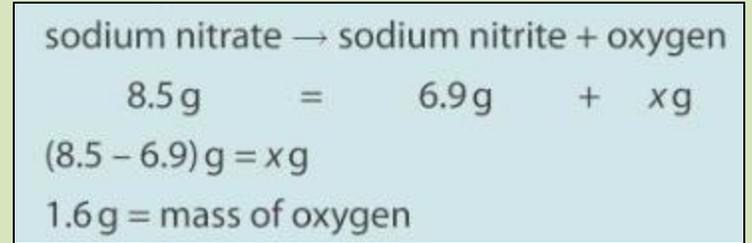
You can also work of the balanced symbol equation from the masses used in the reaction. E.g. ...



Calculate RFM and divide the mass by it to get number of moles. E.g. ...



8.5g = 6.9g + 1.6g If we divide all of them by 8.5 ...  
 1g = 0.8g + 0.2g If we multiplied all by 5 ...  
 5g = 4.1g + 0.9g



### Balancing Chemical Equations

hydrogen + oxygen → water

Word equations only show: reactants → products

A balanced symbol equation shows the number of molecules of reactants and products

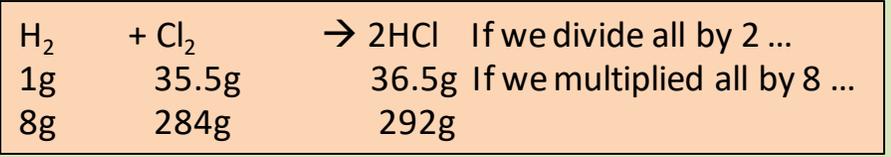
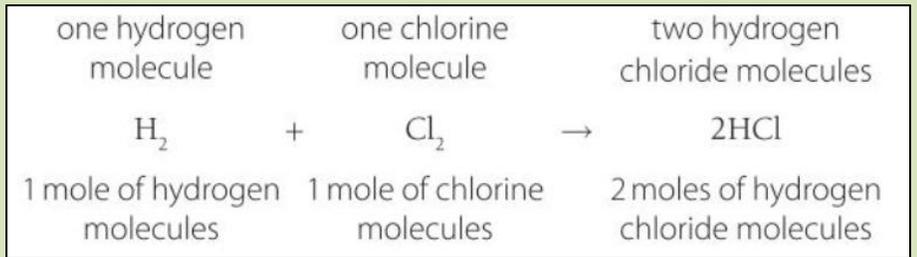
$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$

Formula of reactants and products cannot change - which is why we balance the equation!

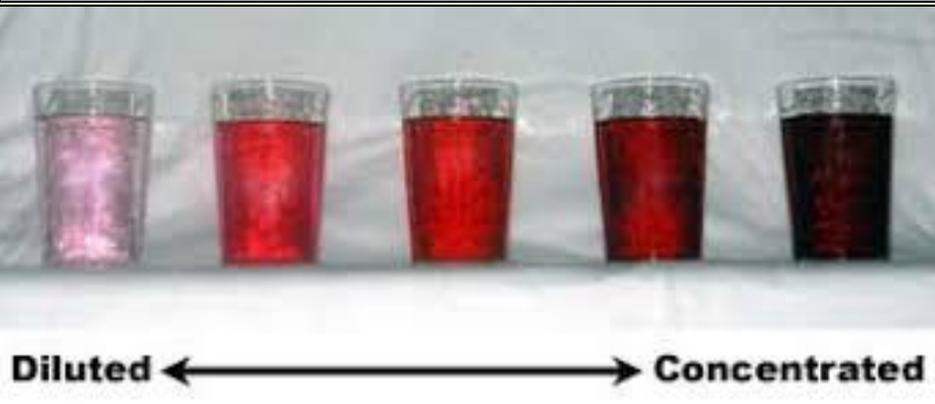
2 molecules of hydrogen, 1 molecule of oxygen, 2 molecules of water

There are 4 H atoms and 2 O atoms on each side of the balanced equation

You can also work of the balanced symbol equation from the masses used in the reaction.



Concentration is a measure of how many particles there are.  
High concentration means lots of particles,  
low concentration means less.



Few drink particles.  
Lots of water particles.  
Low drink concentration.  
High water concentration

Lots of drink particles.  
Few water particles.  
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Low water concentration

$$\text{Concentration} = \frac{\text{mass (in g)}}{\text{volume (in dm}^3\text{)}}$$

$$\text{Concentration} = \frac{\text{mass (in g)}}{\text{volume (in cm}^3\text{)}} \times 1000$$

$$\text{Mass} = \text{concentration} \times \text{volume}$$

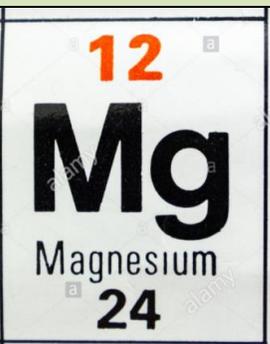
A more concentrated solution has more solute than a less concentrated solution.

Concentration is measured in  $\text{g/dm}^3$

The reactant that gets used up first is the limiting factor as it stops the reaction.  
The other reactants, as there are more than are needed, are in excess.  
The limiting reactant determines how much product can be made.  
If a solid is in excess it can be filtered off at the end of the reaction.  
If a solid is the limiting factor, when you cannot see it, the reaction is finished.

# KS4 Chemistry C4 Chemical Calculations (Separate Foundation)

Relative atomic mass, Ar.  
This is the large number on the Periodic Table.



Relative formula mass is all the atomic masses in a compound added up.  
E.g. CO<sub>2</sub> is 12+16+16 = 44

$$\text{percentage atom economy} = \frac{\text{relative formula mass of the desired product from equation}}{\text{sum of the relative formula masses of the reactants from equation}} \times 100\%$$

Further Reading:

<https://www.youtube.com/watch?v=q49NwlrjaFw&safe=active>

<https://www.youtube.com/watch?v=eAibVvhmsK0&safe=active>

<https://www.youtube.com/watch?v=jGnG0l3w63g&safe=active>

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Lots of water particles.  
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$$\begin{aligned} \text{\% atom economy} &= \frac{\text{relative formula mass of the desired product from equation}}{\text{sum of the relative formula masses of the reactants from equation}} \times 100\% \\ &= \frac{M_r(2\text{PbO})}{[M_r(2\text{PbS}) + M_r(3\text{O}_2)]} \times 100\% \\ &= \frac{2 \times (207 + 16)}{[2 \times (207 + 32)] + [3 \times (16 \times 2)]} \times 100\% \\ &= \frac{446}{(478 + 96)} \times 100\% \\ &= 77.7\% \end{aligned}$$

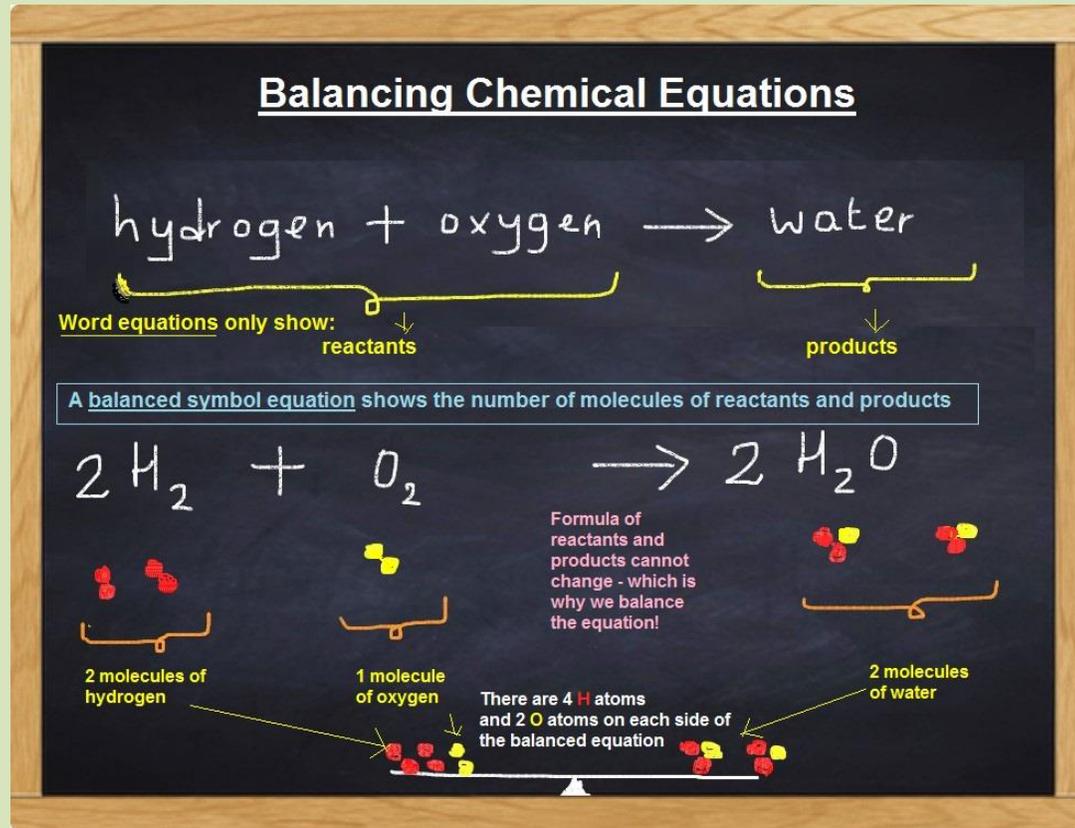
The yield of a chemical reaction describes how much of the desired product was made.  
The percentage yield compares that amount to the total amount of product that was calculated to be the maximum possible, and expresses it as a %.

The yield is affected by ...  
How much product is left in the beaker,  
Reactions not fully completing,  
Impurities making other products,  
Product left in other equipment and on filter papers.

$$\begin{aligned} \text{Percentage yield} &= \frac{\text{actual mass of product made}}{\text{calculated theoretical maximum amount possible}} \times 100 \\ \text{This can be simplified to } \text{Percentage yield} &= \frac{\text{actual mass}}{\text{theoretical mass}} \times 100 \end{aligned}$$

E.g. If it was calculated that 56 tonnes of calcium oxide was to be made and only 45 tonnes were made  
Percentage yield = (45/56) x 100 = 80%

Balanced equations are used to compare the formula mass of the desired product, and compare it to the formula mass of all the products made, including waste products.



You can measure the exact amount of acid needed to neutralise an alkali using titration. The end point is the neutral colour shown by the indicator e.g. universal indicator goes green.

The exact amount of alkali can be measured with a pipette (fixed volume) and the exact amount of acid can be measured with a burette.

Firstly do a rough run to get an idea of how much acid is needed. Then repeat until 3 concordant results have been obtained. Each result is called a titre. Concordant results are within  $0.1\text{cm}^3$ .

## Titration required practical

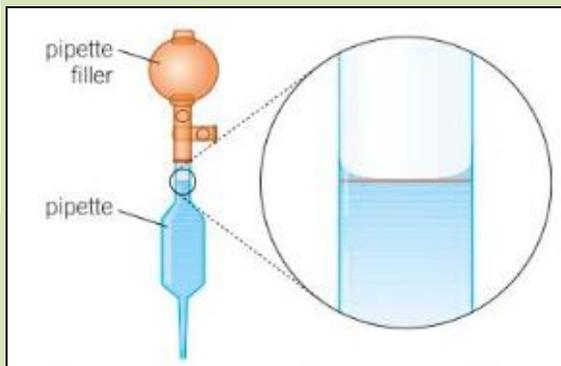
Acid

Clamp stand

Burette

Titration flask

Alkali and indicator



To calculate the concentration of a solution in  $\text{mol}/\text{dm}^3$ , given the mass of solute in a certain volume:

- Calculate the mass (in grams) of solute in  $1\text{cm}^3$  of solution.
- Calculate the mass (in grams) of solute in  $1000\text{cm}^3$  of solution.
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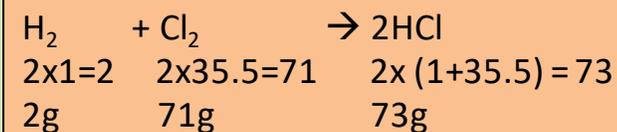
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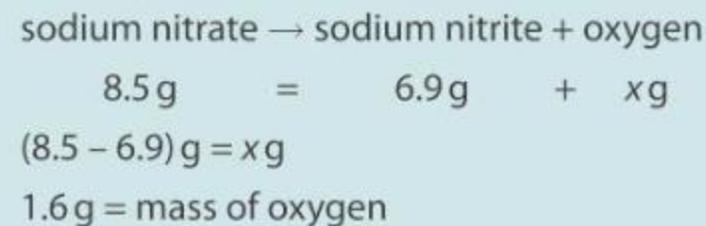
Chemical equations need to be balanced so we can compare the amounts (number of moles) of each substance used or created.

Balanced symbol equations are used to calculate the mass of reactants and the mass of products in reactions.

You can also work out the balanced symbol equation from the masses used in the reaction.



You can also work of the balanced symbol equation from the masses used in the reaction. E.g. ...



Calculate RFM and divide the mass by it to get number of moles. E.g. ...

$$\begin{array}{l} \text{moles of NaNO}_3 = \frac{8.5}{85} = 0.1 \text{ mol} \\ \text{moles of NaNO}_2 = \frac{6.9}{69} = 0.1 \text{ mol} \\ \text{moles of O}_2 = \frac{1.6}{32} = 0.05 \text{ mol} \end{array}$$

### Balancing Chemical Equations

hydrogen + oxygen → water

Word equations only show: reactants → products

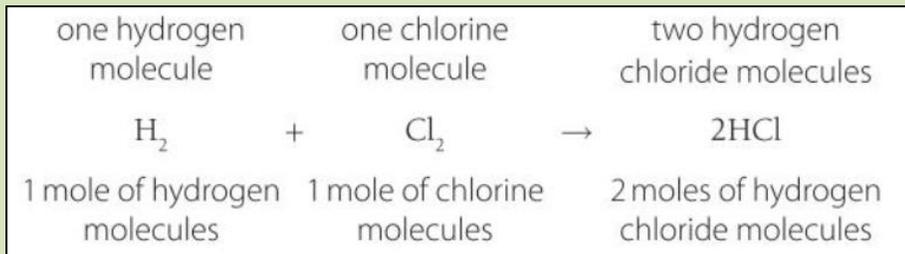
A balanced symbol equation shows the number of molecules of reactants and products

$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$

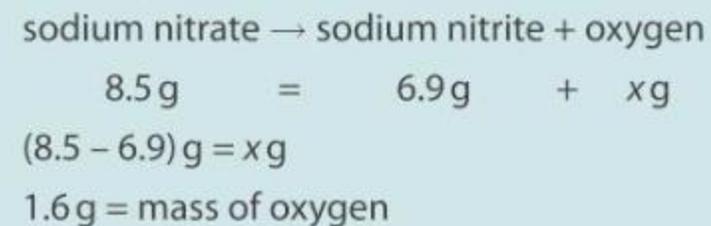
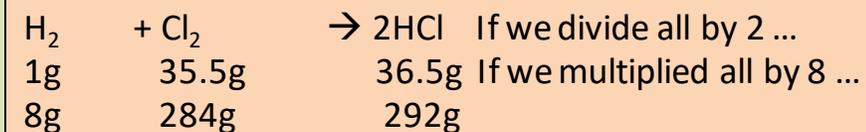
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There are 4 H atoms and 2 O atoms on each side of the balanced equation

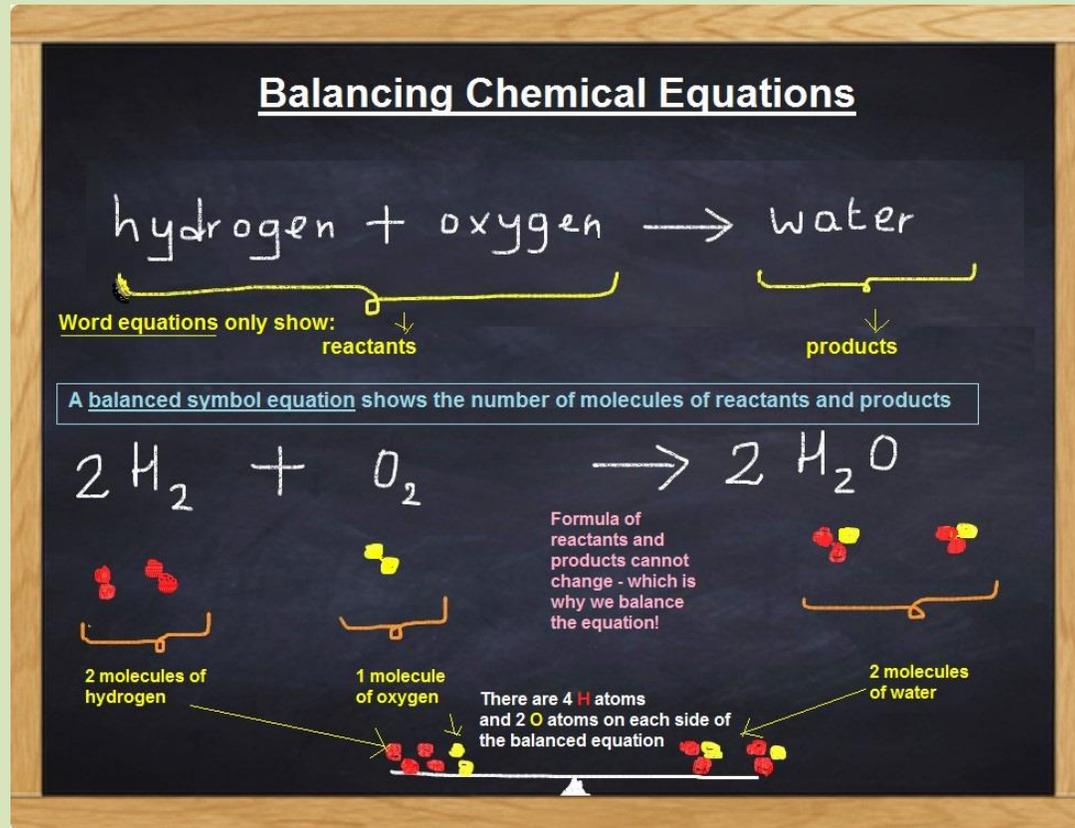
2 molecules of hydrogen, 1 molecule of oxygen, 2 molecules of water



$$\begin{array}{l} 8.5\text{g} = 6.9\text{g} + 1.6\text{g} \text{ If we divide all of them by } 8.5 \dots \\ 1\text{g} = 0.8\text{g} + 0.2\text{g} \text{ If we multiplied all by } 5 \dots \\ 5\text{g} = 4.1\text{g} + 0.9\text{g} \end{array}$$

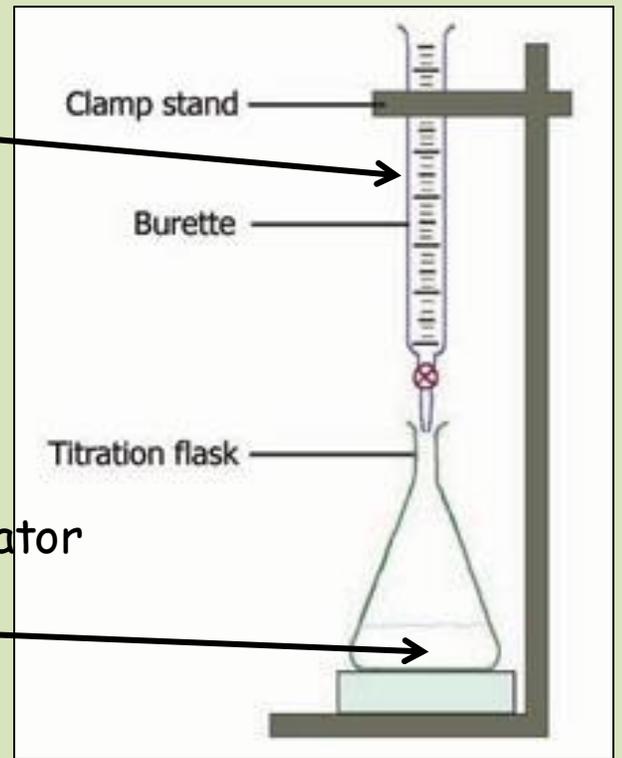


Balanced equations are used to compare the formula mass of the desired product, and compare it to the formula mass of all the products made, including waste products.



Titration required practical

Acid



Alkali and indicator



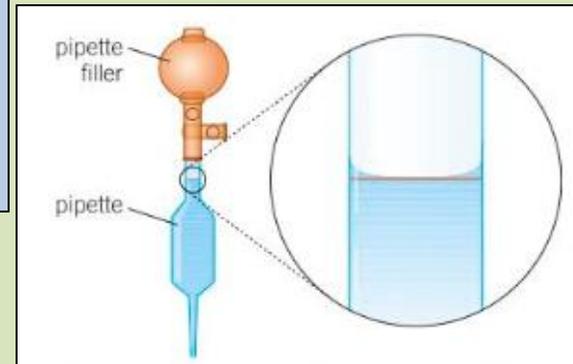
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- Calculate the mass (in grams) of solute in 1 cm<sup>3</sup> of solution.
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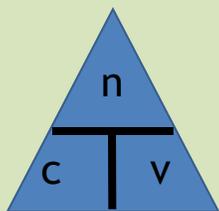
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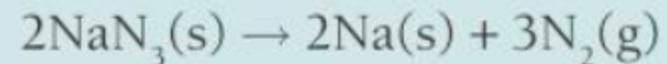
# Titration calculations



Number of moles = n, volume = v, concentration c

$$\text{Number of moles} = \text{volume}(\text{dm}^3) \times \text{concentration} (\text{mol}/\text{dm}^3)$$

$$\text{concentration} (\text{mol}/\text{dm}^3) = \frac{\text{Number of moles}}{\text{volume}(\text{dm}^3)}$$



A certain volume of gas always contains the same number of molecules of gas.  
1 mole of ANY gas is 24 dm<sup>3</sup> (24 000 cm<sup>3</sup>).  
This fact and a balanced symbol equation are used to calculate volumes of gases.

This applies at room temperature and pressure (also written as rtp), 20degC and 1atm.

STEP 1: You will need to write a balanced symbol equation.  
STEP 2: Determine the 'mole ratio' between acid and alkali using the balanced equation e.g. "The balanced equation tells us that 1 mole of acid reacts with 1 moles of alkali".  
STEP 3: Split the page into 2 sections and write in all the values you know:

<u>Acid</u>	<u>Alkali</u>
n = C x V = Calculate	n = ? Step 4
C = Given	C = ? Step 5
V = Average titre in dm <sup>3</sup>	V = Given in dm <sup>3</sup>

STEP 4: Use the 'mole ratio' to find the value for n of the unknown solution.  
STEP 5: Calculate alkali concentration and Fill in the results for the alkali.

If an air bag is inflated by 70.0g of nitrogen, N<sub>2</sub>, what volume is that?  
Number of moles = mass/formula mass = 70.0/28 = 2.5  
Volume = number of moles x 24 = 2.5 x 24 = 60 dm<sup>3</sup>

Na =23, N=14  
Formula mass of NaN<sub>3</sub> = 23 + (14 x 3) = 65

STEP 1: 2NaOH(aq) + H<sub>2</sub>SO<sub>4</sub>(aq) → Na<sub>2</sub>SO<sub>4</sub>(aq) + 2H<sub>2</sub>O(l)  
STEP 2: "The balanced equation tells us that 1 mole of acid reacts with 2 moles of alkali".  
STEP 3: Split the page into 2 sections and write in all the values you know:

<u>Acid</u>	<u>Alkali</u>
n = C x V = (2x0.0123) = 0.0246	n = ? = 0.0492
C = 2M	C = ? = 0.0492/0.0250=1.968
V = (12.3cm <sup>3</sup> /1000)= 0.0123	V = (25.0cm <sup>3</sup> /1000)= 0.0250

STEP 4: Use the 'mole ratio' to find the value for n of the unknown solution, in this case 0.0246 moles of acid reacts with 2x 0.246 moles of alkali  
STEP 5: Calculate alkali concentration and fill in the results for the alkali.

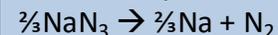
Lots of neutralisation reactions will be a 1:1 ratio so number of moles and acid and alkali will be the same. In this case the number of moles of sulphuric acid is half that of sodium hydroxide.

If only 48 dm<sup>3</sup> were needed and the following reaction made the nitrogen...

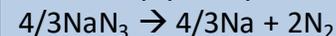
Number of moles nitrogen = volume/24 = 48/24 = 2 moles.

But the equation uses 3 moles, so ..

Divide all by 3 ...



and multiply all by 2 ...



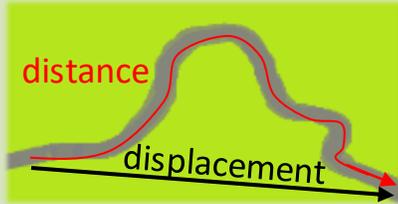
This means that mass of NaN<sub>3</sub> needed is ...

Mass = moles x formula mass = 4/3 x 65 = 86.7g

$$\text{number of moles of gas} = \frac{\text{volume of gas (dm}^3\text{)}}{24 \text{ dm}^3}$$



## KS4 Physics: P8 Forces in balance



**Distance** is a scalar quantity, and is a measure of the total distance travelled e.g. along this path.

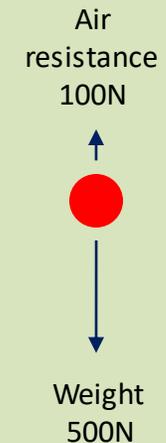
**Displacement** is a distance in a particular direction and is a vector quantity

<b>scalar</b>	A physical quantity, such as mass, speed or energy, that has magnitude only (unlike a vector which has magnitude and direction)
<b>vector</b>	A vector is a physical quantity, such as displacement or velocity, that has a magnitude and a direction (unlike a scalar which has magnitude only)
<b>contact force</b>	A force that only acts on an object when in contact with it
<b>non-contact force</b>	A force that can act on an object without making contact, for example the force due to gravity (weight), electrostatic forces or magnetic forces
<b>resultant force</b>	A single force that has the same effect as all the forces acting on the object
<b>magnitude</b>	the size or amount of a physical quantity

### Calculating resultant force

To work out the resultant force, if two forces are acting in opposite directions, subtract them from each other. If they act in the same direction add them together.

The resultant force on the red ball is **400N downwards** ( $500N - 100N$ )



The resultant force on the red car below is 50N ←  
 (← 100N + 150N = 250N ←)    250N - 200N = **50N ←**



## Newton's Laws

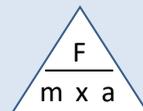
### Newton's first law of motion

If the resultant force on an object is zero, the object stays at rest if it is stationary, or it keeps moving with the same speed in the same direction

### Newton's second law of motion

The acceleration of an object depends on the force applied to the object and mass of the object.

(Force (N) = Mass (Kg) x acceleration ( $m/s^2$ ))

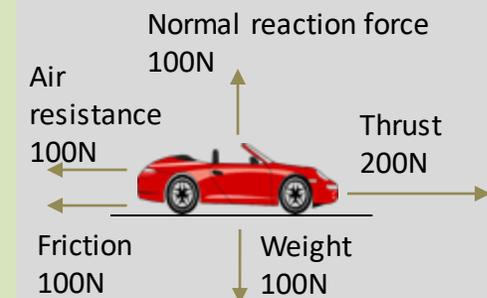


### Newton's third law of motion

When two objects interact with each other, they exert equal and opposite forces on each other

## HT: Free body force diagrams

A free body force diagram is a diagram drawn with vector arrows to represent the size and direction of each force acting on an object. The **length** of the arrow represents the magnitude of a force. You always need a scale on your diagrams e.g. 100N = 1cm



Scale: 100N = 1cm



## KS4 Physics: P8 Forces in balance

### Rules for forces and motion

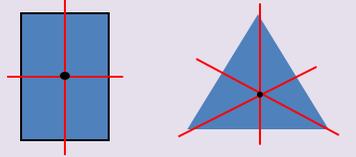
**Balanced forces =** The object is stationary or object moving at a constant speed  
**Unbalanced forces =** The object is changing speed or *changing direction* or *changing shape*  
 (Accelerating or decelerating)

<p>This car is accelerating as it has a larger thrust force than friction force (The resultant force is 100N →)</p>	<p>This car is travelling at a constant speed as it has an equal thrust force and friction force (The resultant force is zero)</p>	<p>This car is decelerating as it has a larger friction force than thrust force (The resultant force is 100N ←)</p>	<p>This car is stationary as there is no friction or thrust forces (the resultant force is zero)</p>

<b>Drag</b>	Drag forces oppose the motion of an object. They include air resistance and friction
<b>Normal reaction force</b>	Normal reaction force is the force exerted by a surface on an object, it acts at right angles to the surface

### Centre of mass

For a symmetrical flat shape, the centre of mass will always be along its line of symmetry.

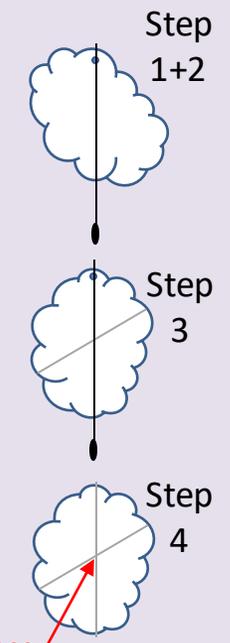


A swinging object will always come to rest with its centre of mass below the pivot.



This idea can be used to find the centre of mass of an irregular flat shape.

1. Suspend your irregular flat shape from a pin.
2. Use a plumb line (string with a mass on the end) to draw a vertical line on the shape.
3. Repeat putting the pin in a different location.
4. The point at which the two lines meet is the centre of mass.



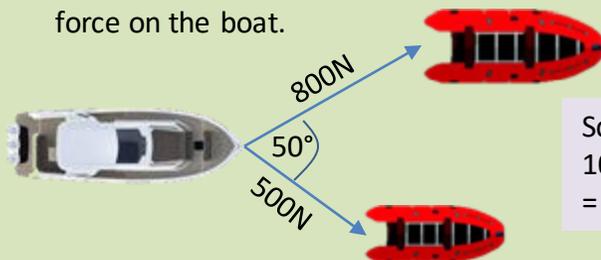
Centre of mass



# KS4 Physics: P8 Forces in balance

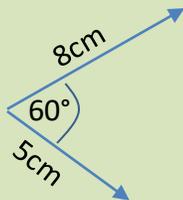
## HT: Parallelogram of forces: working out the resultant force from two forces at an angle

1. Look at the problem. Calculate the resultant force on the boat.

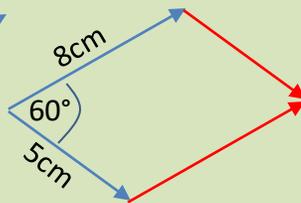


2. Draw a vector for each force at the correct angles

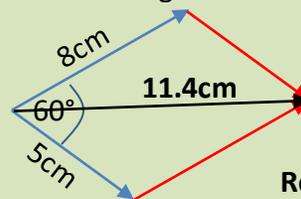
Scale:  
100N = 1cm



3. Turn into a parallelogram



4. Draw a line across the parallelogram and measure its length

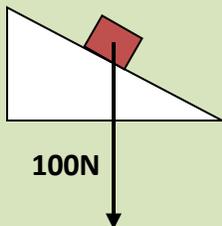


5. Use the scale to turn the length back into a force.

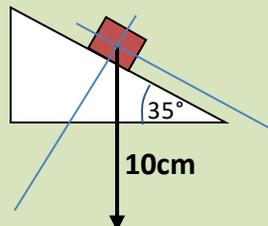
You may need to give the angle of the resultant force relative to one of the other force vectors.

**Resultant force = 1140N at an angle of 23° to the 800N force.**

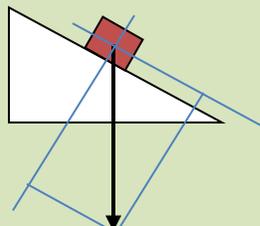
## HT: Resolving forces: working out the 2 components of a force



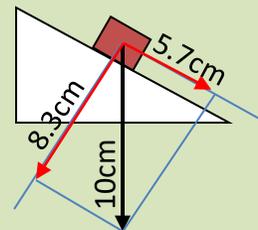
1. A 100N weight is stationary on a 35° slope. What is the friction force?



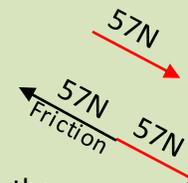
2. Draw the problem as a vector diagram. E.g. 1cm = 10N. Add faint lines perpendicular and parallel to the slope.



3. Draw faint lines at 90° connecting the lines to the vector arrow head.



4. Draw vector arrows to the correct length. The length of each arrow represents the components of the force.



5. The force down the slope is 57N, because the block is stationary the forces are balanced so the force down the slope = the friction force acting up the slope. So the friction force is 57N

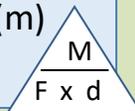


**Moments:** The moment is the turning effect of a force. You know from experience it is easier to undo a bolt with a long spanner than with your hands. The longer the spanner the greater the turning effect of the force.

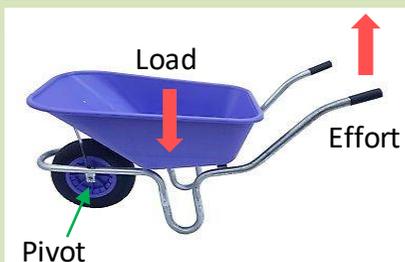
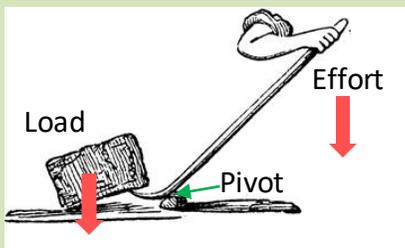
**Calculating moments**

**Moment (Nm) = Force (N) x perpendicular distance from pivot (m)**

$$M = F \times d$$

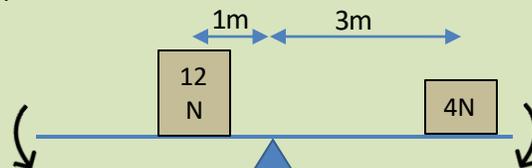


Levers are force multipliers because they can multiply the effect of the force. When looking at levers there is always a pivot, effort and load. Levers reduce the force required to lift or move objects



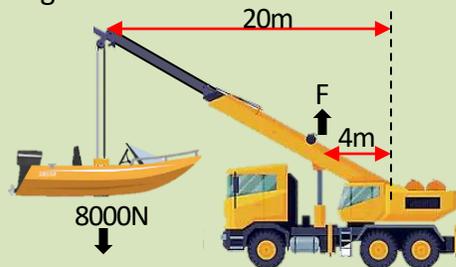
**Balancing moments – equilibrium**

If a lever is in balance the clockwise moment must equal the anticlockwise moment.



$$F_1 \times d_1 = F_2 \times d_2$$
$$12 \times 1 = 4 \times 3$$

**Example:** what force is required to hold the boat above the ground?



( Anticlockwise moment = Clockwise moment )

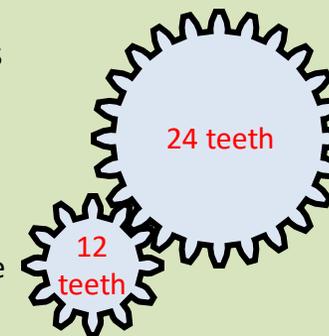
$$F_1 \times d_1 = F_2 \times d_2$$
$$8000 \times 20 = F \times 4$$
$$\frac{(8000 \times 20)}{4} = F = 40000N$$

**Gears**

Gears are force multipliers

A wheel with more teeth turns slower. Here, the bigger wheel turns at *half* the speed

But the *moment of the turning force* will be twice as big (since the radius is twice the size)

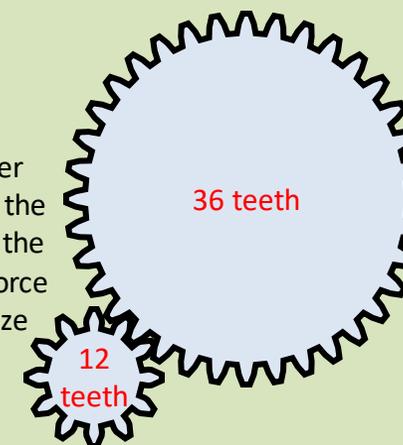


**Ratio of moments**

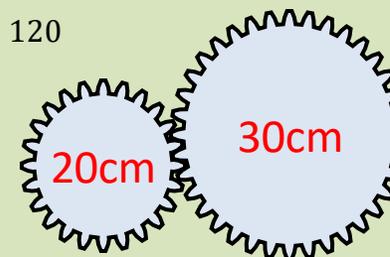
= ratio of teeth

= ratio of radii

In this example, the bigger wheel will turn a third of the speed of the smaller but the moment of the turning force will be three times the size of the smaller wheel



- The larger wheel has a radius of 30cm, and has a moment of 120Nm applied
- What's the moment about the 20cm wheel?
- (Remember ratio of moments = ratio of radii)
- $20 : 30 = M : 120$
- or,  $\frac{20}{30} = \frac{M}{120}$
- $\therefore \frac{20 \times 120}{30} = M$
- $\therefore M = 80Nm$



The same calculation can be performed if you were given the number of teeth instead of the gear radii



# KS4 Physics: P9 speed and motion

## Equations

$$\text{Acceleration} = \frac{\text{change in speed}}{\text{time}}$$

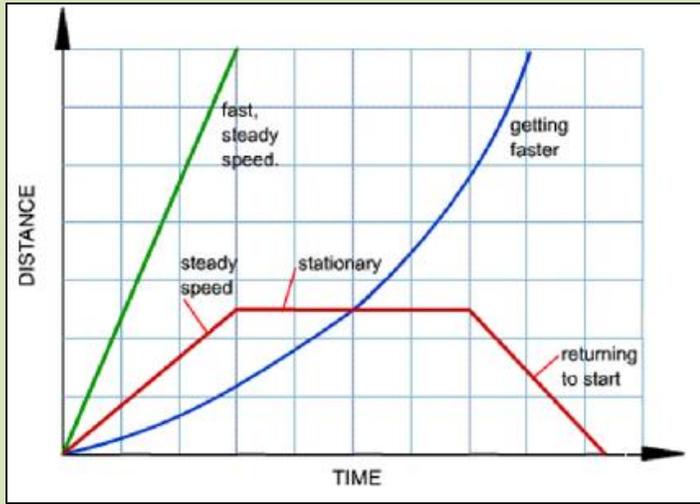
$$a = \frac{\Delta v}{t} \quad \text{or} \quad a = \frac{v - u}{t}$$

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

$$S = \frac{d}{t}$$

a = acceleration (m/s<sup>2</sup> or ms<sup>-2</sup>)  
 v = final velocity (m/s)  
 u = initial velocity (m/s)  
 t = time (s)  
 s = displacement (m)  
 Δ = change in

## Distance time graphs



Shape	description
—	stationary
/	Constant speed
\	Constant speed
⌒	Slowing down - deceleration
⌒	Speeding up - acceleration
gradient	The gradient at any point is the speed. You can measure the gradient at any point on a curve by taking a tangent.

$$\text{final velocity} - \text{initial velocity} = 2 \times \text{acceleration} \times \text{displacement}$$

$$v^2 - u^2 = 2as$$

## HT: Gradients and tangents

The gradient on a distance time graphs is the speed. The gradient on a velocity time graph is the acceleration.

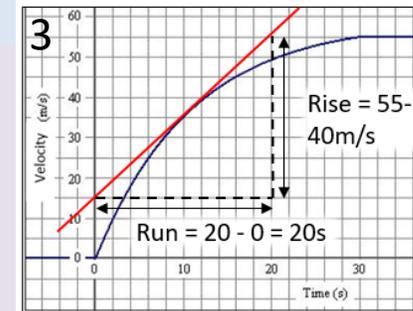
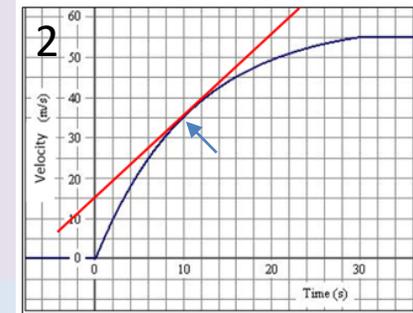
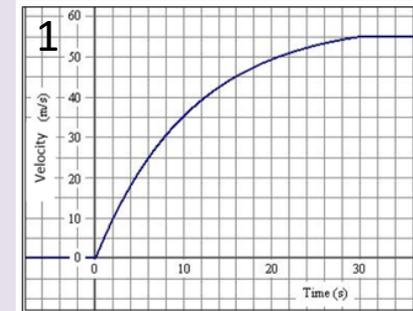
If the line is curved you can calculate the **gradient** at a certain point by taking a **tangent**. For example:  
 What is the acceleration of the object at 10s?

Take a tangent to the curve at the 10s point (a tangent is a line that runs parallel to that exact part of the curve, it should just touch the curve but not cut through any other part)

$$\text{gradient} = \frac{\text{change in } y}{\text{change in } x} \quad \text{or} \quad \text{gradient} = \frac{\text{rise}}{\text{run}}$$

Calculate the gradient of the tangent, draw vertical and horizontal lines to the tangent. Measure rise and run.

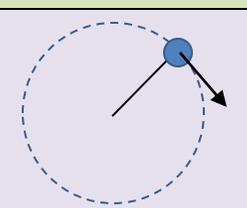
$$\text{gradient} = \frac{\text{rise}}{\text{run}} = \frac{40}{20} = 2\text{m/s}^2$$



**KS4 Physics: P9**  
**speed and motion**

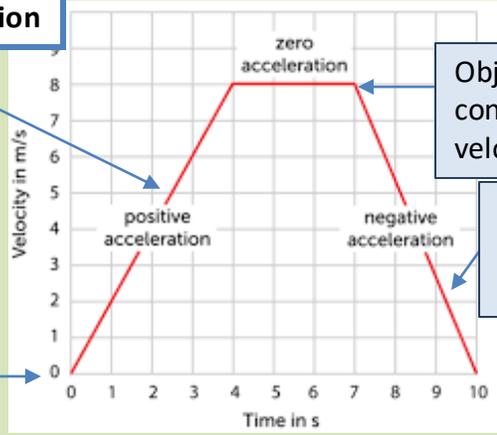
# Velocity time graphs

**HT: Circular motion** – an object moving in a circular motion can have a constant speed but its velocity is constantly changing as it changes direction (remember velocity is a vector quantity with a magnitude and direction)



constant acceleration / speeding up

Object stationary

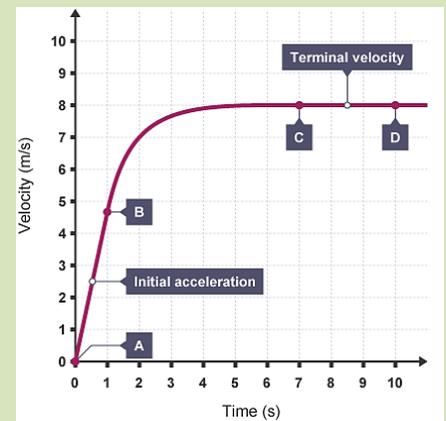
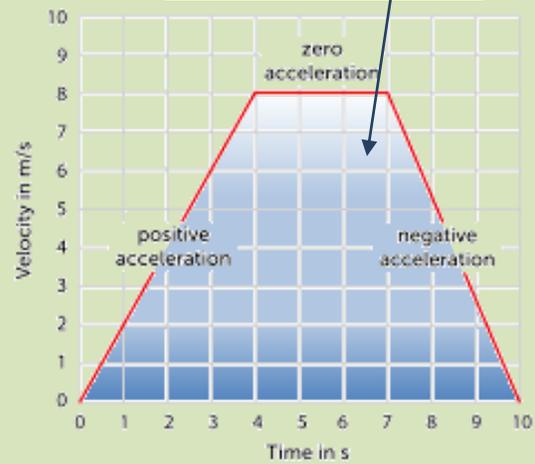


Object at a constant velocity

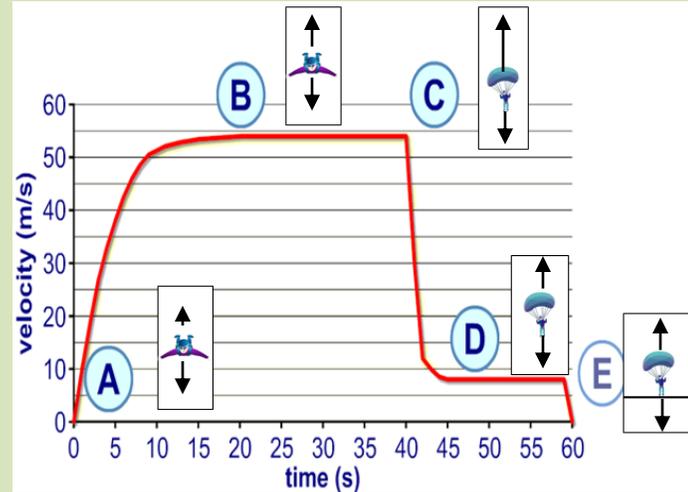
Constant deceleration / slowing down

Shape	description
	Constant speed
	acceleration
	deceleration
	Increasing deceleration
	Decreasing acceleration
gradient	Acceleration or deceleration

**HT: The area under a velocity time graph = displacement**



Falling objects start with an initial acceleration (A-B). Acceleration decreases due increasing air resistance (B-C). They reach a terminal velocity as weight and air resistance become balanced (C-D).



- A) The weight force is greater than the air resistance force therefore the sky diver is accelerating. The sky diver is accelerating, but at a decreasing rate due to the increasing air resistance.
- B) The weight force and the force of air resistance is the same (resultant force = zero) so the sky diver travels at a constant speed. The Sky diver reaches terminal velocity, travelling at a constant velocity.
- C) On opening the parachute the air resistance becomes greater than the weight force. The skydiver opens the parachute and the sky diver decelerates.
- D) As the skydiver slows, the air resistance decreases until it becomes the same as the weight force. The sky diver reaches a new terminal velocity (constant velocity)
- E) The skydiver reaches the ground. The weight force is balanced by the normal reaction force exerted by the ground. Their velocity drops to zero.



# KS4 Science – P10 Force and Motion

Newtons Second Law states that the acceleration of an object is:

- Proportional to the resultant force on the object
- Inversely proportional to the mass of the object

The formula  $F = ma$  gives the resultant force on an object

Inertia is the tendency of an object to stay at rest or continue moving at the same speed and direction.

Inertial mass =  $\frac{\text{Force}}{\text{Acceleration}}$

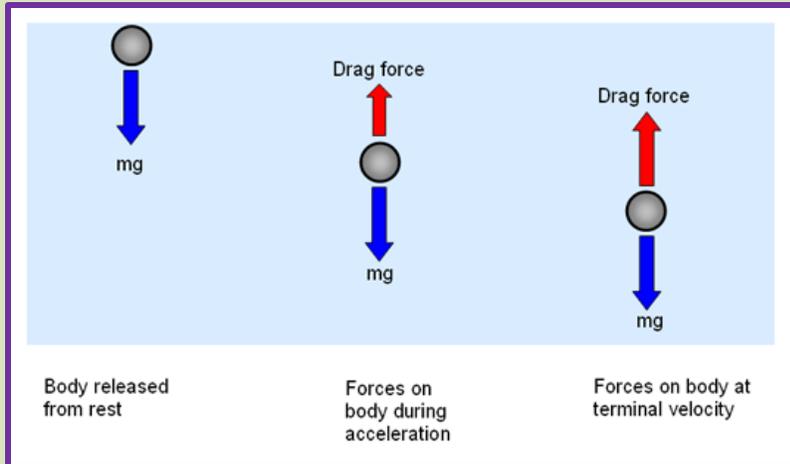
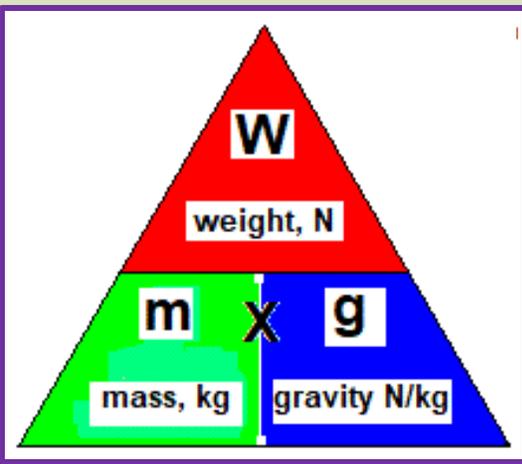
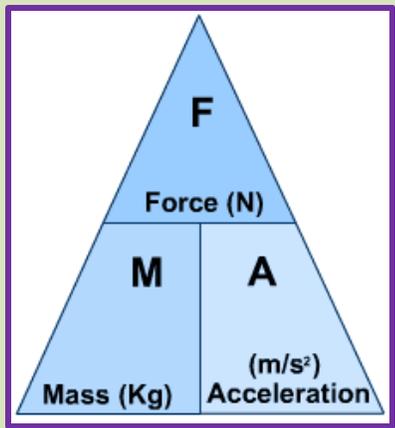
If you know the mass of an object in kg, you can calculate the force due to gravity that acts on it (i.e. its weight) using the equation:  
 Weight,  $W = \text{mass, } m \times \text{gravitational field strength, } g$

***The weight of an object is the force on it due to gravity. The mass of an object depends on the amount of matter in it.***

The acceleration due to gravity on Earth is  $10 \text{ m/s}^2$

Terminal Velocity is eventually reached by a falling object when the weight of the object (acting down) is equal to the frictional force acting on an object.

When an object is moving at terminal velocity, the resultant force on it is zero.

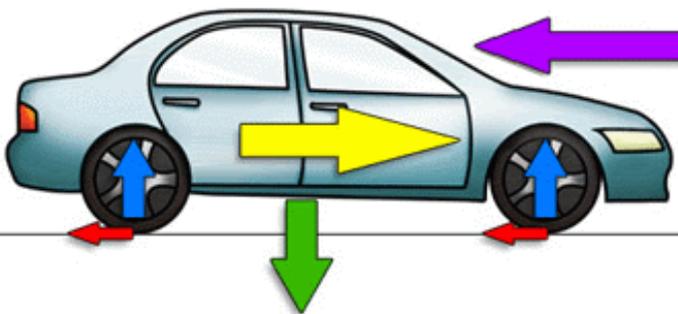


Key Word	Definition
Force (F)	A force can change the motion of an object Units are Newtons, N
Weight	The force of gravity pulling on an object. The units are Newtons, N
Mass	The quantity of matter in an object – a measure of the difficulty of changing the motion of an object. Units are kilograms, kg
Inertia	The tendency of an object to stay at rest or in uniform motion
Gravitational Field Strength (g)	The force of gravity on an object of mass 1kg. Units are N/kg
Terminal Velocity	The velocity reached by an object when the drag force on it is equal and opposite to the force making it move
Stopping distance	The distance travelled by a vehicle in the time it takes the driver to think and brake
Thinking distance	The distance travelled by the vehicle in the time it takes the driver to react
Braking distance	The distance travelled by the a vehicle during the time it takes for the brakes to act
Momentum	This equals mass (in kg) x Velocity (in m/s)
Elastic	Elastic materials regain their shape after being squashed or stretched
Extension	The increase in the length of a spring (or strip of material) ( from its original material
Directly proportional	A graph will show this if the line of best fit is a straight line through the origin

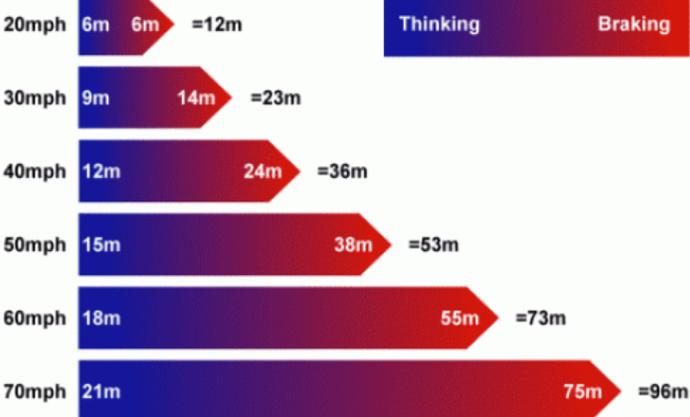
# KS4 Science – P10 Force and Motion



Friction and air resistance oppose the driving force of a vehicle



- █ weight
- █ driving force
- █ reaction force
- █ friction
- █ air resistance



Stopping distance = thinking distance + braking distance

The stopping distance depends on the thinking distance and the braking distance.  
 Braking distance is increased by high speed, poor weather and poor vehicle maintenance  
 Thinking distance is increased by poor reaction time (due to tiredness, drug, alcohol or using a mobile phone) and high speed

Deceleration can be calculated using  $v^2 = us + 2as$

Where s = distance travelled

U = initial speed

V = final speed

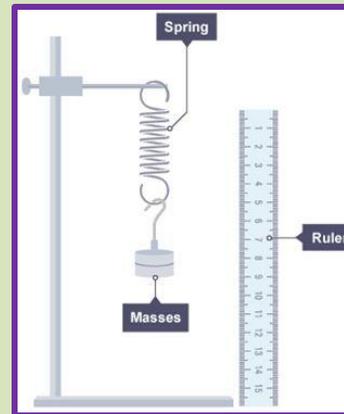
When vehicles collide, the force of the impact depends on the mass, change of velocity, and the length of the impact time.  
 The longer the impact time, the more the impact force is reduced.

$$\text{Impact Force, } F = \frac{\text{mass, } m \text{ (kg)} \times \text{change in velocity, } \Delta v \left(\frac{m}{s}\right)}{\text{time taken, } t \text{ (s)}}$$

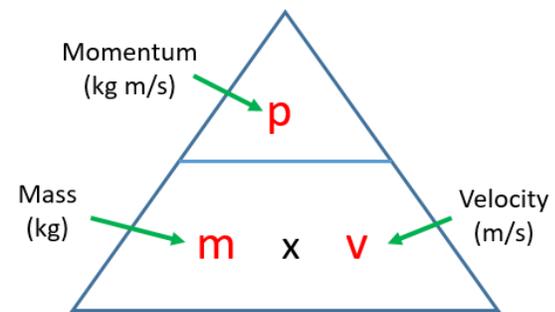
The time of impact is important; to create a large force the time of impact should be as short as possible.

Impact forces are reduced by cycle helmets and cushioned surfaces which increase impact time. Seat belts and side impact bars also increase impact time.

However if you stretch the object too far you will reach its ELASTIC limit, and the object won't return to its original shape. You will have reached the LIMIT OF PROPORTIONALITY.



## Momentum



$$\text{Momentum (kg m/s)} = \text{Mass (kg)} \times \text{Velocity (m/s)}$$

Because momentum = mass x velocity it has both SIZE AND DIRECTION

The momentum of a moving object makes it harder to stop that body from moving or change its direction

A closed system is a system where the total momentum before an event (e.g. collision) is the same as the total momentum after the event. This is called **conservation of momentum**.

The idea of conservation of momentum can be used to find the velocity of an object after a collision with another object. If no other external forces apply you can use this equation:  
 $m_A v_A = m_B v_B = 0$

Hooke's Law states that if you stretch an elastic object (e.g. spring), the extension is proportional to the force applied. Force applied, F = spring constant, k x extension, e (newtons, N) (newtons per metre, N/m) (metres, m)

Other Useful Links  
<https://www.bbc.co.uk/bitesize/topics/zgtrmw6f>  
<https://www.bbc.co.uk/bitesize/topics/zcw22nb>  
<https://www.youtube.com/watch?v=W3VbonFNcw>



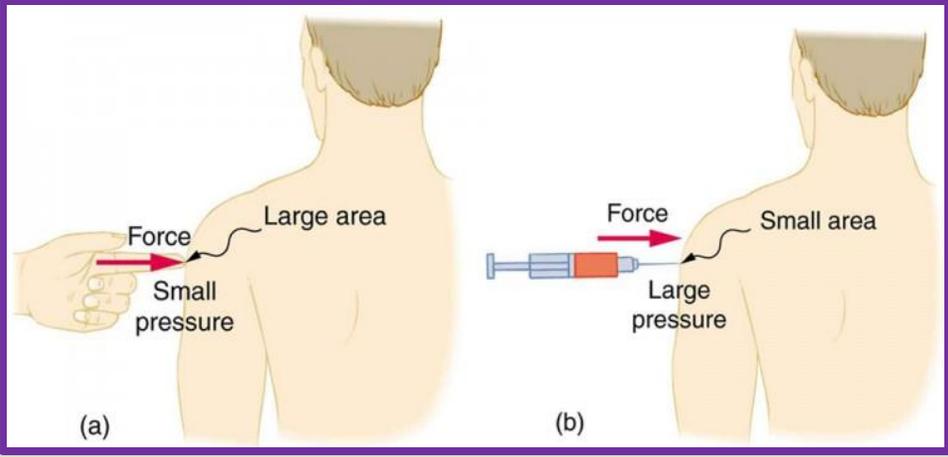
# KS4 Science – P11 Force and Pressure

Pressure = Force / Area

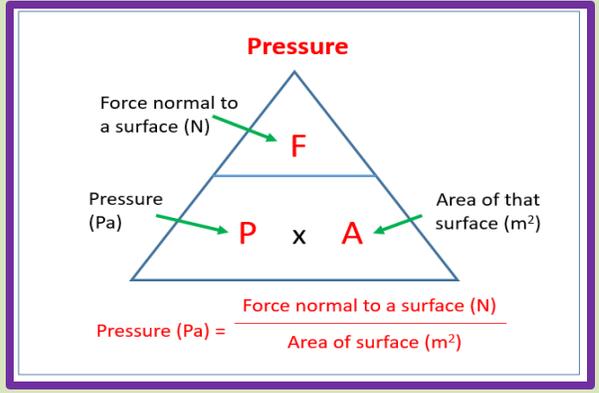
For example if a vehicle of weight 12,000 N is fitted with tyres that have an area of 3 m<sup>2</sup> in contact with the ground, the pressure of the vehicle on the ground

$$= \text{Force} / \text{Area}$$

$$= 12,000 / 3$$

$$= 4000 \text{ N/m}^2 \text{ or Pa}$$


A sharp object like a knife or needle exerts more pressure than a blunt object because the force is concentrated over a much smaller area



You need to be able to REARRANGE and USE the formula  $F = p \times A$  i.e.  $p = F/A$

You must also be able to calculate cross-sectional areas

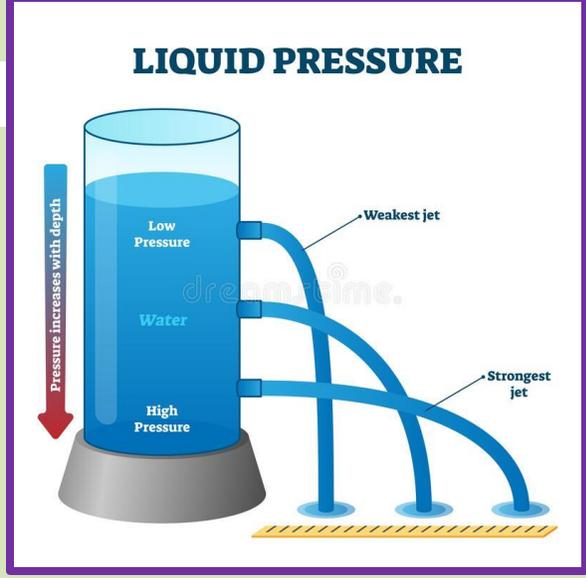
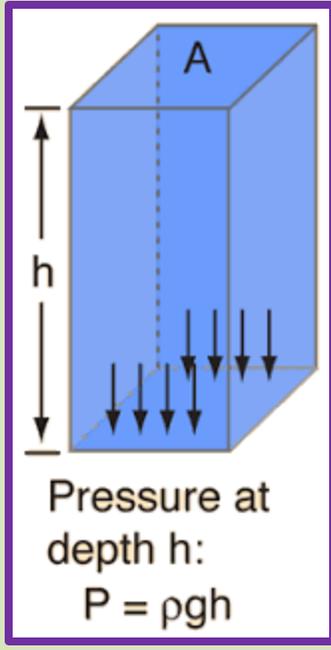
The pressure of a liquid increases with the depth of the liquid.

Gravitational Field Strength

Pressure

$$P = h \times \rho \times g$$

Depth of water      Density of water

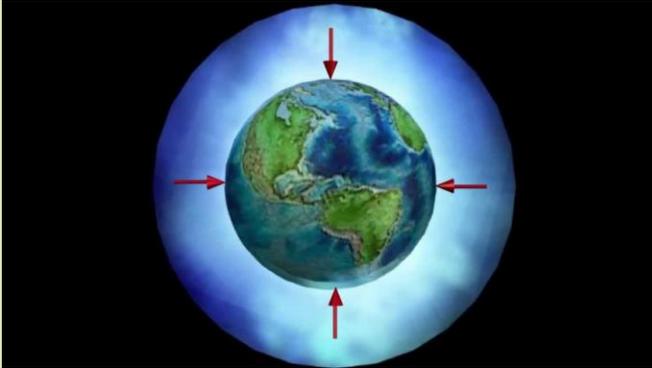


Pressure increases with depth due to the increased number of water particles above

Key Word	Definition
Pressure (p)	The Force per unit area. Units are pascals, Pa
Force (F)	A force can change the motion of an object Units are Newtons, N
Weight	The force of gravity pulling on an object. The units are Newtons, N
Density (ρ)	The mass per unit volumes of a substance. Units are kg/m <sup>3</sup> The symbol for density is ρ, rho
Atmospheric Pressure	The pressure that Earth's atmosphere exerts on the surface of the Earth at Sea Level
Altitude	the height of an object or point in relation to sea level or ground level
Gravitational Field Strength (g)	The force of gravity on an object of mass 1kg. Units are N/kg
Upthrust	The upwards force that acts on a body partly or completely submerged in a fluid
Immersed	Put into or underneath water
Displace	Move an object out of its normal position or place

The greater the density of a liquid, the greater the pressure in a liquid. This is because particles of denser fluids are closer together, so there are more collisions of particles in a given area.

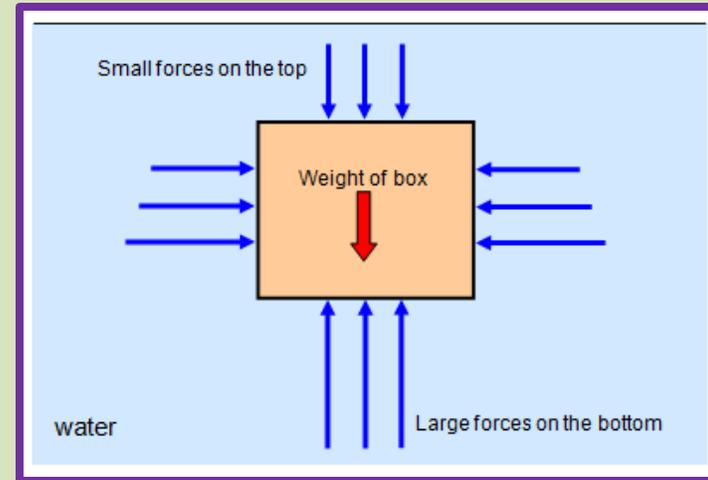
Air molecules create atmospheric pressure by colliding with surfaces and creating pressure on them



The pressure in Earth's atmosphere depends on altitude (height above sea level) and air density

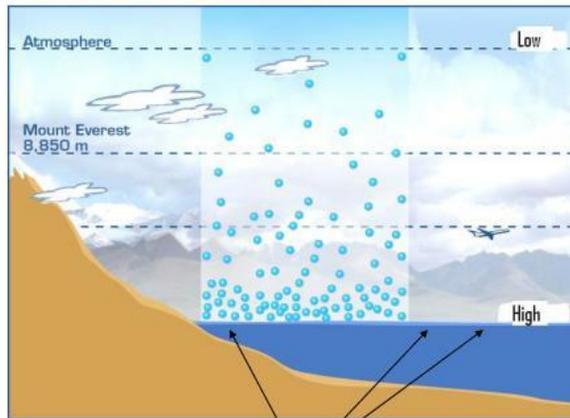
$$P = h \times \rho \times g$$

Pressure, P is in Pascals (Pa)  
 Height, h is in meters (m)  
 Density,  $\rho$  is in kilograms per meter cubed ( $\text{kg/m}^3$ )  
 Gravitational field strength, g is in Newtons per kilogram (N/kg)



As you go higher in the Earth's atmosphere there are less particles of air, so the atmospheric pressure decreases.

## Atmospheric Pressure



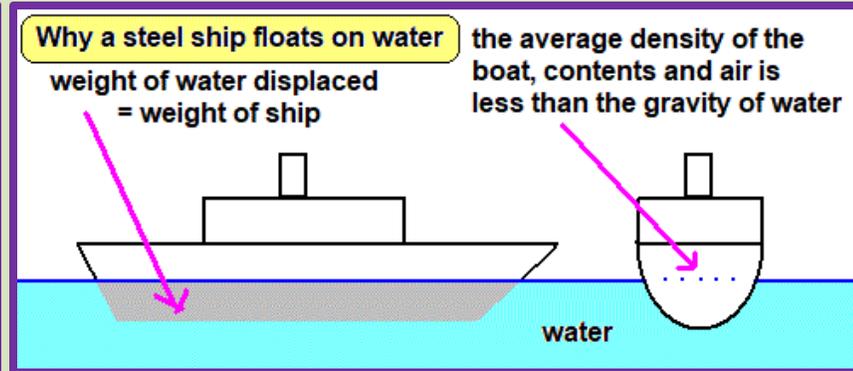
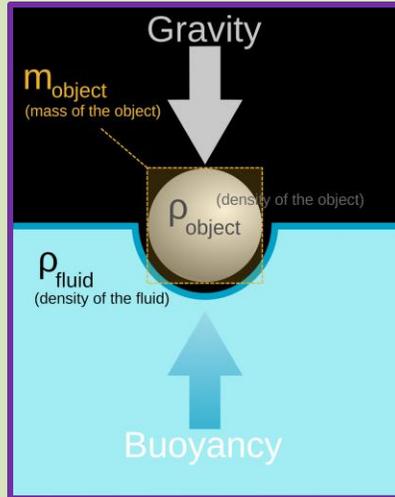
Higher altitudes have a lower pressure.

*There is less air above you.*

Lower altitudes have a higher pressure.

*There is more air above you.*

Sea level = 1 ATM of pressure (14.7 lbs/in<sup>2</sup>)



Upthrust on an object in a fluid is an upward force on the object. Upthrust provides buoyancy.

Upthrust is caused by the pressure of the fluid.

The pressure in a fluid depends on the density of the fluid and the depth of the fluid at that point.

Objects in water displace some of the water.

The more the object is lowered into the water, the bigger the volume of water displaced and the bigger the upthrust.

When the object is fully immersed the volume of water displaced is equal to the volume of the object.

An object sinks if its weight is greater than the upthrust on it when it is fully immersed.

- Other Useful Links
- <https://www.bbc.co.uk/bitesize/guides/zrcm39/revision/1>
  - <https://www.bbc.co.uk/bitesize/guides/z9ykmsg/revision/1>
  - <https://quizlet.com/gb/410612406/aga-gcs-e-physics-p11-force-and-pressure-flash-cards/>
  - <https://www.youtube.com/watch?v=P08-lYPy1hi>

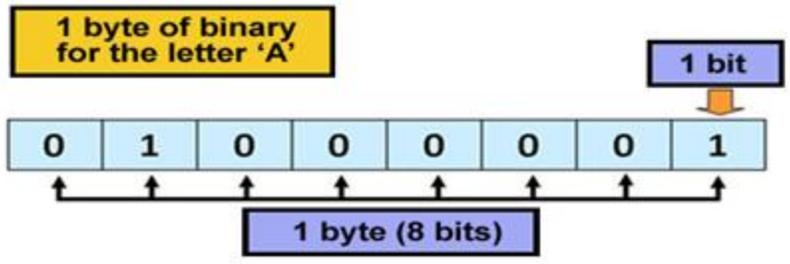
# Data Representation

## KS4 CT – Term 1



- Bit = Binary DigIT = 1 or 0 (True or False)
- Byte = x8 bits = 1B
- Nibble = x4 bits
- Kilobyte = x1000 bytes = 1KB
- Megabyte = x1000 KB = 1MB
- Gigabyte = x1000 MB = 1GB
- Terabyte = x1000 GB = 1TB

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



$$2 + 4 + 16 = 22$$

**Counting in binary**

0	0000	8	1000
1	0001	9	1001
2	0010	10	1010
3	0011	11	1011
4	0100	12	1100
5	0101	13	1101
6	0110	14	1110
7	0111	15	1111

Type	Lossy compression	Lossless compression
Formats	JPG, MP3, WMV, MPG	TIF, PDF, GIF, PNG, MOV, ZIP
Examples		
Advantages	Smallest file sizes, least transmission time, reduces internet traffic and collisions	Original quality is preserved / no information or data is lost
Disadvantages	Detail is permanently lost	Less significant reduction in file size
Example uses	Music streaming, online images and video, image libraries on devices or in the cloud	Text documents, electronic books, high resolution print documents

Compression software uses algorithms to remove repeated or unnecessary data to try to reduce the file size.

Run Length Encoding (RLE) stores patterns

For example:

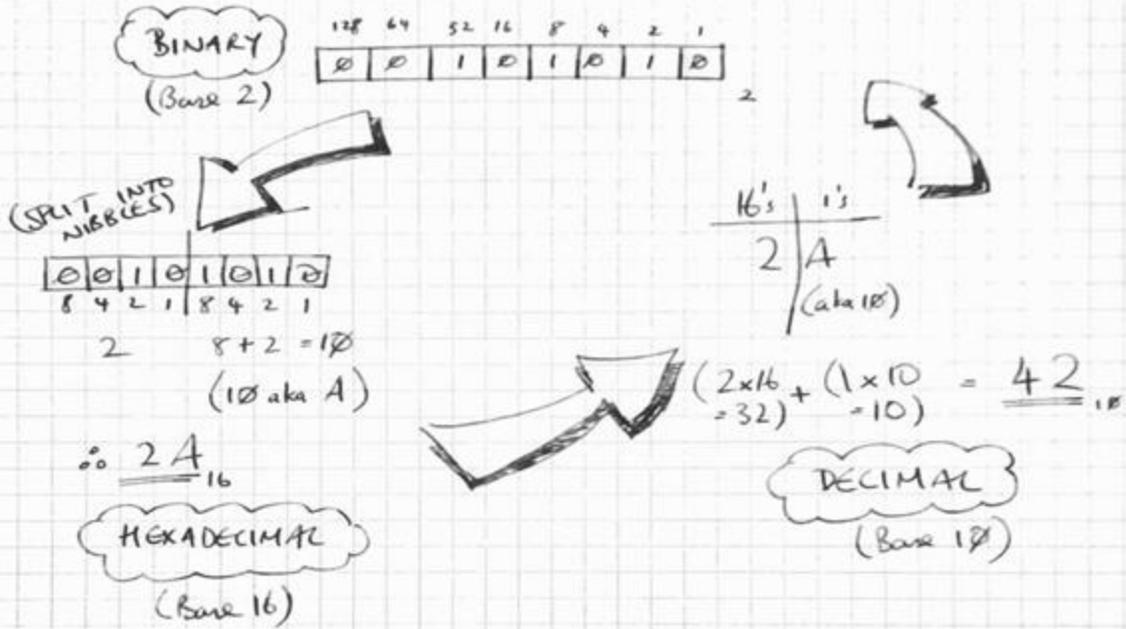
010 010 010 010

Can be stored as:

010 11

# Representing numbers digitally

## The Holy Trinity



### Binary shifts:

- Moves all bits either to the left or right
- A shift left multiplies number by 2 (overflow)
- A shift right divides number by 2

### Representing characters:

- ASCII (7bit)
- Extended ASCII (8bit)
- Unicode (16bit)

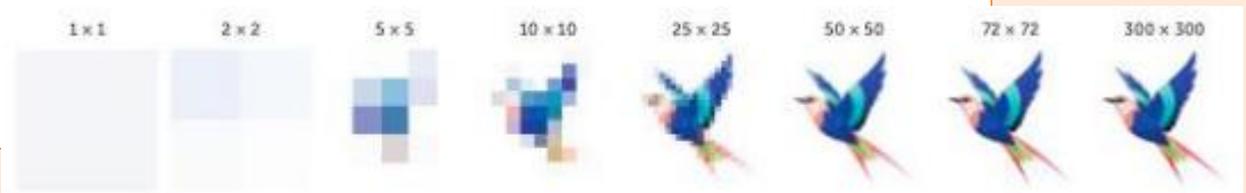
# Representing images digitally

## BITMAPS

- Image made up of 'squares of colour' (aka pixel)
- Image becomes blurry (pixelated) when zoomed in
- Colour depth = number of possible colours per pixel
- Resolution = number of pixels in the image
- File size = Number of pixels x colour depth

## VECTOR

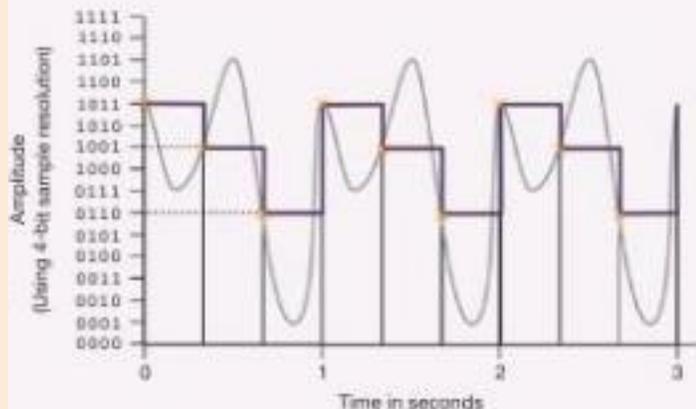
- Image described in terms of polygons
- Image needs to be created each time it is viewed (rendered) by the viewing program. It follows the instructions and draws each polygon in turn.
- File size is proportionate to the complexity of the image (number of polygons)
- As the image is re-drawn each time it is viewed it does not get blurry when zoomed
- Used in computer games!



# Representing sound digitally

## SAMPLING

- Sound recorded by taking a reading of the wave amplitude (sample) at regular intervals and stored as a number
- Frequency / sample rate = number of samples per second
- Bit depth = the size of each sample



## MIDI

- Sound is described
- Each note is described in terms of:
  - Pitch of note
  - Length of note
  - Attack of note
  - Sustain of note
  - Instrument for note
- File size is proportionate to the complexity of the music



# Networking - connecting x2+ nodes to send data

- Why network?
  - To share resources
- Problem with networking?
  - Complexity
  - Security
- Opposite of networking
  - Stand-alone machine
- Types of network
  - PAN - personal area network - eg. bluetooth phone to speaker
  - LAN - local area network - small geographical area
  - MAN - Metropolitan network - eg. London network
  - WAN - Wide area network - large geographical area (Internet)
- Peer-to-peer networks
  - Where all nodes are equal
- Client-Server networks
  - Clients request data from server
- Latency
  - Time it takes to send and receive a message
- Encoding
  - Representing information in a different way

# Network Topology - network design

## Common network topologies:

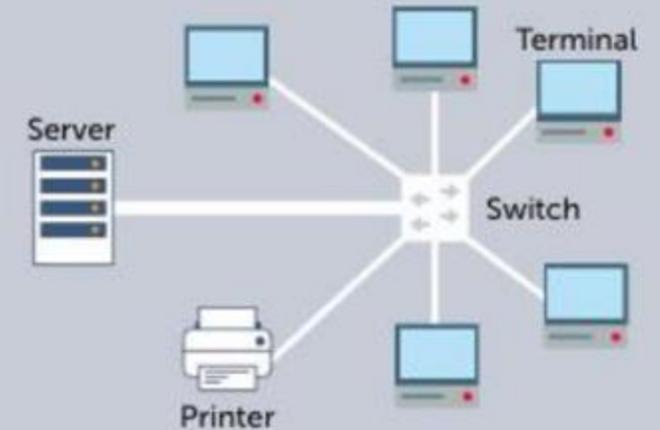
- Star
  - Used at school
- Line/bus
- Mesh
  - highly redundant
  - Used by Internet

## Network equipment:

- Switch
  - Connects different nodes on same network
- Router
  - Connects different networks
  - Used by Internet

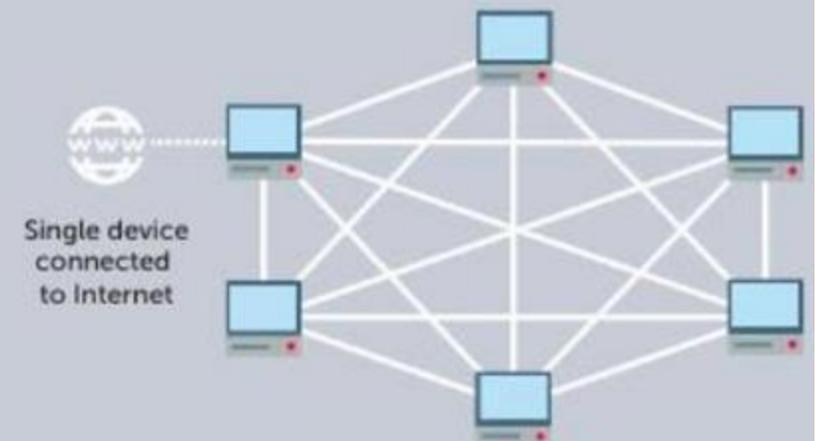
### Star networks

Star networks are most commonly used in businesses and organisations where performance and security is essential. They are also found in smaller offices and home networks owing to their simplicity. Each device on the network is connected to a central **switch** which directs transmissions to the correct device using its unique **MAC address**. Some home routers will also have switch and wireless access point capabilities.



### Mesh networks

Mesh networks can be used to connect small offices or entire cities. Wireless examples are most common, providing very large networks supporting traffic management and home automation systems. In a full mesh topology, every node is connected to every other node. Each node sends its own signals and in addition, relays data from other nodes.



More common is the partial mesh topology, where some of the devices may be connected to only one or two others. This is less costly and reduces redundancy.

Protocols - agreed set of rules to aid communication

Ports:

80

443

20/21

110

143

25

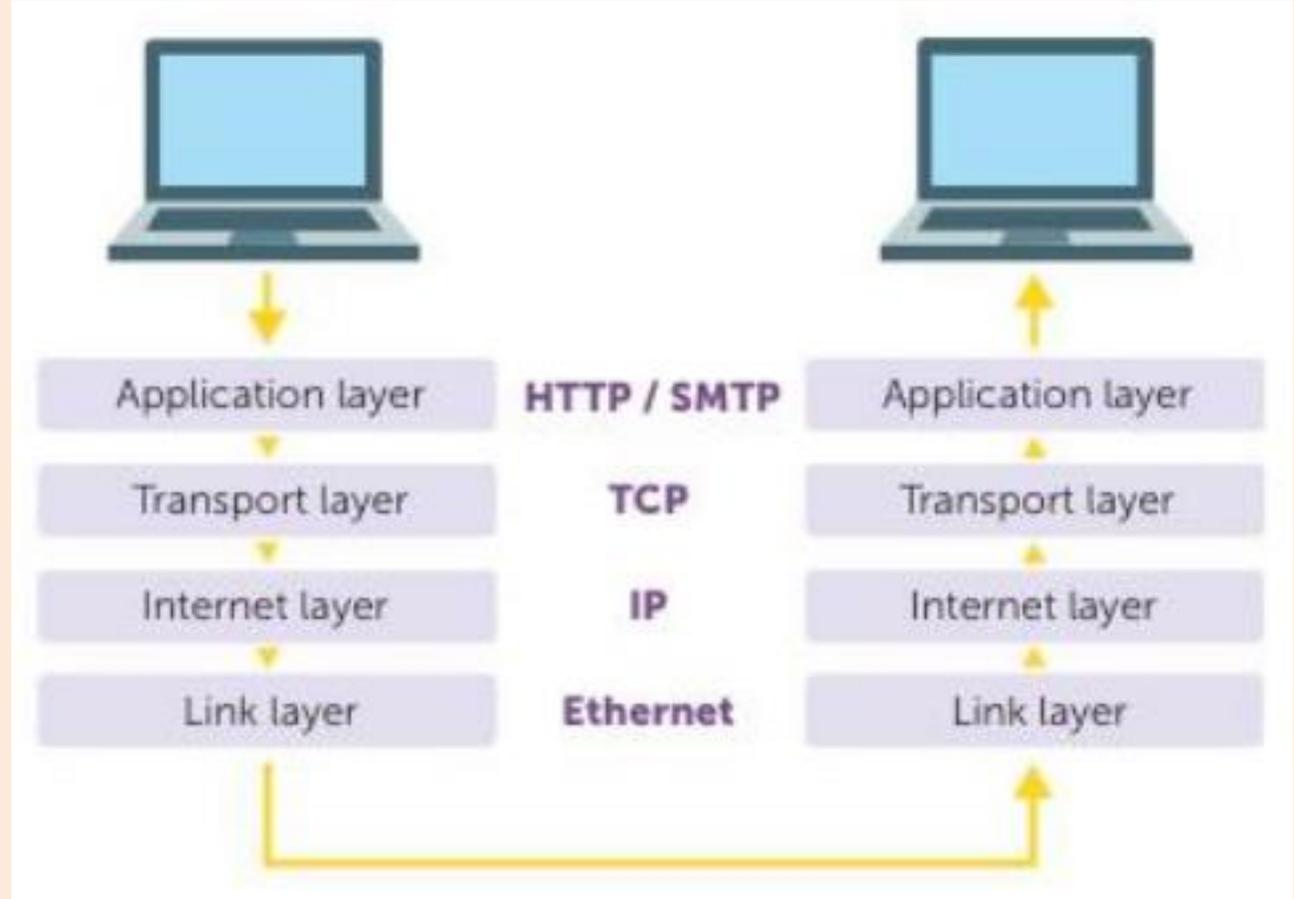
**Different protocols are used for different purposes:**

Protocol	Purpose	Key features
HTTP (Hypertext Transfer Protocol)	Used by a browser to access a webpage from a web server	Delivers web page data
HTTPS (Hypertext Transfer Protocol Secure)	As HTTP with encryption	Encrypts the data and uses a secure socket layer for greater protection
FTP (File Transfer Protocol)	Transmitting files between client and server computers	Used to upload and download files from a server
POP (Post Office Protocol)	Retrieving an email from an email server to your device	Deletes messages on the email server once they have been downloaded to a single device
IMAP (Internet Message Access Protocol)	Accessing email on a mail server via multiple devices	Maintains synchronisation of an email account across all devices
SMTP (Simple Mail Transfer Protocol)	Sending email messages between mail servers	Used for sending only

# TCP/IP protocol layer

A protocol stack is useful because:

- Enables engineers to specialise in an area without needing to know about other layers
- If protocols are changed in one layer they do not affect protocols in other layers



### Medieval Britain

1	Medieval Britain is the period between <b>1250-1500</b> also known as the <b>13<sup>th</sup>-16<sup>th</sup> century</b> . It is also known as the <b>Middle Ages</b> .
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### Key Events

2	1123 – Britain's first hospital, St. Bartholomew's was set up in London
3	1348-49 – The Black Death (Bubonic Plague) hits England, killing 40% of population.
4	1350 – Average life expectancy is 35 years of age
5	1370 – 12 rakers (cleaners) are employed to clean the streets of London
6	1388 – The government passes the first law requiring streets and rivers to be cleaned
7	1400 – There were 500 hospitals in Britain

### Key Concepts

8. The Medieval Church	Britain was Christian (Roman Catholic) with all the population being religious. Ideas and power was dominated by the Church, they controlled education and the church played a central part in daily life.
9. Medieval Power	The emphasis in Medieval Britain was on authority, the King had absolute power but the Church has considerable control. People followed authority and would not question the views of King/Church at risk to their own lives.
10. The Four Humours	<p>First suggested by Greek doctor Hippocrates. He believed the body was made up of Four Humours, Black Bile, Yellow Bile, Blood and Phlegm. These humours linked to the four elements/ seasons.</p>  <p>Hippocrates believed if your humours became unbalanced you would get ill, so you would need to rebalance the four by removing the excess humour.</p> <p>Galen, another Greek doctor, used the Four Humours Theory to create the 'Theory of Opposites'. Galen said that to heal illness, you should use the opposites to cure the unbalanced humour, e.g. using heat (like spices) to cure a cold (Phlegm).</p>
11. Public Health	The health of the population as a whole and the efforts made by the King or Government to improve this e.g. cleaning streets

### Ideas on the Cause of Disease

12.	Superstition	Beliefs based on the supernatural like witchcraft or astrology.
13.	Sins	Idea that God caused to punish for peoples sins
14.	Miasma	'Bad air' which was blamed for spreading disease
15.	Astrology	Study of the planets/stars and its affect on humans
16.	Urine Chart	A chart used by physicians to help diagnose an illness using urine
17.	Amulet	A charm that brought 'protection' from disease
18.	Purging	To rid the body of a 'excess' humours like blood or phlegm
19.	Leeching	The use of leeches for drawing 'bad blood' from patients
20.	Cupping	Using glass cups to draw blood to the surface, removing the humour (bad blood)
21.	Herbal Remedy	Medicine made from plants with natural cures e.g. honey/mint
22.	Trepanning	Cutting hole in the skull to release 'bad spirits' causing pain
23.	Pilgrimage	A journey to a religious shrine and relics to show your love of God and to cure an illness
24.	Fasting	Going without food, as a punishment to please God
25.	Regimin Sanitatis	Idea promoted by physicians to the rich. Encouraged to eat healthy, exercise, bath and relax to avoid getting ill
26.	Apothecary	A medieval pharmacists or chemist
27.	Monastery	A building where monks live, eat and pray
28.	Physician	A doctor, completed 7 years of university training, expensive
29.	Vademecum	A medieval 'medical' book carried by doctors
30.	Barber Surgeon	Untrained surgeon, who practiced basic cheap surgery
31.	Wound Man	Visual guide to help surgeons treat injuries
32.	Wise woman	A female healer and midwife, who used herbal remedies as cure
33.	Epidemic	A widespread outbreak of a disease
34.	Flagellant	People who whipped themselves to show god they repented their sins and wanted mercy. They hoped to avoid getting sick

### Impact of Medieval Society on Medicine

**Church:** Church controlled everything and people afraid of God, they limited change as no one challenged. They controlled education and training of doctors, they support Hippocrates/Galen's ideas so no one dared or wanted to challenge ideas as if you challenged Church, you were challenging God.

**Tradition:** Many simply respected traditional ideas, e.g. Hippocrates/Galen and saw ideas as rational and respected. Galen wrote 300 books, so why bother looking for change?

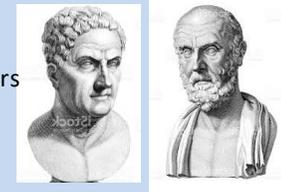
**Government:** King and government most powerful but spent nothing on improving public health, it was only during the Black Death of 1348/9 that killed 40% that King Edward did something.

**As a result, there was little progress (continuity) in medicine in the Middle Ages**



### Hippocrates and Galen

The ideas of Galen and Hippocrates were well respected as they were over 1000 years old, and the four humors made sense to people at the time. Galen had written over 300 medical books, it was assumed he was right.



All medieval training (from the church) focused on the work of Hippocrates and Galen, it was never challenged.

	Description	Was there progress?
Ideas on cause of disease	<p><b>Four Humours:</b> Idea that body contained 4 humours (blood, black bile, yellow bile, phlegm) that when imbalanced, made you ill, for example nosebleed = too much blood, that needed to be got rid of. Physicians also used Urine Charts, linked to humours to diagnose illness</p> <p><b>Miasma:</b> Bad air called Miasma causes disease, caused by dirt/waste</p> <p><b>God:</b> Church taught God caused disease to test faith or for punishment, most popular idea</p> <p><b>Supernatural:</b> Astrologists blamed stars &amp; planets for illness for example the movement of Mars/Jupiter caused Black Death. People also superstitious e.g. believed in black magic, and Jews also blamed for the Black Death</p>	There was <b>no progress</b> in ideas on what caused disease during the Middle Ages.
Treatment of Disease	<p><b>Four Humours:</b> Galen's <i>Theory of Opposites</i> used to treat humour with opposite, cold/phlegm= have hot/spicy food to remove the humours. Also physicians encouraged the use of Leeching, Cupping, to remove bad blood and purging with herbs, draw out humours like yellow bile.</p> <p><b>Herbal Remedies:</b> Wise women gave homemade remedies that did work e.g. honey for infection, mint for stomach.</p> <p><b>Religious:</b> Prayers, pilgrimage to shrine</p> <p><b>Surgery:</b> Barber surgeons used trepanning to remove demons from skulls, basic antiseptic like wine, experienced in times but high chance of death due to dirty tools, high risk of infection and no anatomical knowledge</p> <p><b>Supernatural:</b> e.g. wearing crushed magpie beak for toothache, trepanning to remove 'bad spirits' or rubbing chickens on plague buboes</p>	The majorities of treatments did not work so there was <b>mostly no progress</b> . Surgery did improve in times of war, but it was <b>VERY basic</b>
Prevention of disease	<p><b>Religious:</b> Most people thought ONLY god could prevent disease, so they focussed on prayer, fasting, pilgrimages to religious sites/shrines. During the Black Death, flagellants publically whipped themselves to avoid getting sick by punishing for their own sins</p> <p><b>Regimin sanitis:</b> Rich encouraged to eat and live healthy to avoid sickness</p> <p>Wearing amulets/charms for protection, this linked to supernatural/superstitious ideas. This was common during the Black Death</p> <p><b>Miasma:</b> Fresh Herbs and ringing bells were to remove miasma from the air, again this was common during the Black Death</p>	<b>No progress</b> in preventing disease as they did not understand the cause. Regimin Santitis was sensible advice but only for the rich
Care & Hospitals	<p><b>Physicians:</b> trained by church at university, no anatomical knowledge as dissection was banned. Took observation and diagnosed the rich</p> <p><b>Apothecaries:</b> Chemists who made herbal remedies, experienced but no training</p> <p><b>Wise Woman:</b> Local woman with medical skills such as midwifery &amp; making remedies</p> <p><b>Hospitals:</b> First was St Bartholomews in 1123. All hospitals ran by the church in places like monasteries with monks offering 'care not cure', as they believed only God would do it. Rooms were cleaned and patients well fed. Mostly for the old/poor patients, they turned away infectious.</p>	<b>Some progress</b> with development of hospitals, but the care given remained stuck in old ways
Public Health	<p>Poor public health, dirty towns with few fresh water supplies and a lack of waste cleaning. Blamed for Miasma and help spread Black Death</p> <p>No government spending but some cities employed rakers (12 in London) and installed cesspits and water supply (York).</p> <p>Only in Black Death did King Edward order cleaning of streets,</p>	There was <b>very little progress</b> in public health during the Middle Ages.

## Renaissance Britain

1.	The Renaissance is the period between 1500-1700 also known as the <b>16<sup>th</sup>-18<sup>th</sup> century</b> . <b>Renaissance means 'rebirth'</b> , it was a period when old ideas were questioned and new ideas/discovered, but there was little medical improvement.
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### Key Events

2.	<b>1440</b> – The printing press is invented, increased books and knowledge spreading
3.	<b>1536-40</b> – The Dissolution of the Monasteries – Henry VIII shuts down monasteries across England, this includes the closing of church hospitals
4.	<b>1543</b> – Vesalius releases influential book ' <i>Fabric of the Human Body</i> '
5.	<b>1628</b> – William Harvey scientifically proves the circulation of blood through the body, his book marks the end of Galen's influence on the anatomy
6.	<b>1660</b> – Royal Society is set up, aiming to share scientific ideas/knowledge
	<b>1665</b> – The Royal society releases its first journal, Philosophical Transactions
7.	<b>1665</b> – First use of the microscope.
8.	<b>1665-66</b> – The Great Plague in London, kills 25% of London's population
9.	<b>1676</b> – Thomas Sydenham publishes ' <i>Observations Medicae</i> '
10.	<b>1683</b> - Van Leeuwenhoek discovers bacteria but does not link it to disease

### Key Individuals

<b>11. William Harvey</b>	An English doctor, who also challenged Galen on his views about blood. He proved for the first time, blood circulation and the flow of arteries/veins by using dissection and experimentation. Helped improve knowledge and long term impact, but at the time doctors were resistant and slow to follow him.
<b>12. Thomas Sydenham</b>	A physician, called the 'English Hippocrates'. Released a famous book called ' <i>Observationes Medicae</i> ' where he argued that doctors should visit patients and observe them rather than just reading books. He believed in a <b>scientific method</b> to medicine, by encouraging science and experimentation. He also openly said God or the Four Humours did not cause disease, but did believe disease was caused by 'atmospheres'.
<b>13. Vesalius</b>	An anatomist who proved Galen wrong in his ideas on the human jaw. Importantly, he said that medical students should perform dissections themselves and he released his book the ' <i>Fabric of the Human Body</i> ' with highly detailed anatomical illustrations, this improving medical knowledge

## Key Terms

14.	<b>Dissection</b>	The cutting open of a human body to study its anatomy for medical training/research. More common in the Renaissance.
15.	<b>Anatomy</b>	The science of understanding of the human body
16.	<b>Syphilis</b>	A sexually transmitted disease, often caught in bathhouses
17.	<b>Transference</b>	New idea that that an illness could be transferred to an object, like onion or chicken, to treat yourself.
18.	<b>Pox/Plague House</b>	A specialist hospital to focused on one disease such as the plague. These were new in the Renaissance.
19.	<b>Plague Pits</b>	Mass graves where victims of the plague were buried
20.	<b>Direct Observation</b>	The observation of the human body through dissection to improve knowledge and understanding.
21.	<b>Circulation</b>	The movement of blood around the body
21.	<b>Quack Doctors</b>	A doctor who pretends to have medical knowledge or skills, They sold medicine which supposedly cured all illnesses
22.	<b>Alchemy</b>	'Medical Chemistry' A new type of treatment, using minerals and metals to cure illness, such as mercury. They didn't work
	<b>Moderation</b>	Idea to prevent illness by avoiding exhaustion, fatty foods, drinking too much or being too lazy.
23.	<b>Quarantined</b>	To separate people from others if they have an illness
24.	<b>Scientific Method</b>	A new process of conducting an experiment, collecting observations, then coming to a conclusion

### Key Changes

<b>25. Scientific Revolution</b>	The Renaissance became an age of challenge and experimentation which has a significant impact on medical thinking, which developed with the invention of printing press which helped knowledge spread. However, at the time, it had LITTLE impact on ideas on the cause of disease/treatment
<b>26. The Church in the Renaissance</b>	The Reformation led to changes in religion, especially a decline in the Church's authority (power). As a result, the church had less control, there was freedom of education, challenging of God's teaching, increase in dissection but a decline in the number of hospitals. Majority of people remained religious, and still blamed god for illness and treatment

## Renaissance 16<sup>th</sup> to 18<sup>th</sup> Centuries

### Ideas on cause of disease

**Change:** Fewer people believed in supernatural or religious causes (reducing power of the Church in Reformation).

Scientific thinking spreads, idea seeds in air may spread disease. Less use of Urine Chart

Thomas Sydenham promotes 'direct observation' of patients not using books

**Continuity:** Miasma theory continued and stayed popular whilst Four Humours continued, even used on King Charles II. People believed God caused Plague, 1666

### Treatment of Disease

**Change: Little change over the period**

Alchemy: Over 122 chemical cures like Mercury to cure Smallpox but dangerous

Transference: Idea illness could be transferred to an object like an onion

New Remedies: New World (USA) brought herbs/spices like quinine for dysentery

**Continuity: Large amounts of continuity**

Herbal remedies remained popular

Bleeding and purging the Four Humours, even Charles II was and during Great Plague

Religious: People still believed God cured, 92,000 touched Charles II hand to cure scrofula. Many still prayed in Great Plague

### Care & Hospitals

**Change:** Physicians had better access to medical books due to printing press, impact of Vesalius improved knowledge of anatomy. Dissection now allowed

Surgeons/Apothecaries could join guilds to get training to become masters :

Over 122 Hospitals: More hospitals treating sick but Henry VIII closed monastery run hospitals

Pest house for contagious disease & some charity hospitals opened with physicians who focused on treatment not religion

**Continuity:** Large amounts of continuity

Physicians continued to be too expensive, most care done in the home by women

Most hospitals continued, no contagious

### Prevention of Disease

Emphasis on removing Miasma: draining swamps & clearing rubbish.

Closing bathhouses to stop Syphilis spread

### The Scientific Revolution

**Royal Society** (1660) set up and given £ by Charles II, encouraged science printed scientific book '*Philosophical transactions*' e.g. Van Leeuwenhoek seeing of bacteria

**Vesalius** Italian professor who carried out dissection, improved understanding of anatomy and proved Galen wrong (Jaw) which encouraged others to challenge Galen/do dissections. Work printed in UK **William Harvey** Royal physicians, did public dissections and recorded symptoms, not using books. Used Vesalius ideas to prove Galen wrong about blood circulation through arteries & veins. Ideas then taught in medical schools and encouraged further challenge of ideas

**Thomas Sydenham** Doctor, published *Observationes Medicae*, challenged four humours and suggested direct observation of patients symptoms. Part of Royal Society

### Great Plague 1666-7

**Causes:** Most people blamed for Miasma, realised could be passed between people

**Treatment:** Similar to Black Death, many visited Quack Doctors & used transference

**Prevention:** Plague Doctors advised herbs

**Public Health:** Govt did much more, closed theatres, killed cats/dogs, burnt tar, carts collected the dead and quarantined houses

### Factors for/against progress

**Church:** Decline of church power in reformation, allowed new ideas/dissection

**Tech:** Printing press allowed spread of ideas to challenge church and new scene ideas

**Government:** King supported scientific revolution, govt. action in Great Plague

**Individuals:** Sydenham, Vesalius, Harvey

**BUT, little short term change as old ideas continued and new ones slow to spread**

# Knowledge Organiser - Industrial Revolution Medicine 1700-1900

## Summary

1	The Industrial Revolution period was the period between <b>1750-1900</b> also known as the <b>18<sup>th</sup> and 19<sup>th</sup> centuries</b> . It was an <b>age of breakthroughs</b>
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## Key Events

2	1796-98 – Jenner develops the Smallpox vaccination
3	1847 – James Simpson discovers chloroform as an anaesthetic
5	1854 - John Snow's discovers the link between the 1854 cholera outbreak and the Broad Street pump.
6	1854 - Florence Nightingale treats wounded soldiers in the Crimean War
7	1859 – Nightingale publishes her 'Notes on Nursing'
8	1860 – The 'Florence Nightingale School of Nursing' opens
9	1861 – Pasteur discovers the Germ Theory
10	1866 – Joseph Lister begins to use carbolic acid as antiseptic in surgery
11	1875 – The Second Public Health Act
12	1881 – Pasteur develops a vaccination for anthrax
13	1882 – Robert Koch publishes his four hypotheses and discovers bacteria causes tuberculosis
14	1895 - William Rontgen discovers x-rays

## Key Words

15.	Enlightenment	Idea in the 18 <sup>th</sup> century that people should think for themselves and authorities like the church and nobility should not control everyday life
16.	Bacteria	A tiny living organism, only seen by microscope, which causes disease
17.	Antibodies	Parties inside the body that fight and remove germs.
18.	Antiseptics	Chemicals uses to destroy bacteria & prevent infections

## Key Words

19.	Aseptic Surgery	Surgery where microbes are kept out of the wound in the first place, rather than being killed by antiseptic.
20.	Anaesthetics	Drugs given to unconsciousness before and during surgery
21.	Surgery 'Black Period'	Period when anaesthetics were used and the death rate in surgery went up as doctors attempted complex surgery.
22.	Chloroform	A liquid whose vapour is used as an anaesthetic
23.	Germ Theory	The theory that germs cause disease, often by infection through air
24.	Infection	The formation of disease causing germs or bacteria
25.	Inoculation	Infecting the body with a disease in order to help it fight a more serious attack of the disease later
26.	Vaccinations	Injection into the body of weak organisms to give the body resistance against disease
27.	Anthrax	An infectious disease
28.	Smallpox	A dangerous disease, which was a major cause of disease until beaten by vaccination.
29.	Patent Medicines	Medicine sold for profit. In the Industrial Revolution many of these medicines had no medical benefit at all.
30.	Dispensary	Where medicines are given out.
31.	Public Health	The well-being of the whole population
32.	Poor Law Unions	Local organisations set up to take care of the poor and unemployed
33.	Privies	Public toilets outside houses
34.	Cesspit	A pit for storing sewage or waste
35.	Workhouses	Accommodation for the poorest people, they had to work there for rent.. Families were also split up.

1 The modern period refers to **1900 onwards to the present day.**

## Key Events

2	1902 – Archibald Garrod, an English doctor theorises that hereditary diseases are caused by missing information in the body’s chemical pathways.
3	1911 – National Insurance Act – workers under a certain wage were entitled to free medical care.
4	1928 – Penicillin identified by Alexander Fleming
5	1940 – Florey and chain successfully treat mice with Penicillin
6	1942 – Diphtheria vaccination introduced
7	1948 – The National Health Service is established
9	1950 – Whooping Cough vaccination introduced
10	1951 – Rosalind Franklin and Maurice Wilkins create images of DNA using X-rays
11	1953 – DNA discovered
12	1956 – First successful kidney transplant carried out between identical twins in the USA
13	1956 – First Clean Air Act introduced to deal with increasing smog and pollution in cities.
14	1961 – Tetanus vaccination introduced
15	1963 – First successful lung transplant
16	1967 – First successful liver and heart transplants
17	1968 – Measles vaccination introduced
18	1968 – Second Clean Air Act introduced
19	1970 – Rubella Vaccination introduced
20	1990 – Human Genome Project Launched

## Key Words & People

21	Genome	The complete set of DNA containing all the information needed to build a particular organism. .
22	Compound	A mixture of two or more elements
23	Penicillin	The first true antibiotic.
24	Antibiotic	A treatment that destroys or limits the growth of bacteria in the human body.
25	Hereditary disease	Diseases which are caused by genetics so can be passed on from parents to children or other descendants.
26	DNA	DNA carries genetic information from one living thing to another. It determines characteristics like hair and eye colour.
27	Hemophilia	A genetic disease passed from parent to child that stops blood clotting
28	Fundamental laws of Inheritance	The theory that genes come in pairs and one is inherited from each parent.
29	Alexander Fleming	Fleming studied soldiers wounds on the WW1 battlefields and then tried to find a way to heal bacterial infection. He discovered that a penicilium mould produced an excellent antibiotic.
30	Howard Florey & Ernst Chain	They continued Fleming’s research on penicillin and won a Nobel prize for medicine in 1945. .

**Timeline**

1	Oct – Nov 1914	First Battle of Ypres – the British stopped the Germans from capturing the port of Calais.
2	Apr – May 1915	Second Battle of Ypres – A German attack using Chlorine gas for the first time.
3	July – Nov 1916	Battle of the Somme – Major attack led French and British to move German troops from Verdun.
4	Apr – May 1916	Battle of Arras – large scale Allied attack. Very high casualties.
5	Jul – Nov 1917	Third Battle of Ypres – Aim to capture Passchendaele ridge near Ypres. The ground turned to mud.
6	Nov-Dec 1917	Battle of Cambrai – first use of a large number of tanks by the British. 40,000 British casualties.
7	Spring 1918	The German Spring Offensive – Large scale German attack to bring the war to an end before the Americans arrived.
8	Summer – Autumn 1918	The final months – the Allied army, reinforced by the fresh US troops broke through German lines.
9	11 Nov 1918	Germany surrendered and the war ended.

**Types of Sources**

National Army records for individual soldiers	Photographs
National newspaper reports	Hospital records
Government reports on aspects of war	Army statistics
Medical articles by doctors or nurses who worked in the war	Personal accounts of medical treatments by soldiers, doctors, nurses or others involved.

**Key Words/Terms**

10	Terrain	The type of ground – was it hilly, muddy, flat, easy to walk and run on?
11	Front line Trench	The firing line – the trench nearest the enemy.
12	Communication Trench	Linked the firing line with the command support and reserve trench.
13	No Man's Land	Area between the enemy front line trenches where the fighting took place.
14	Trench Fever	Spread by lice and caused headaches, shivering and pain in joints. Lasted 5 days.
15	Trench Foot	From standing in waterlogged trenches, feet became numb and swollen. Some cases became gangrenous and needed amputation.
16	NYD.N.	Army code for shell shock.
17	Shrapnel	Fragments of metal or lead designed to cause maximum injuries.
18	Artillery	Heavy fire causing half of all casualties.
19	Steel Helmets	Introduced to British troops by autumn 1915 & widely available by Summer 1916 to reduce head wounds.
20	Gas	Weapon causing blindness, loss of taste and smell and coughing.
21	Evacuation Route	How injured soldiers accessed medical treatment from front line fighting. Stretcher bearers, Regimental Aid Post (RAP), Field Ambulance and Dressing Station, Casualty Clearing Station (CCS) and Base Hospital.
22	Thomas Splint	A splint to help fractured bones heal in the leg - 1916
23	Plastic Surgery	Improved during WW1, led by Harold Gillies, who opened a specialist hospital in Kent in 1917.

# The Big Picture of 'Western Front Medicine'

WW1 & Conditions	Injuries	Care	Treatments
<p><b>Key Battles</b>  <b>Ypres, Hill 60, 1914:</b> First use of mines dug under German positions to blow them up  <b>Second Battle of Ypres, 1915</b>                      First use of Chlorine Gas by Germans. British unprepared, cotton pads until gas masks  <b>Battle of the Somme, 1916</b>                      Largest British battle in WW1, 400,000 casualties for British                      First tanks &amp; creeping barrage  <b>Battle of Arras, 1917</b>                      British build tunnels for bases and also Arras Underground Hospital, with 700 beds.  <b>Battle of Cambrai, 1918</b>                      First tank battle, 450 used</p>	<p><b>Trench Foot</b>                      Major problem caused by standing in water logged trenches with no change of boots/socks. Feet would swell, go numb, quickly led to gangrene and amputation                      In winter of 1914-15, the 27<sup>th</sup> Division of the British army experienced 12,000 cases                      Solution: Soldiers ordered to carry 3 pairs of socks and change them twice a day and rub whale oil into their feet. Efforts made to pump out trenches</p>	<p><b>Royal Army Medical Core (RAMC)</b>                      Responsible for medical care, it organised and provided medical treatment. In 1914, there were 9000 men, by 1918 113,000 who were doctors, stretcher bearers etc.</p>	<p><b>Mobile X Ray Units</b>                      6 Mobile vans were used throughout the British sector of the Western Front to identify bullets/shrapnel                      There were a number of weaknesses such as timing, poor quality, overheating, could only be used 3 times an hour</p>
	<p><b>Gas</b>                      Gas caused great panic, but only killed 6000 soldiers  <b>Chlorine: Ypres 1915</b> Caused death by suffocation. Before gas masks, so soldiers soak cotton pads in urine and put to their faces. Led to introduction of gas masks  <b>Phosgene 1915</b> Used at Ypres. Faster acting than chlorine, killed exposed person in 2 days.  <b>Mustard Gas 1917</b> Odourless gas. Caused internal and external blisters/burns through clothes</p>	<p><b>First Aid Nursing Yeomanry (FANY)</b>                      Women's voluntary organisation to go front. First 6 women went in 1914, eventually 500. FANY help by driving ambulances, delivering supplies to the frontline and setting up a mobile bath units (Bathed 40 men an hour)</p>	<p><b>Blood Transfusions</b>                      1915, first blood transfusions at base hospital, human to human                      1915, Lewisohn added Sodium Citrate so blood could be stored                      Keynes created a portable blood transfusion kit that could store blood and be used on the front line, helped reduce shock                      By 1917 blood transfusion stations at CCS, massively helped                      1917, first blood bank at Cambrai, 22 units of blood saved 11 lives – blood transfusions began to have a huge impact.</p>
	<p><b>Shell Shock</b>                      Symptoms included tiredness, nightmares, loss of speech, uncontrollable shaking and complete mental breakdown. It is estimated 80,000 British troops experienced shell shock. Condition not understood, some accused of cowardice, others treated in Britain</p>	<p><b>The Chain of Evacuation</b>  <b>Regimental Aid Post</b> :Within 300m of front line, gave immediate first aid but basic aim to send men back to front line, or onto the ADS  <b>Advanced Dressing Station:</b> Within 400m of RAP, in a tent or shelter, could deal with 150 men. Medical officers but no surgery, overwhelmed at Ypres  <b>Causality Clearing Station</b> 7 miles from the front on railway line, contained doctors and operating theatres, x ray machines and could deal with 1000 men                      Treated critical injuries and assess wounded; send back to front or to base hospital  <b>Base Hospitals</b> Near ports in France/Belgium, large hospitals with all equipment and some specialist ones for gas/head injuries                      Could treat 2500  <b>Arras:</b> Underground hospital built 1916                      700 beds, operating theatre, water supply. Dressings station close to fighting</p>	<p><b>Thomas Splint</b>                      In 1914 men with thigh wound, small chance of survival (20%)., the existing splint made things worse, due to terrain and type                      In 1915 Thomas splint invented, kept the leg straight so the bone healed in the correct position, survival rates increased 20-80%.</p>
<p><b>Conditions</b>                      The constant bombing and shelling ruined landscape. Evacuation tough.  <b>Stretcher Bearers</b> 4 man stretcher bearers Carried the wounded during day and night, often under enemy fire in poor conditions  <b>Horse Ambulance:</b> Often made patients worse due to shaky journey, often killed  <b>Ambulance Cars</b> Shortage at the start of war. Red Cross raised money for 512. Hard to drive on destroyed roads.  <b>Trains/Canals:</b> Used transport wounded to base hospitals</p>	<p><b>Trench Fever</b>                      Flu-like symptoms with high temperature, headache and aching muscles. It affected 500,000 men on Western Front. Only by 1918 had its cause been tracked down to lice (a parasitic insect). After this delousing stations were set up and cases declined.</p>	<p><b>Brain Surgery</b>                      Injuries to the brain were almost always fatal in WW1 due to a lack of experience/infection. Harvey Cushing pioneer new ideas  <ul style="list-style-type: none"> <li>• Development of magnets to withdraw metal fragments</li> <li>• Local Anaesthetic to avoid brain swelling in surgery</li> <li>• Chain of Evacuation sent on head injuries to CCS quickly</li> <li>• Specialist base hospitals such as Mendingham for brain injury</li> </ul> </p>	
<p><b>Trenches</b>  <b>Not all trenches same across front</b>  <b>Frontline:</b> Where attacks were made from, most dangerous area  <b>Support:</b> 80m behind, to retreat  <b>Reserve:</b> 100m back, counterattacks  <b>Communications:</b> Linked trenches  <b>Duckboard:</b> to prevent trench foot  <b>Parapet:</b> low protective wall  <b>Dugout:</b> Hole in trench for cover</p>	<p><b>New Injuries</b>                      Artillery shells and shrapnel caused 58% of wounds with 60% of these injuries were to arms and legs                      Bullets were responsible for 39% of wounds.                      Gas Gangrene from bacteria in soil, could not be cured, spread rapidly and led to amputations.                      Tetanus vaccines                      Brodie Helmet (1915) = 80% reduction in deaths by head injury. 20% of injuries to head and face.</p>	<p><b>Plastic Surgery</b>                      Harold Giles pioneered plastic surgery in WW1  <ul style="list-style-type: none"> <li>• Set up specialist Queens Hospital in Kent, 1917</li> <li>• Using skin grafts (taking skin from to graft to another area)</li> <li>• Using jaw splints, wiring and metal replacement cheeks</li> <li>• By 1915, 7 specialist hospitals in France 12,000 operations done</li> </ul> </p>	
		<p><b>Progress up to 1914</b>  <b>X-rays:</b> Discovered by Wilhelm Roentgen in 1901, but not portable yet and slow.  <b>Blood Transfusions:</b> Blood groups discovered in 1901, couldn't store blood  <b>Aseptic Surgery:</b> Germs Theory led to more hygienic surgery, hard on frontline</p>	<p><b>Gas Gangrene</b>                      Infections caused by gas gangrene &amp; no aseptic surgery on front  <b>Amputation:</b> If antibiotics/excisions failed to stop the spread of infection, amputation only way. By 1918 over 240,000 men  <b>Wound excision or debridement</b> :This was cutting away the dead, damaged and infected tissue from around the wound to reduce infection.  <b>The Carrel-Dakin method:</b> Sterilised salt solution pumped into wound through a tube. Only lasted 6 hours, not enough of it and had to be ready made, by 1917 was the most effective method.</p>

## Geography

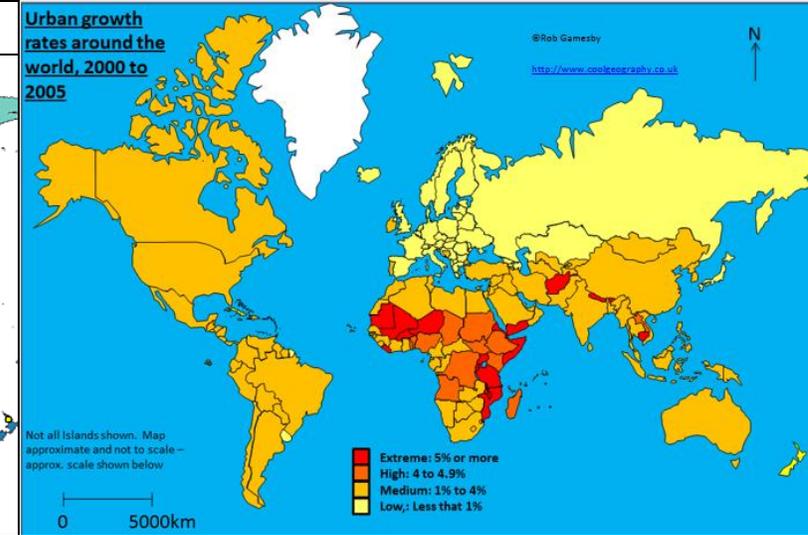
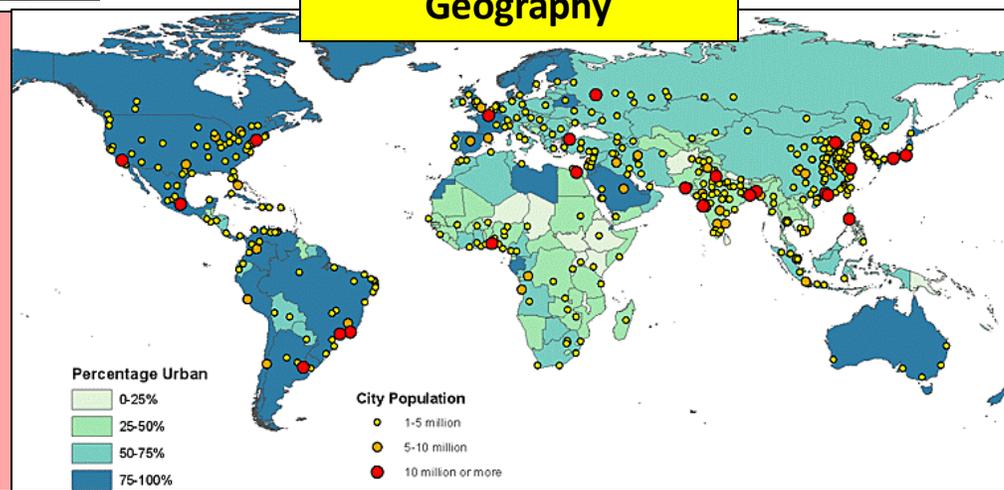
### The global pattern of urban change

**Urbanisation** is defined as the "increasing percentage of people living in built environments such as towns and cities".

The word percentage in this definition is very important, because it indicates that we must judge urbanisation by looking at both the numbers of people living in both rural AND urban areas. For the first time ever in the history of mankind, more people now live in towns and cities than in rural areas.

Patterns in urbanisation:

1. **HICs** were the first to urbanise, and generally have the largest proportion of their population living in towns and cities.
2. **LICs** currently have lower amounts of urbanisation, but are urbanising rapidly. Megacities, cities with over 10 million people, are almost exclusively in poorer nations.
3. Cities of World importance for **commerce** and trade are predominantly in HICs, regardless of size. World cities include Tokyo, London and New York.
4. Many old colonies (e.g. in South America) have high percentages of urbanisation as the colonising countries such as France and the UK favoured city growth to help administration.
5. Asia has the highest number of Megacities.



Urbanisation levels are affected by 2 things – Migration and Natural Increase:

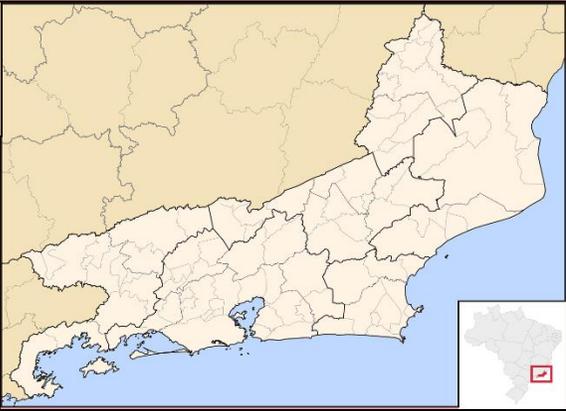
**Migration** is the movement of population from one area to another. Some migrations are forced, voluntary, permanent and temporary, International and regional. The type of migration that we are principally interested in is **rural to urban migration**, which is the movement of people from countryside to city areas. This type of migration happened in HICs from the 18th Century onwards on a large scale, and has gradually slowed down. In fact in many HICs the movement of people has reversed, and people are moving from urban areas back into the countryside as they search for the quiet life (this is known as **counter-urbanisation**). However, many LICs are experiencing massive rural to urban migration, mainly of young males, into the major cities. The major reasons for this movement can be classified into push and pull factors.

A **Push factor** is something that can force or encourage people to move away from an area. Push factors can include famine (as in Ethiopia in the 1980s), drought, flooding (as in Bangladesh, where people are becoming climate change refugees and having to move to Dhaka), a lack of employment opportunities, population growth and over population, and civil war (as in Darfur at the moment). A **Pull factor** is one in which encourages people to move to an area. Pull factors include the chance of a better job, better access to education and services, and a higher standard of living. These factors have contributed to millions of people in LICs moving to cities, creating mass urbanisation.

**Natural Increase** also has a major effect on rates of urbanisation. During the initial urbanisation phase natural increase in poorer parts of the world can increase, as death rates fall in cities because there is better access to medical care, improved water supplies, improved sanitary conditions and improved wealth so improved food supply. However, it is important to note this isn't always the case – see urban challenges. Whilst birth rates take longer to fall and indeed more babies survive as infant mortality falls in cities. Also, young people move to towns and cities, which also boosts the birth rate. These combined factors can fuel the rate of urbanisation.

These 2 factors have pushed world urbanisation above 50% and have led to the emergence of hundreds of Megacities. Megacities are those cities that have a population above 10 million. Most megacities can currently be found in Asia, for example Mumbai.

**Rio de Janeiro (Rio)** is the second most populated city in Brazil after Sao Paulo. Rio is located in the southeast of Brazil on the Atlantic coast.



**How has Rio de Janeiro grown?**

Rio's population is growing rapidly. Since the 1950s the population of the city has trebled. Rio de Janeiro had over 12 million residents in 2016.

As Rio has developed it has attracted migrants from within Brazil and from abroad. One of the largest groups of migrants is Portuguese people. This is likely because of the cultural connections following years of Portuguese rule (16th to the early 19th century). In fact, Rio has the largest Portuguese population outside of Portugal. More recently Rio has attracted migrants from South Korea and China who seek business opportunities.

Rural to urban migration has also been a major cause of population growth. Migrants are pulled to the city because of better education and employment opportunities along with improved living conditions. Migrants have been pushed from rural areas due to factors such as **mechanisation** on farms, poor living conditions and the lack of employment opportunities.

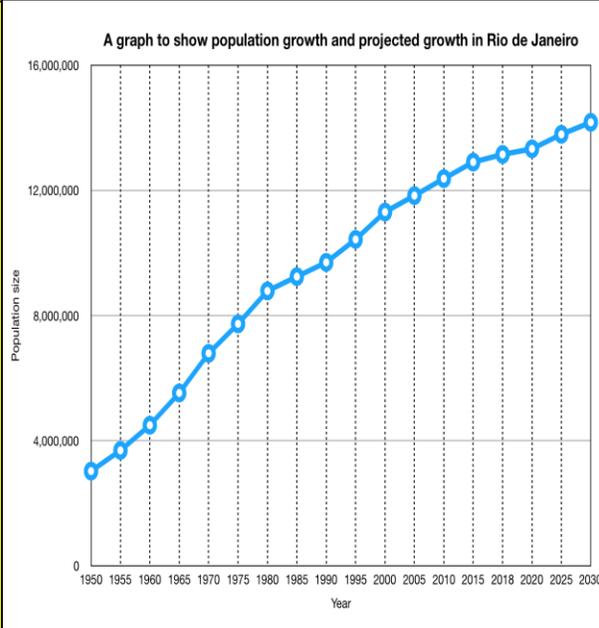
The high rate of migration into Rio has led to a **youthful population** in the city. As the result of this, the city has a high rate of natural increase due to the high birth rate and relatively low death rate.

**Importance of Rio de Janeiro**

Rio de Janeiro is the second most populated city in Brazil, South America. Recently millions of people from rural areas have migrated to major cities such as Rio de Janeiro to seek better opportunities. The city holds much regional and international significance:

- It provides schools, hospitals and universities as well as opportunities for employment, leisure and recreation.
- It is an important centre for research due to universities and research labs locating in the city.
- Rio is important for its art and culture scene. The Statue of Christ the Redeemer is one of the Seven New Wonders of the World.
- It is an important transport hub, with its three airports and five ports which enable trade. The ports are very important for the export of iron ore, sugar and coffee. The city is the second most important area for industry in the country. Some 5% of the country's GDP is produced here.
- Many of Brazil's largest companies have their headquarters located there. These include mining, oil and telecommunications companies. Rio is a major centre specialising in clothing, processed food, chemicals and **pharmaceuticals**.
- Tourism: The city is one of the most visited places in the Southern Hemisphere. The city hosted the 2016 Olympic and Paralympic games and in 2014 was a host city for the World Cup. It is also renowned for its beaches, architecture and tours of the **favelas**.

The rapid growth of Rio de Janeiro's population has led to a severe shortage of housing. Millions of people have been forced to construct their own homes from scrap materials such as wood, corrugated iron and metals. These areas of temporary accommodation are known as favelas in Brazil. Favelas are located on the edge of most major Brazilian cities. They are located here for a number of reasons. Firstly, this is the only available land to build on within the city limits. Secondly, industry is located on the edge of the cities. Many people need jobs, therefore, they locate close to factories. Some of these settlements may be 40 or 50 km from the city centre (on the edge of the city), along main roads and up very steep hillsides.



## The growth and development of Rio de Janeiro have led to a number of social and economic opportunities to improve the quality of life of its residents.

### Social:

Health Care – Healthcare provisions, such as health care centres and hospitals, is significantly better in Rio than in rural areas. Compared to living in the countryside, vulnerable people such as children and the elderly have better access to emergency care and **vaccinations** in Rio.

Education – There are many primary and secondary schools in Rio which have enabled 95% of children aged 10 and above in the city to be **literate**. This is considerably higher than the national average. The city also has several universities providing higher education opportunities.

Water supply – Access to clean water has increased considerably in Rio since the city hosted major sporting events such as the 2014 World Cup and the 2016 Olympics. Over 90% of the population of Rio have access to mains water supply. However – most of the 10% who do not, live in the favelas.

Energy – Although the city is subject to power cuts, the energy supply is more reliable than in rural areas where lighting and power are not always available. In poor areas, some residents tap into the power supply illegally. This has led to fires.

### Economic:

As Rio is one of Brazil's most important industrial cities considerable economic growth has occurred. Employment opportunities are available in Rio's five ports through the **export** of coffee, sugar and iron ore. The largest steelworks in South America is located in Sepetiba Bay in Rio. This has led to new construction and supply industries being attracted to the area further encouraging economic growth and job opportunities. This is known as the **multiplier effect**. As the population has grown and industry has developed so too has the service sector (e.g. retail and finance) to meet the demands of the area. **Migrant labour** and economic investment are also attracted to Rio due to the growth in manufacturing industries such as furniture, clothing, pharmaceuticals and food processing.

- Rio has one of the highest incomes per person in the country.
- The city provides 6% of the country's total employment.
- The growth of urban industrial areas can increase economic development.
- As the city becomes more industrialised, the city will become wealthier.

## The growth and development of Rio de Janeiro have led to a number of challenges

Millions of people have been forced to build their own homes due to the lack of affordable housing. Migrants to the city often have to build homes on land that they do not own. Large squatter settlements are known as favelas appear on wasteland on very steep hillsides around the edges of the bay. Over time residents seek to improve these properties however due to them not owning the land, there is always a risk of them being demolished by the authorities. They are also at risk from landslides. Following heavy rain in 2010 one such slide destroyed thousands of homes and 200 people were killed.

### Providing clean water, sanitation systems and energy

- In the poorest areas, 10% of people do not have access to fresh piped water and 50% lack proper sanitation, which means human waste can follow through the streets. Illegal tapping and leaks lead to one-third of fresh piped water being lost.
- 30% of people have no electricity. In some areas where there is a lack of electricity residents tap into mains electricity illegally which causes frequent power cuts.
- An estimated 200 tons of raw sewage pour into Guanabara Bay EVERY day.

### Providing access to services – health and education

- Due to the very high population density in favelas, disease can spread very quickly. Infant mortality rates are very high at 50 per 1000. Often there is limited waste collection which increases the risk of disease
- Half of the population doesn't have a local health clinic.
- Only half of children continue education beyond 14 due to a lack of schools and a need to work.

### Reducing unemployment and crime

- The city suffers from high crime rates.
- There is high unemployment in the favelas.
- Most people who live in favelas work in the informal sector, with no job security or support systems.

### Environmental issues – waste disposal, air and water pollution, traffic congestion.

- Heavy pollution due to industrialization and poor sanitation.
- 3.1 million tons of waste is generated in Rio every year. Most of this is taken to landfill. In favelas there is often no bin collection at all, as they are illegal dwellings and the streets so narrow and steep, bin lorries cannot get there.
- Due to its physical geography with steep slopes and mountains, Rio is one of the most congested locations in South America. This has led to high levels of air pollution and commuters spending a lot of time travelling, which also costs businesses money through delays and fuel expense!

## How is urban planning improving the **quality of life** for the urban poor?

### Transport

The metro system is being extended to address the problem of congestion and sprawling development. Also, road tolls in the city centre are being introduced to encourage people to use public transport.

Tunnels through mountains have also been constructed to improve transport links across the city.

### Waste disposal

Recycling is big business in Rio. Pickers collect recyclable Materials from landfill sites. As materials decompose in landfill sites they release gas which is harnessed to fuel vehicles and provide a source of energy for electricity.

### Healthcare and education

In Rocinha favela a new University has opened.

Infant mortality has fallen significantly in some favelas as health kits have been used to detect and treat diseases.

### Self-help schemes – Rocinha, Bairro Project

The authorities in Rio de Janeiro have taken a number of steps to reduce problems in favelas. They have set up self-help schemes. This is when the local authority provide local residents with the materials needed to construct permanent accommodation. This includes breeze blocks and cement. The local residents provide the labour. The money saved can be spent on providing basic amenities such as electricity and water.

Today, almost all the houses in Rocinha are made of concrete and brick. Some buildings are three and four stories tall and almost all houses have basic sanitation, plumbing, and electricity. Compared to simple shanty towns or slums, Rocinha has a better-developed infrastructure and hundreds of businesses such as banks, drug stores, bus lines, cable television, including locally based channel TV ROC, and, at one time, even a McDonalds franchise, though it has since closed. These factors help classify Rocinha as a Favela Bairro, or Favela Neighbourhood.

## Key terms and definitions for this topic

**Low income country (LIC) and high income country (HIC)** - this subdivision of countries is based on the World Bank income classifications (GNI per capita), which in 2013 were Low Income \$1,045 or below, and High Income \$12,746 or above.

**Newly emerging economies (NEEs)** - countries that have begun to experience high rates of economic development, usually with rapid industrialisation.

**Urbanisation** - the process by which an increasing percentage of a country's population comes to live in towns and cities. Rapid urbanisation is a feature of many LICs and NEEs.

**Mega-cities** - an urban area with a total population in excess of ten million people.

**Migration** - when people move from one area to another.

**Rural-urban migration** - in many LICs people move from rural to urban areas.

**Natural increase** – when birth rates are above death rates and the population increases.

**Commerce** – the activity of buying and selling, especially on a large scale.

**Counter-urbanisation** - large numbers of people move from urban areas into surrounding rural areas.

**Push factor** – negative things that make people want to move away from an area.

**Pull factor** – positive things that make people want to move in to an area.

**Natural increase** – Birth rate - death rate = natural increase.

**Pharmaceuticals** – companies manufacturing medicinal drugs.

**Favelas** – Brazilian word for a slum or shanty town.

**Mechanisation** – the introduction of machines or automatic devices into a process, replacing human labour.

**Youthful population** – A large proportion of the population are aged below 35 years old.

**Vaccinations** – treatment with a vaccine to produce immunity against a disease.

**Literate** – an ability to read and write.

**Export** – goods shipped to other countries.

**Multiplier effect** – one change leads to another positive change.

**Migrant labour** – people who move to a place in search of work.

## Geography

### Practice questions worth 1 or 2 marks

State two countries which have an urban population of 0-25% on the map on page 1.

Define a megacity.

Give two examples of push factors.

Define counter-urbanisation.

### Practice questions worth 8 or 9 marks

Evaluate the success of an urban planning scheme you have studied, in improving the lives of the urban poor.

### Practice questions worth 4 marks

Describe the global pattern of urban growth 2000-2005, using the map on page 1.

Outline the factors that affect changing levels of urbanisation.

Explain why rural to urban migration occurs in countries like Brazil.

### Practice questions worth 6 marks

To what extent do you agree with the statement “there is a large difference in the quality of life between the urban rich and poor”?

Discuss the problems a city faces when it’s population grows rapidly.

**Freiburg, Germany**  
Freiburg is located in South West Germany with a population of about 220,000 people. In 1970 it set the goal of focusing on social, economic and environmental **sustainability**.

**WASTE**

- Financial rewards are given to people who compost their green waste and use textile nappies.
- The city uses biogas to provide energy for 28,000 homes. This gas comes from a **biogas digester** which uses garden and food waste, which is collected weekly.
- The city has more than 88% of packing waste recycled. There are over 350 recycling collection points around the city.
- These three strategies have been instrumental in reducing **landfill** waste from 140,000 tons to 50,000 tons in a 12 year period.

**WATER CONSERVATION**

- Rainwater is retained and reused to reduce the amount of water used. Houses have ‘green roofs’ which aid rainwater collection.
- Residents are given financial incentives for using less water pumped from the **reservoir** (to their tap – ‘mains’ water).
- Wetland areas near the river reduce flood risk.

**ENERGY CONSERVATION**

- Local people are encouraged to **invest** in **renewable energy**. Investors get financial returns on their investments and even free season tickets at the football club!
- A solar factory making solar panels, employs over 250 people.
- More than 10000 people are employed in over 1500 renewable energy companies within the city, with many companies having their HQ in the city.
- The city regularly hosts renewable energy conferences.
- Solar panels are regularly incorporated as unusual design features in buildings, such as vertical cladding.
- One community has invested over £5 million in 8 renewable energy schemes, including a **micro HEP** scheme, solar energy systems at the football stadium, and wind turbines.

**The city plans to be 100% renewable energy-powered by 2050.**

**SUSTAINABLE TRAFFIC MANAGEMENT STRATEGIES**

- The city has **integrated public transport strategy** (ITS) which is updated every ten years.
- The tram network is an important part of the ITS, as it provides cheap and accessible public transport.
- There are 400km of cycle paths with 9000 parking spaces for bikes.
- Areas of the city have **restrictions** on car parking spaces. A car park space in one area cost £20,000!! This discourages people to own, or use, a car.
- Tram journeys increased by over 25,000 in one year, while car journeys reduced by nearly 30,000.

**CREATING GREEN SPACES**

The provision of open spaces contributes to the sustainability of the city in many ways. They act as the city’s ‘green lungs’, reducing air pollution. Additionally, they serve as a free recreational resource for people and create valuable habitat for wildlife.

- 44,000 trees have been planted in parks and streets to provide more green spaces but to also reduce pollution.
- Green spaces are left between houses to give space for children to play.

**SOCIAL SUSTAINABILITY**

- There is a focus on providing people with **affordable housing**.
- Local people are involved in urban planning at both local and city level. Sites for building are considered by the local council and interest groups.
- Cycle and walking paths aim to encourage exercise and healthy living.

### Key terms and definitions for this topic

**Sustainability** - is the practice of using natural resources responsibly, so they can support both present and future generations.

**Biogas digester** – biogas is a naturally occurring gas that is generated by the breakdown of organic matter by anaerobic bacteria and is used in energy production. Biogas can also be produced in anaerobic digesters from plant or animal waste or collected from landfills.

**Landfill** – a system of rubbish disposal in which the waste is buried between layers of earth to build up low-lying land.

**Reservoir** – an artificial lake where water is stored. Most reservoirs are formed by constructing dams across rivers. A reservoir can also be formed from a natural lake whose outlet has been dammed to control the water level. The dam controls the amount of water that flows out of the reservoir.

**Invest** - to commit (money or capital) in order to gain a financial return.

**Renewable energy** - is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat.

**Micro HEP** – a small scale Hydro Electricity Power generation scheme.

**Integrated transport system**- Integrated transport system refers to a multi-modal transport system where different modes of transport are efficiently linked with each other. This translates into the smooth movement of freight and people over various modes of transport like roads, railways, ports, coastal shipping, inland water and civil aviation.

**Restrictions**- certain rules are put in place.

**Affordable housing**- is housing which is deemed affordable to those with a median household income or below as rated by the national government or a local government by a recognised housing affordability index.

## Geography

### Practice questions worth 1 or 2 marks

Give two ways in which Freiburg is reducing it's landfill waste.

Suggest two ways in which Freiburg is conserving it's water resources.

### Practice questions worth 8 or 9 marks

Evaluate whether a city you have studied has been successful in trying to make itself more sustainable in terms of water, waste and energy use.

### Practice questions worth 4 marks

Explain why it is important to conserve water.

Using an example you have studied, describe how an urban settlement is attempting to reduce it's reliance on fossil fuels.

Outline how an integrated transport system works, using an example you have studied.

### Practice questions worth 6 marks

Discuss whether an integrated transport system you have studied has been successful or not.

**Distribution of population and the major cities in the UK**

The United Kingdom is a country with a high level of **urbanisation** and number of large cities. 82% of the UK population live in urban areas. It has no megacities with a population over 10 million but London, the capital, has the biggest population with over 8.5 million inhabitants.

The relief (shape of the land) has a significant impact on the **distribution** of the population in the UK. The population and cities of the UK are not evenly distributed, nor is the **population density**.

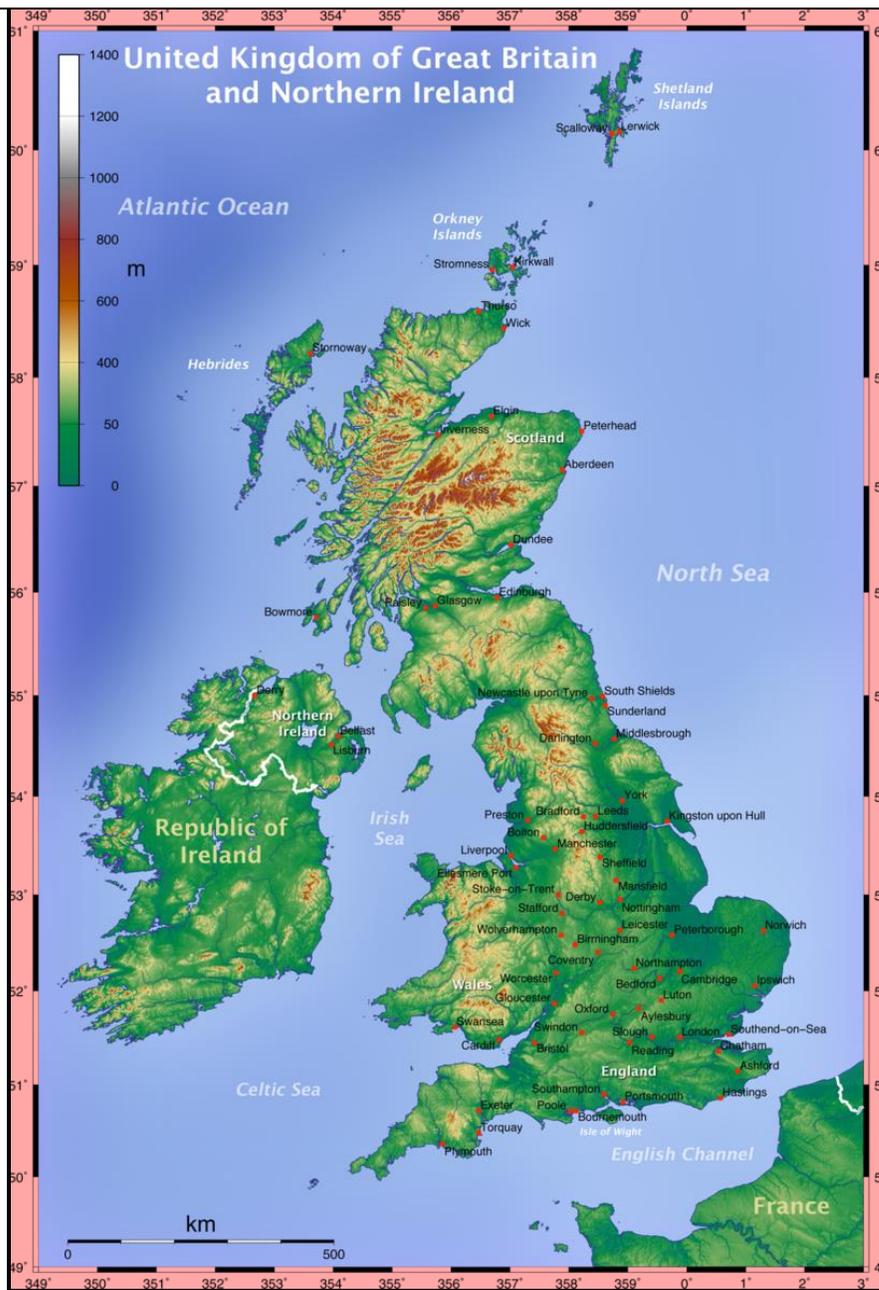
Lowland areas tend to be **densely populated** whereas upland areas are **sparsely populated**. Most urban areas have developed in low land areas because they are easier to build on and have favourable climates e.g. Birmingham.

Upland areas, such as northern Scotland, tend to be sparsely populated because they are difficult to build on and the climate is often cold and wet. Also, these areas are difficult to farm and often lack natural resources.

Some coastal locations have a high population density. This is particularly the case close to estuaries because harbours can be constructed. In the past, this enabled the fishing industry to develop along with ports being established to enable trading to occur.

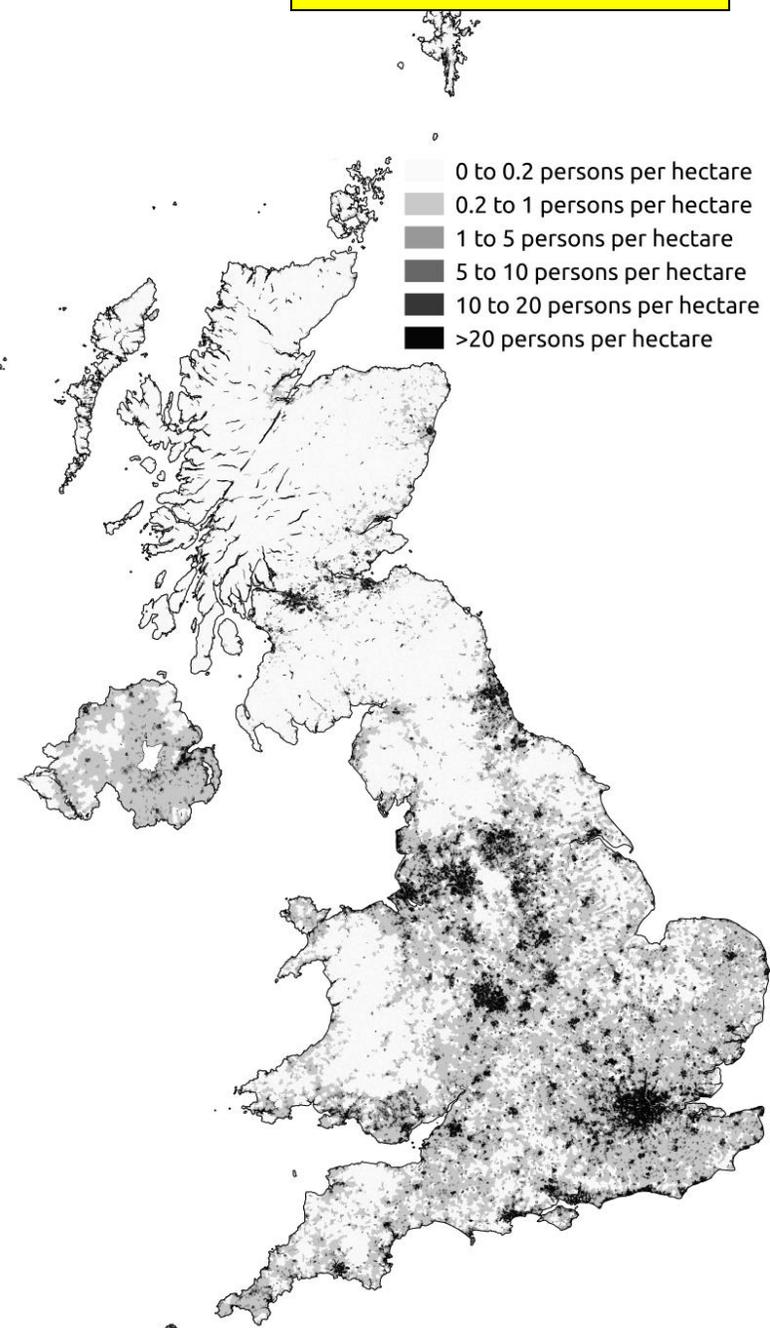
Urban areas have also developed where there are large reserves of natural resources. This includes iron ore and coal e.g. Newcastle and Leeds.

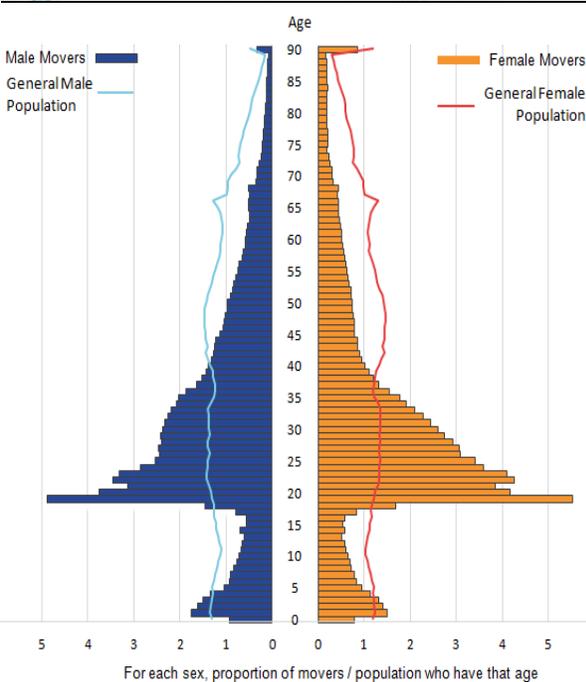
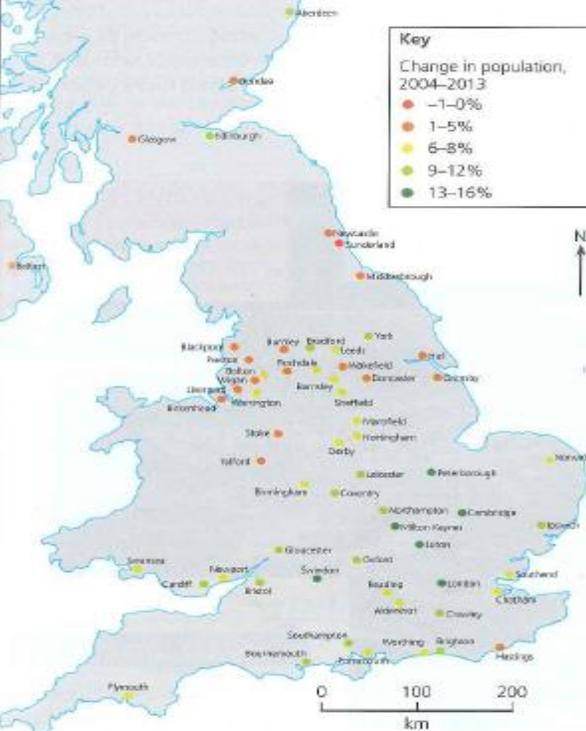
Population density is high in the south-east of England, due to the favourable climate and proximity to the capital city of the UK, London. The city has many industries and is a global financial centre.



Above: map showing upland and lowland areas in the UK  
Right: map showing population densities in the UK

**Geography**





Currently, the fastest growing cities are in South East England, which is also the region with the fastest growing economy. Over one million more people live in London now than in 2000. At the other end of the scale, there are now fewer people living in Sunderland than in 2000, as a result of declining industry and a loss of jobs, forcing people to move elsewhere to find work.

Portsmouth is the most densely populated city outside of London. It has always been a key settlement, due to its coastal location and sheltered waters (the Solent is sheltered from the English Channel by the Isle of Wight, which also made it easier to defend). It became a town in 1180, and grew rapidly after 1495 when Henry VII founded Portsmouth Dockyard. It has had a strong association with the **British Navy** and **sailing** expertise ever since, and in more recent times this has led to a development in the **tourism industry** too, with the historic dockyard, Spinnaker Tower and Gun Wharf Quay shopping centre at the heart of this and ferries to France, Spain and the Isle of Wight also being integral.

Importantly, Portsmouth is on a mainline railway to London, and motorway links are good to – so lots of people live in the Portsmouth area and commute in to London because it is cheaper than living in London.

These transport, defence and tourism industries, along with education (University of Portsmouth) offer a wide variety of employment opportunities. Given its international transport connections and proximity to London, it has become home to lots of migrants from elsewhere in the UK, Europe and the rest of the world. The graphic (right) shows the numbers of people arriving to Portsmouth from different countries. As can be seen from the population pyramid, these migrants are often aged between 18-40, while the total population remains fairly even in structure – indicating that they come for work and often later leave Portsmouth again. People may also move here for an improved quality of life (usually overseas migrants), or facilities and attractions (often wealthy migrants becoming involved in the sailing industry or to gain access to the sailing industries).



## Migration in Portsmouth can create opportunities and challenges:

### Opportunities:

- Enriching the city's cultural life by creating different, interesting buildings, events, social spaces and ideas.
- Filling 'skill shortages' within the workforce after skilled workers move elsewhere.
- A hard working and motivated workforce as the vast majority of these people have chosen to come here and work, knowing it will get them a better wage and better quality of life.
- Greater variety of shops, cuisine (food) and entertainments.

### Challenges:

- Integration of different cultures and ideologies into the community - this can often create tension and conflict within a community.
- Language barriers in schools – additional workload for staff (and lack of training) as well as frustration amongst native speakers.
- Pressure of housing and employment – there isn't enough houses or jobs for everyone within the area and this can cause conflict.

**Urban sprawl** is the result of inward migration and so increased urbanisation occurs: as more and more people move into cities, so the population density rises and it becomes a less appealing place to live (overcrowded, traffic issues, pollution, housing prices) and so the city spreads outwards into more rural areas. Other associated issues include:

**Lower Land Rates:** Lower cost land and houses in the outer suburbs of the cities, because land in the centre is very expensive.

**Improved Infrastructure:** There is increased spending on certain types of infrastructures, including roads and electricity. This is something that hasn't always been available, and there are still some areas that don't have these luxuries.

**Rise in Standard of Living:** There are also increases in standards of living and average family incomes, which means that people have the ability to pay more to travel and commute longer distances to work and back home.

**Lack of Urban Planning:** People love to find areas that are less trafficked and more calm, which leads them to sprawl out to other sections of the town. Unprecedented development, cutting of trees, loss of green cover, long traffic jams and poor infrastructure in the city centre force people to move out to new areas.

**Lower House Tax Rates:** Cities will usually have high property taxes, and you can usually avoid these taxes by living in the outer suburbs because the taxes are usually lower than they would be in other situations.

**Rise in Population Growth:** Another factor that contributes towards urban sprawl is rise in population growth. As number of people in a city grows beyond capacity, the local communities continues to spread farther and farther from city centres.

**Consumer Preferences:** People in high income groups have stronger preferences towards larger homes, more bedrooms, bigger balconies and bigger lawns. This also causes urban sprawl as this option is not usually available in crowded cities. People generally look out for low-density residential areas where they can get home according to their preference.

**The UK is short of suitable housing. Approximately 3 million new homes are needed by 2030. They need to be built somewhere. The options are using Brownfield sites or Greenfield sites.**

### Brownfield sites are often on disused or derelict land.

- There are more available in the North and Midlands (but most housing demand is in the south east).
- They are valuable as existing buildings can be split up into smaller apartments.
- The site has already been developed so reduces urban sprawl.
- Use unsightly areas for building developments, so improves the urban environment.
- Are found in urban areas, so building housing there reduces demand on car use.
- Are more expensive to build on as often the land needs to be cleared first (especially if land is contaminated from previous industrial use).

### Greenfield sites

- Are sites which have not previously been built on. This includes the greenbelt land around cities.
- Are cheaper to build on.
- Are not favoured by environmentalists, as it encourages urban sprawl.
- will mean that countryside is built on.
- Encourage commuting and traffic congestion as people travel into urban areas from the countryside.
- Often leaves derelict sites in city centres looking run down – doesn't solve this issue.



## Social challenges of urban sprawl

Some issues are obvious:

- With an ever growing city, there is an ever growing problem with waste! While recycling centres typically recycle 70-85% of the material taken to them, the council has had to start introducing charges on items such as rubble simply to manage spiralling costs. This has led to an increase in fly-tipping. What goes in the general waste bin, goes to landfill. In many ways this is an environmental catastrophe, but especially in terms of potential water pollution – and therefore is a social issue too!
- Increased vehicle use is also fuelling the obesity crisis and causing other health problems.

Some issues are not so obvious, but are REALLY important to understand:

- While old industrial areas (such as Gun Wharf) which are derelict can be knocked down and the **brownfield site** reused (Gun Wharf Quays as it is today), the older, less desirable “working class housing” nearby often remains, slowly falling into disrepair and making the housing cheaper, relative to other houses in and around the city.
- Suburbs built on greenfield sites are built to modern standards, demand drives prices up further, and so the houses are much more expensive.
- Those on lower incomes, often with poorer education, generally end up in the cheaper housing – and in turn this creates issues with crime, radicalisation and unemployment.

## Geography

### Integrated transport system

Traffic issues are a big problem in Portsmouth and in the larger Portsmouth-Southampton area, along the M27 corridor. It can often take 5 times longer to complete a journey during rush hour than it does during off-peak times. As a result of this, there are two key transport schemes you should be aware of. One has been completed; the second is in the planning phase.

**Portsmouth Transport Hub (built):** On the seafront, between the major attractions of the Historic Dockyards and Gun Wharf Quays, and next to the Portsmouth Harbour railway station, a new transport hub has been built. An information centre is provided, here tickets for buses, coaches, the railway and ferries can be booked. As well as being next to the railway station, it is the bus/coach station and taxi rank, and is less than 1 minute walk to the Isle of Wight Ferry terminal and 2 minute walk to the Gosport ferry (used by large numbers of commuters). This makes transfer between different modes of transport much easier and quicker, and is further encouraged by bus lanes around the city centre (making it quicker on bus than in a car), therefore more people use public transport, helping to reduce traffic congestion in the city.

### Transport chiefs want to build a multi-million-pound hi tech tram system to link Southampton and Portsmouth (proposed):

Several schemes to improve transport in the South have been suggested, with one such project being a new tram line operating between Southampton and Portsmouth and serving communities between the two cities. The line could see a tram service operating throughout Southampton, connecting St Mary's, the civic centre, West Quay, Ocean Village and Woolston, as well as other places. It would then head down the coast to Portsmouth city centre. Labour Southampton City Council leader Simon Letts says “the South could take inspiration from the likes of Nottingham, which has had a tram since 2004. If you have a tram line that is segregated from traffic it gives you a much more reliable and faster service which is key to getting people out of their cars. Southampton and Portsmouth would definitely benefit from a modern tram system that was properly integrated. Tram services in other parts of the country have reduced car traffic, increased property values and generally improved people's quality of life, there is no question about it.”





## Gun Wharf Quays regeneration

### Why was it regenerated?

- The area was a disused, derelict part of the naval dockyard, close to the historic dockyards, ferry/rail terminals and historic areas of Portsmouth such as Spice Island, Old Portsmouth and Southsea Common.
- The shopping areas in the city centre (NOT at Gun Wharf) were not attracting 'high-end' brands, and one of the shopping centre buildings was condemned and knocked down.
- The city wanted to improve its 'offer' for tourists – and increase the number of tourists who wanted to visit the city, to attract further inward investment.
- The council wanted to open up the waterfront for public use (previously inaccessible due to Navy use) and to create jobs.

### What are the main features of the regeneration scheme?

- Gun Wharf Quays shopping centre – 90+ designer shops
- Cinema, state of the art bowling alley, art gallery, casino
- Spinnaker tower – 170m tall viewing tower with fantastic panoramic views across Portsmouth and the Solent
- Marina, harbour water tours and rib boat rides
- Gunwharf Quays has its own on-site recycling centre, and over the last three years has increased its combined recycling and reuse performance from 48% to 80%.
- Gunwharf Quays has one of the largest arrays of solar panels on a shopping centre in Europe, which are used to power the car park.

## Key terms and definitions for this topic

**Urbanisation** – is the increase in the proportion of people living in towns and cities.

**Distribution** – the way in which something is spread over an area.

**Population Density** – is the number of people per unit of area, usually quoted per square kilometre.

**Densely populated** – high number of people per km<sup>2</sup>

**Sparsely populated** – low number of people per km<sup>2</sup>

**Skills shortages** – Not enough people with the appropriate skills to do the jobs required.

**Urban sprawl** – the rapid expansion of cities and towns.

**Infrastructure** – the basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise.

**Brownfield sites** – is an area that has been used before and tends to be disused or derelict land. Such sites are usually abandoned areas in towns and cities which have been used previously for industrial and commercial purposes.

**Greenfield sites** – are areas of land, usually agricultural land, which are being considered for urban development.

## Geography

### Practice questions worth 1 or 2 marks

Describe the pattern of distribution of population in the UK.

Describe the pattern of population change in UK cities shown on page 2 (top left).

Outline the popular places of origin for migrants to Portsmouth.

### Practice questions worth 8 or 9 marks

For an urban regeneration scheme you have studied, evaluate its success.

### Practice questions worth 4 marks

Explain why population distribution in the UK is uneven.

Suggest why the South East of England is so densely populated.

Explain why it is not always possible to use brownfield sites for housing developments.

### Practice questions worth 6 marks

Discuss how an integrated transport system might benefit a UK city you have studied.

To what extent does building on brownfield sites in city centres solve the issues of urban sprawl?

“Urban sprawl causes socio-economic segregation within cities and leads to increased levels of crime in some areas.” Do you agree with this statement? Justify your opinion.

## Forgiveness and Reconciliation

### **Forgiveness:**

All religions encourage forgiveness.

Sometimes there are some actions that are very difficult to forgive.

Here are 2 examples of people who suffered greatly that have still managed to forgive those that had done them wrong....

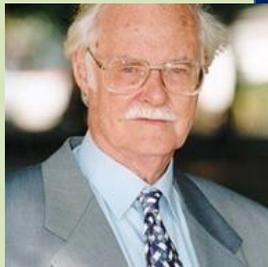
### **Corrie Ten Boon**

Corrie helped Jews in Holland during the Holocaust/WW2. She was caught and she was sent to a concentration camp. Her father and sister were shot, but by some chance she was realised. Years later when giving a talk about the Holocaust in Munich she met a guard that had been at her concentration camp. He held out his hand to shake hers, but all she felt was anger. She prayed so she could forgive him, and thought about the teachings and actions of Jesus. When she shook the guard's hand, she felt love and was able to forgive him.



### **Eric Lomax**

Eric was taken a prisoner by the Japanese during WW2 and forced to build the Burma railway. During his time his captors treated him poorly, he was tortured and the prisoners faced starvation. At the end of the war Eric was so angry at these captors he said "I would have been happy to murder him" (about one particular guard). Years later Eric decided to meet this man who had tortured him and Eric was able to forgive Nagase who told Eric how sorry he was.



## **BVT**

### **Conflict**

#### **Key vocabulary**

Forgiveness

Justice

Protest

Reconciliation



## Justice and Protest

**Reconciliation** is when someone is able to **make up** with someone they have had conflict with.

This is **only possible once forgiveness** been accepted.

**Justice** is **making things right**.

Many people believe getting justice can be **revenge** – but it can also be making things **fair** for example someone being sentenced by a judge to a crime they have committed.

Other **examples of justice** could be:  
Protesting, voting to make a change, getting a law passed

### **Examples of recent protests:**

[https://www.youtube.com/watch?v=onloEzLg4w](https://www.youtube.com/watch?v=onloEzLg4wA)

A (climate change 2019)

<https://www.bbc.co.uk/news/uk-england-53120735> (Black Lives matter 2020)



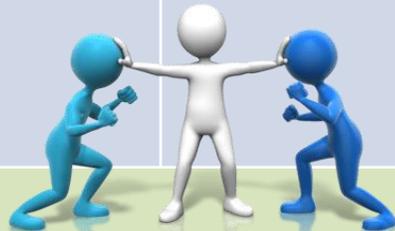
### Is protest a good way to achieve Justice?

Is violent protest more effective? Some would agree because it gains **media attention** more. Think about historical active protests such as the **suffragettes** who campaigned violently, by burning down buildings, putting bombs in letter boxes. What about the recent **pulling down of the statue of Edward Colston in Bristol**, protesting to anti slavery and supporting the **Black Lives Matter** campaign?

However some would argue that **violence only encourages more violence**. **That when trying to make a change it is better to win hearts and minds** and take the morale high ground. This is something that **Martin Luther King Jr** believed.

# Religious Beliefs about forgiveness, Justice, and protest

Christianity	Islam	Buddhism
<p>Encourages <b>forgiveness</b>, taught by: parable Prodigal Son and Lord's prayer "We forgive those that trespass (sin) against us."</p> <p>Believe <b>justice</b> is gained from <b>forgiveness and reconciliation</b>. Christians fight and speak up for injustices in the world. However, some Christians may follow "an eye for an eye a tooth for a tooth" from the Old testament, representing revenge as justice.</p> <p>Believe that <b>Protest</b> can make a change and bring justice.</p> <p>Believe violent protest is acceptable WHEN peaceful protest has failed and if it achieves a change for the common good.</p>	<p>Encourages <b>forgiveness</b>, taught by: "Those who pardon and maintain righteousness are rewarded by God" Qur'an.</p> <p>Muhammad and the old lady: Muhammad helped an old lady who had regularly mistreated him</p> <p>Believe <b>justice</b> should be sort by punishment. Some extreme examples are Shari'ah law that punishes adultery by stoning to death.</p>	<p>Buddhism encourages <b>forgiveness</b>, HOWEVER recognises that sometimes it is too difficult to forgive.</p> <p>Believe in non-violent <b>protest</b> speaking out against injustice is important as it follows the <b>Right Action of the Eightfold Path</b></p>



## BVT

### Conflict

#### Key vocabulary

- Forgiveness
- Justice
- Protest
- Reconciliation
- Terrorism
- Jihad
- Radicalisation



#### What causes conflict?

- Greed
- Defence
- Retaliation (revenge)
- To stop aggression / terrorism
- To stop injustice / protect other

## Investigating Terrorism

Google definition of terrorism is "the unlawful use of violence and intimidation, especially against civilians, in the pursuit of political aims."

Terrorism is to create fear. It does this through types of violence that are difficult to prepare and control. **At no point does it mention the word religion.**

### Why do some people get involved in terrorism? Is terrorism linked to Islam?

**This is not a straight forward answer. Read the following viewpoints about terrorism and think about your opinion on this matter:**

Terrorism is when extreme people do extreme things. There have been many extreme acts of violence by different groups of people (religious and non religious) in the past to gain political gain. E.g. ISIS, suffragettes. This extreme behaviour is **NOT subject to being religious.**

Some people may argue that if you take part in extreme violence you are **not truly religious**, as all religions try to **preserve PEACE.**

Some may argue that when looking at Islam, a minority of Muslims are following a religious idea called **Jihad** or **Holy War**. Muslims involved in terrorist acts may believe this and feel a need to attack those that are against Islam "Fight in the name of Allah" (Qur'an). **However**, 2 things:

- 1) This quote is taken out of context of modern times. It is also linked to rules of Holy War (see next slide) that terrorism **does not follow.**
- 2) These minorities of Muslims believe this because they have been **radicalised.** The people at the top of terrorist organisations are NOT truly religious, they are organising terrorist acts for political reasons – to gain power, assert dominance etc.

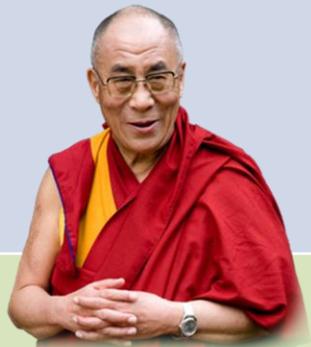


# Violence and Peace

By nature religions are peaceful. However there are some times when some religions will justify violence for what they believe is a good reason.

## Buddhism

Buddhists are **pacifists** – believe in peaceful methods and behaviour. Buddhism teaches that consequences will have consequences  
The Dalai Lama said  
*“Hatred with not cease by hatred, but by love alone”*  
Buddhism teaches doing the **“Right Action” in the Eightfold Path principles.**



## Christianity

Jesus teaches peace  
*“Love your enemies and pray for them”*  
Jesus said *“Those that live by the sword, die by the sword”*  
  
HOWEVER:  
There are different quotes from the Old Testament that show conflict can be acceptable:  
*“An eye for an eye, a tooth for a tooth”*  
*“Declare a Holy War, call the troops to arms”*

## Islam

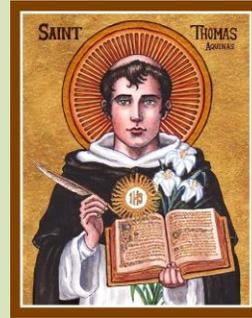
Islam means peace  
Muslims will greet each other by saying “salaam alaikum” meaning peace be upon you.  
  
HOWEVER:  
Those that die in the name of Allah will be rewarded in paradise. When Muhammad was alive the Muslim community had to fight to defend themselves or be killed. Allah ordered Muslims to fight when attacked, so Holy war became **duty** for Muslims  
*“Fight in the cause of Allah those who fight you”* (Qur’an)

# BVT

## Conflict

### Key vocabulary

Jihad  
Pacifism  
Just War



# Holy War – a justified war?

A Just war is a war that people will justify i.e. going to war for a good reason. Some may believe defending yourself may be a just reason to go to war or protecting innocent people from harm.

In religion, Christianity and Islam have terms for a just war, outlined below

### Christianity:

In the 1200’s **St Thomas Aquinas** (a Italian Catholic Priest) declared the conditions for a just war, which Christians use today

#### The war MUST:

- Be for a just cause
- Have a good chance of success
- Be legally approved by a legitimate government
- Not harm innocent civilians
- Be a last resort – disputes should have tried to be sorted out peacefully

### Islam:

Many Muslims relate just war with Jihad. Jihad means struggle. Greater Jihad is the spiritual struggle e.g. against sin. But **Lesser jihad is the physical struggle** e.g. to preserve Islam. Lesser Jihad is a belief to justify a Holy war...

#### BUT the war MUST:

- Be for a just cause e.g. Muslims are being oppressed / mistreated
- Not harm innocent civilians
- Treat prisoners well
- War can only be declared once the enemy has attacked



# Weapons of Mass Destruction



Weapons of mass Destruction or WMD are weapons used in modern day conflict. These include:  
**Nuclear, biological, radioactive and chemical.**



## BVT

### Conflict

#### Key vocabulary

- WMD
- Nuclear
- Radioactive
- Biological
- Chemical

# Religious groups / people that work towards peace

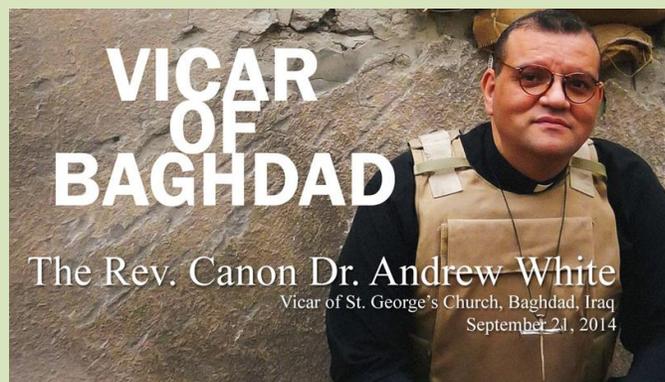
A religious example of someone who has campaigned for peace is **Andrew White, known as the Vicar of Baghdad:**

Andrew Smith founded the Foundation for Relief and Reconciliation in the Middle East.

His main aim in the Middle East has been to try to maintain communication between Shia and Sunni leaders. He sees his role as trying to mediate and re-establish the dialogue between conflicting groups.

He also helped the victims of war, by supporting ordinary people in war zones. He remained as the only Anglican Church in Iraq, until his departure, ordered in November 2014 by the Archbishop of Canterbury due to security concerns.

Christianity	Quakers	Buddhism
<p>Does not agree with the USE of WMD                      “will have fatal consequences for life on earth... nuclear weapons should be banned” Vatican council (Catholic faith)                      BUT                      Believe that they <u>are</u> <b>acceptable</b> to have as a deterrent</p>	<p>Against the principles of use of weapons as they are pacifists                      They believe they harm everyone and cannot be controlled in a fair way in warfare</p>	<p>Are against suffering and therefore against WMD.                      WMD are against the <b>5 Precept beliefs</b> – the 1st Precept of not harming any living thing.</p>



**Christian Peace making Teams**

Send small teams out to areas of conflict to try to end the conflict by peaceful means

They work in areas such as Palestine and Iraq talking to local people educating them in order to bring about peace

They bring aid and support to victims of war

# The Five Pillars

## Shahadah

This is the first pillar means **Declaration of the Islamic faith**. Muslims repeat the words of the Shahadah to show their faith and commitment to Allah. The first line is:

**“There is no God but Allah, Muhammad is the messenger of Allah”.**

The Shahadah is therefore spoken at very **important** times: it is spoken in prayer, spoken to new born babies and to Muslims just before they die.

## Salah – Prayer

Muslims prayer a 5 times a day, the **importance** of this is:

- It is frequent because otherwise Muslims sins would build up
- Rewarded by Allah in Heaven

Muslims also pray in a large group at Mosque. Men gather at the mosque, women often pray at home. This strengthens the idea of **Ummah** (which translates as Brotherhood) or community.

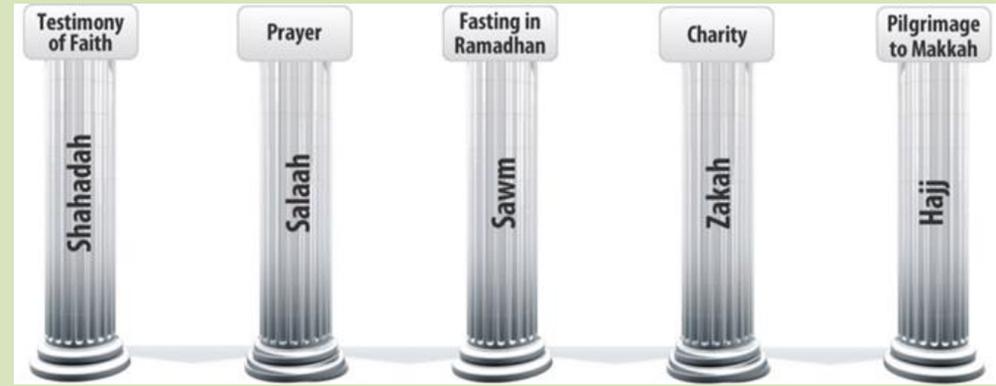


## BVT

# Islamic Practices

### Key vocabulary

- Shahadah
- Salah
- Adhan
- Wudu
- Rak’ah



## How do Muslims pray?

Muslims are called to prayer (this is called **Adhan**). The call is called out from the Mosque, it uses the words of the Shahadah.

Before prayer Muslims perform **Wudu**. This is to wash before prayer. This is to be physically clean before praying to God.

Muslims pray using the movements of **Rak’ah**.

These are special movements with set words. This is a set routine that is used every time a Muslim prays.

The first 2 lines of prayer/Rak’ah are the words of the Shahadah.

The **importance** of this is:

- A Connection to Allah – this is shown in the Qur’an **quote “Prostrate and draw near to Allah”**
- Strengthens faith and dedication and praise of Allah

## Friday night Prayer – called Jumu’ah

This happens only once a week  
 Adhan - call to Prayer given  
 Wudu performed  
 The Imam gives a sermon  
 The congregation are given direct spiritual guidance as part of the sermon  
 The sermon may be about local or global issues  
 It finishes with Rak’ah

## Regular daily Prayer

Daily prayer is conducted 5 times a day  
 Adhan - call to Prayer given  
 Wudu performed  
 Rak’ah is performed  
 It is a set prayer of words and movements, with no sermon

# The Five Pillars

## Sawm

**Sawm** means fasting. It happens during the Islamic calendar month of **Ramadan**.

It is a celebration of a past event. The past event being the Night of the power. This is the night that Muhammad was visited in the cave by Jibril and chosen as prophet.

“Ramadan is the month in which the Qur'an was sent down as a guide to humanity” Qur'an

What happens during Sawm?

- ❖ Fasting from sunrise to sunset
- ❖ Refrain from sexual activity
- ❖ Consider behaviour to others
- ❖ Time should be spent reflecting praying not wasted on material things e.g. watching TV
- ❖ Get up before dusk and eat something. Then after sunset have a meal with their family.
- ❖ Many Muslims go to mosque in the evening for prayers.

## Why is Sawm important?

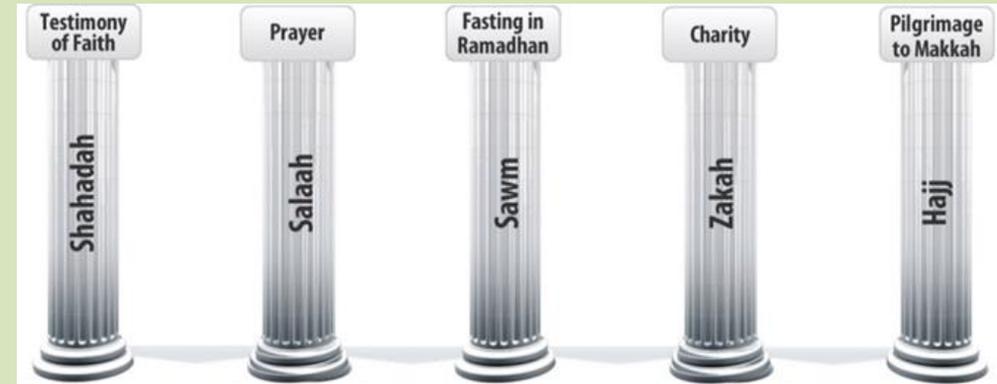
- Sawm remembers the importance of Muhammad and therefore his teachings. (see quote above)
- Sawm develops Muslims determination, faith, resilience; it stops cravings and desires and allows Muslims to reflect and focus on their religion.
- Sawm also brings Muslims closer to Allah, showing them the right path for their life, it is also a month for forgiveness.
  - Zakah given this month demonstrating what Muslims have (e.g. money, possessions, food) and what others do not. That they should not to take things for granted.

## BVT

# Islamic Practices

## Key vocabulary

Sawm  
Fasting  
Ramadan  
Zakah  
Alms



## Zakah

**Zakah** is giving **Alms** – this means giving to charity. Giving Zakah is a duty for Muslims – as part of the 5 pillars.

Muslims give **2.5%** of their annual income and savings as adults. It is paid by all Muslims after debts, expenses are taken out and of those Muslims who have money left over. Therefore if you have nothing left after rent, food etc it is not paid. For this reason it is not a tax as you only pay if you can.

The Qur'an promotes Zakah as it says “Be steadfast in prayer and giving”.

## Importance of Zakah

- Purifies Muslims by showing they have no greed – they are blessed by Allah for this giving
- By giving they will be rewarded by their actions on judgement day
- Zakah can be given to charities to support poverty in Muslim communities but also in other world wide communities.



# The Five Pillars

## Hajj – Pilgrimage

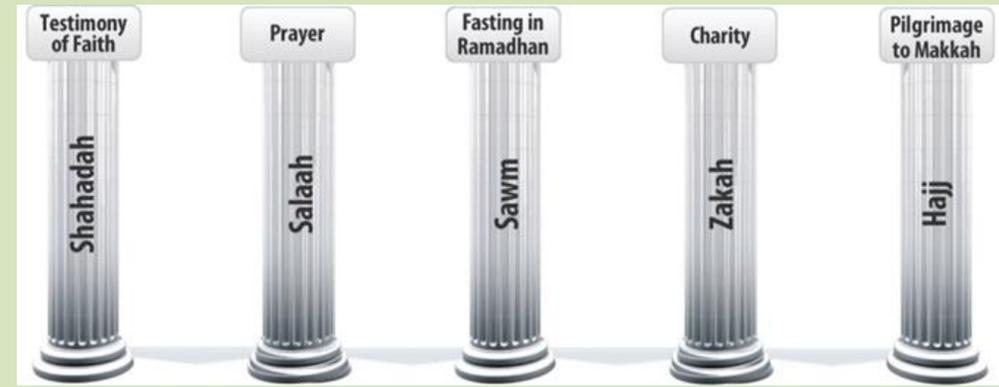
- All Muslims are expected to take part in Hajj at least once in their lives. It happens once a year for a 10 day period.
  - Everything that happens at Hajj has meaning and **Significance in its actions or the Places** where it is set, hence why the pilgrimage has a **set route**, around the cities of Mekkah and Medinah.

# BVT

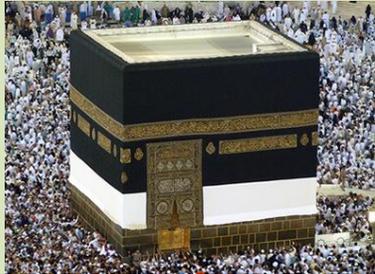
## Islamic Practices

### Key vocabulary

- Hajj
- Mekkah
- Medinah



## Below are some of the KEY places and their significance that are visited during Hajj



Place	What happens here?	Why is it important? Significant?
Ka'aba and the black stone.	The Ka'aba shrine is covered each year in black cloth embroidered in gold. Muslims perform Tawaf – walking around the ka'aba 7 times.	The black stone is said to have been given by Jibril to Adam. The Ka'aba was built around the sacred black stone (first by Adam, then Ibrahim). These are the <b>oldest shrines to Allah on earth</b> . The circling re-enacts Muhammad smashing idols to convert Mecca to Islam.
Zam well	Muslims drink water from the well	The well was given to Ibrahim by Allah for his wife and step son Ismail, when they were searching for water. It <b>represents for Muslims how water is essential for life and Allah is also essential for life</b> . It shows how <b>Allah will provide for them</b> .
Mount Arafat (Also called mercy mountain)	A hill Muslims climb up. Muslims pray for forgiveness for their sins here.	Muhammad gave his final sermon here. It is believed that <b>all sins can be forgiven</b> here.
Madinah	The prophet's mosque is here with <b>Muhammad's tomb</b> . Muslims visit this sacred place.	Madinah was the first city Muhammad converted to Islam. Muslims believe no prayer will be unanswered here.

# Festivals of Islam

## Eid Ul-Fitr

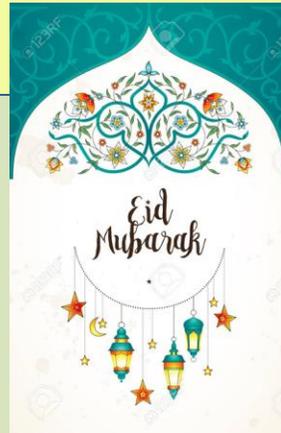
What is Eid Ul-Fitr and how is it celebrated?

- ❑ This is the festival at the **end of Swam during Ramadan**
- ❑ Muslims are allowed the day off school and work
- ❑ People greet each other “Eid Mubarak”
- ❑ The fast is broken by eating dates
- ❑ At mosque morning and evening Eid prayers are said and the importance of Zakah is explained
- ❑ Families meet up and celebrate: Cards and presents are exchanged, new clothes and a special evening meal.

Why is Eid Ul-Fitr important?

**Eid Ul-Fitr is the celebration of completing Swam through Ramadan and the giving of Zakah. Therefore its importance is...**

- ❑ In giving Zakah to needy /helping others, sharing Allah’s wealth
- ❑ A celebration that Muslims have completed Ramadan.
  - That Muslims have given up material things and focused on their faith and family
  - Showing good behaviour - respectful, kind and humble to others.
  - Focused truly on Allah for the month.



## BVT

# Islamic Practices

## Key vocabulary

Eid Ul-Fitr  
Sawm  
Ramadan  
Zakah  
Eid Ul-Adha  
Ashura  
Musa  
Israelites



**Look at these news stories / photos to show celebrations of Eid Ul-Fitr:**

- <https://www.bbc.co.uk/news/in-pictures-44485703>
- <https://www.bbc.co.uk/news/uk-england-44496158>

## Eid Ul-Adha

This translates as Festival of the sacrifice and relates to the story of Ibrahim. It is celebrated at the **end of Hajj**.

### How is it celebrated?

The Sacrifice of a Lamb is split 3 ways:

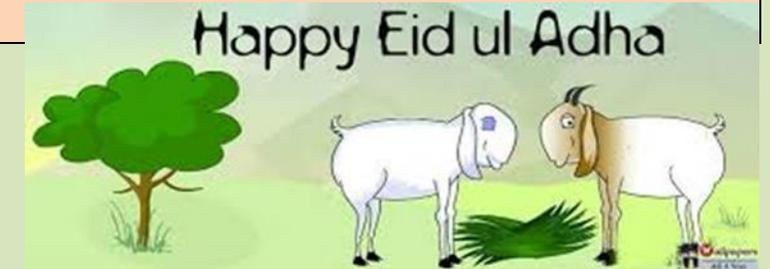
1. 1/3 for family
2. 1/3 for relatives, friends, neighbours
3. 1/3 for the poor

Though more families now give money to charity instead of a slaughter New clothes are brought and Muslims go to Mosque. Eid prayers are read and Muslims are reminded of Ibrahim's sacrifice for Allah.

### Why is it important?

Muslims observe this Festival in respect and remembrance of Ibrahim, who showed devotion and faith to Allah

It shows Muslims that they should be able to submit to Allah for their faith and you shall be rewarded; just like Ibrahim.



## Festival of Ashura

This Festival is a celebration which recognises how Allah helped prophet Musa (Moses) escape the persecution of the Egyptians. The Israelites escaped with Musa (Moses) on the **10<sup>th</sup>** day (Ashura means 10<sup>th</sup>).

On this day the Israelites and Musa fasted in the desert. For this Festival Muslims also fast on this day in recognition of Prophet Musa and for forgiveness.

# How do Shi'a Practices differ?

## 10 obligations of Shi'a Islam

These are the **Shi'a equivalent of the Sunni 5 pillars**. 10 obligations have 4 of the 5 pillars in – Salah, Hajj, Sawm and Zakah.

The 10 Obligations DO NOT have the Shahadah

The 10 Obligations also have some other duties:

- Khums – a different charity / alms giving
- Showing Maroof – is guiding others towards good. E.g. encouraging charity, helping others, fighting against injustice.
- Munkar is forbidding evil e.g. rejecting Shaytan (Satan)
- Tawalla is expressing and showing love to others
- Jihad – struggle to preserve and be focused to Islam
- Tabarra is showing hatred to those that oppose Allah. Some may argue that this links with Lesser Jihad and Holy war. Fighting against others in the name of Allah.

## Khums

Shia Muslims pay **20%** on their annual wealth after expenses/debts are paid.

Khums are split 6 ways:

- ❖ Allah
- ❖ Muhammad (now this section goes to religious teachers)
- ❖ Relatives of Muhammad
- ❖ Orphans
- ❖ The poor
- ❖ Anyone who is away from their home and in need

This would create lots of money for the needy however only 10-15% of Muslims are Shi'a.



## BVT

# Islamic Practices

## Key vocabulary

10 Obligations  
Khums  
Maroof  
Munkar  
Tawalla  
Tabarra  
Jihad



## Salah – How is pray different for Shi'a Muslims?

1. Shi'a Muslims pray **3 times**. However – they do the same amount of pray / Rak'ah, but fit it into 3 sessions.
2. A wooden block or clay tablet signifying the Holy city for Shia Muslims is touched when praying
3. When Shia Muslims pray it is to affirm Muslims humility to the power of Almighty Allah.
4. Wudu must also be seen as purifying the heart (as well as body) before standing in front of Allah

## How is Sawm different?

For Shi'a Muslims: Swam is about giving generously at Ramadan, but also to think about **Judgement day** – to remind themselves to reject evil. Swam helps them grow spiritually and will therefore be stronger to reject evil



## Festival of Ashura

### Its importance:

This festival is a remembrance festival for the Death of Hussain: Therefore it is a mourning Festival, one of sadness.

It remembers Hussein (Grandson of Muhammad) who was a Shi'a Islamic leader. Yazid tried to seize power from Hussain which led to the battle of Karbala on the 10th day of the month (Ashura means 10<sup>th</sup>). Hussein and his family tried to flee, but were captured and murdered by Yazid

### What happens?

- Muslims wear black and Mosques are covered with black cloth
- After afternoon prayers poems and the story of the murder is told
- Many Muslims will find it very upsetting and will cry, Some Shi'a Muslims will whip themselves in sorrow (though this is now less common)

## French

### Fais une description de ton collègue..

mon collège est situé / se trouve (*my school is located*)

c'est un collège mixte / c'est un petit collège (*it's a mixed school / small school*)

il y a / nous avons (*there is, are / we have*)

nous n'avons pas de... (*we don't have*)

la salle de classe (*classroom*)

le couloir (*corridor*)

le gymnase (*gym*)

le terrain de sport (*sports field*)

### Quelles matières aimes-tu ? Tu as une matière préférée ?

j'aime / je ne supporte pas (*I like / can't stand*)

ma matière préférée, c'est... (*my favourite subject is...*)

les maths / les sciences / l'EPS / l'anglais / le français (*maths, science, PE, English, French*)

intéressant / amusant / barbant (*interesting / fun / boring*)

### Décris-moi une journée typique au collège...

normalement je me lève à... (*normally I get up at...*)

je vais au collège à pied / en bus / à vélo (*I go to school by foot / bus / bike*)

le premier cours commence à (*the first lesson starts at*)

le collège finit à (*school finishes at*)

avant de + infinitive (*before doing something*)

après avoir + past participle (*having done something*)

### C'était comment hier au collège ?

je me suis réveillé(e) (*I woke up*)

je suis parti(e) (*I left*)

je suis arrivé (*I arrived*)

pendant la récré (*during break*)

mon premier cours (*my first lesson*)

après (*afterwards*)

j'ai joué (*I played*)

j'ai mangé (*I ate*)

j'ai travaillé (*I worked*)

c'était (*it was*)

### Que penses-tu du système scolaire anglais ? Quelles sont les plus grandes différences entre lui et le système français ?

je préfère / j'aime mieux (*I prefer*)

car / puisque / parce que (*because*)

c'est plus / moins ... que (*it's more / less... than*)

on peut (*one can / you can*)

on ne peut pas (*you can't*)

on doit (*you have to*)

on ne doit pas (*you don't have to*)

il faut (*one must*)

c'est interdit de (*it's forbidden to*)

**Qu'est-ce que tu feras dans le futur ? Est-ce que tu voudrais aller à la fac /faire un apprentissage ? + Et quand tu auras 30 ans... ?**

je vais / j'espère / je voudrais + être, aller, travailler (*I'm going / hope / would like to be, go, work*)

je travaillerai ( I will work)

j'aurai (I will have)

j'habiterai (I will live)

je serai (I will be)

j'étudierai (I will study)

## Key Grammar

### Comparatives and superlatives

Use 'plus', 'moins' and 'que' to compare things.

La France est **plus grande que** l'Angleterre = France is bigger than England

Le sport est **moins intéressant que** la lecture = sport is less interesting than reading

Mon frère est **le plus intelligent** dans son collège = my brother is the most intelligent in his school

This very useful word can be used to say what 'people' do, or what 'they' do. For example:

In France, they start school at 8 in the morning = **En France, on commence à huit heures du matin**

In France, they don't go to school on Wednesday = **En France on ne va pas au collège le mercredi**

## French

### The simple future

This is how we say that we 'will' do something in the future. Typically, take the infinitive of the verb and add on the following endings. Notice that these endings come from the present tense of the verb 'avoir' (to have).

There are some exceptions, usually with irregular verbs (to do, to be, to have, to go etc)

person	ending
je	-ai
tu	-as
il	-a
nous	-ons
vous	-ez
ils	-ont

je regarderai – I will watch

nous mangerons – we will eat

ils travailleront – they will work

tu écouteras – you will listen

Exceptions:

j'**aurai** – I will have

je **serai** – I will be

je **ferai** – I will do

j'**irai** – I will go

(and there are some others)

## Key Grammar

### As-tu un petit boulot? / Reçois-tu de l'argent de poche? / Il faut aider à la maison pour ton argent?

je reçois (*I get*)

mes parents me donnent (*my parents give me*)

quand / si (*when / if*)

cinq euros chaque semaine (*five Euros every week*)

je travaille (*I work*)

je dois aider à la maison (*I have to help at home*)

nettoyer (*to clean*)

laver (*to wash*)

ranger (*to tidy*)

### Que font tes parents comme métier?

mon père / ma mère travaille comme... (*my mum/dad works as...*)

il / elle est ... (*s/he is...*)

docteur (*a doctor*)

professeur (*a teacher*)

homme / femme d'affaires (*businessman / businesswoman*)

dans une usine (*in a factory*)

dans un collège (*in a school*)

### Talking about jobs / occupations

We don't use the word 'a' when talking about a job we do.

je veux devenir professeur = I want to be a teacher

ma soeur travaille comme chef de cuisine = my sister works as a chef

### Qu'est-ce que tu veux faire plus tard dans ta vie?

je veux être / devenir (*I want to be / become*)

+ raisons:

parce que je m'intéresse beaucoup à (*because I'm very interested in*)

car c'est important d'aider les autres (*since it's important to help others*)

### Le travail bénévole c'est important aujourd'hui?

une association caritative (*charity*)

aider les autres (*to help others*)

une année sabbatique (*gap-year*)

voyager (*to travel*)

aller à l'étranger (*to go abroad*)

### Modal verbs

Reminder: modal verbs use a second verb in a sentence.

They help us to state what we CAN, MUST, OUGHT to do etc

devoir – to have to / to must

pouvoir – to be able to / to can

je dois aider dans le magasin = I have to help in the shop

mon oncle peut construire de grandes maisons = my uncle can build big houses

**French**

### **Describe tu colegio..**

Mi colegio está ubicado / está ubicada (*my school is located*)

es un colegio mixto / es un colegio pequeño (*it's a mixed school / small school*)

hay / tenemos (*there is, are / we have*)

no tenemos... (*we don't have*)

La aula (*classroom*)

El corredor (*corridor*)

El gimnasio (*gym*)

El campo (*sports field*)

### **¿Cómo estuvo ayer en el colegio?**

me desperté (*I woke up*)

Salí (*I left*)

Llegué (*I arrived*)

Durante el recreo (*during break*)

Mi primer clase (*my first lesson*)

después (*afterwards*)

jugué (*I played*)

comí (*I ate*)

trabajé (*I worked*)

Fue (*it was*)

¿Qué asignaturas te gustan? ¿Tienes una asignatura favorita?

Me gusta / no soporto (*I like / can't stand*)

Mi asignatura favorita, es... (*my favourite subject is...*)

matemáticas / ciencias / educación física / inglés / francés (*maths, science, PE, English, French*)

interesante / divertido / aburrido (*interesting / fun / boring*)

### **¿Qué opinas del sistema escolar inglés? ¿Cuáles son las mayores diferencias entre él y el sistema español?**

Prefiero (*I prefer*)

Porque/ ya que/ puesto que (*because*)

Es más/ menos ... que (*it's more / less... than*)

Se puede (*one can / you can*)

No se puede (*you can't*)

Tienes que (*you have to*)

no tienes que (*you don't have to*)

Se debe (*one must*)

Está prohibido (*it's forbidden to*)

**Spanish**

Describe un día típico en el colegio...

normalmente me levanto a las... (*normally I get up at...*)

Voy al colegio a pie/ en autobus / en bici (*I go to school by foot / bus / bike*)

El primer clase comienza a las (*the first lesson starts at*)

El colegio termina a las (*school finishes at*)

Antes de + infinitive (*before doing something*)

Después de + past participle (*having done something*)

### **Pros and Cons**

**A nice way to describe the pros and cons of something is to use 'lo + adjective' to mean 'the... thing'**

**Lo bueno – the good thing**

**Lo malo – the bad thing**

**Lo interesante – the interesting thing**

**Lo gracioso – the funny thing**

**Lo bueno es que Salisbury es limpia\***

*The good thing is that Salisbury is clean*

**Lo malo es que Salisbury es ruidosa\***

*The bad thing is that Salisbury is noisy*

- *The word for town in Spanish is feminine so the adjective must end in 'a'*

**¿Que vas a hacer en el futuro? ¿Te gustaría ir a la universidad / hacer un aprendizaje? + ¿Y cuando tienes 30 ...?**

*Voy a / espero / me gustaría + ir, trabajar (I'm going / hope / would like to be, go, work)*

trabajaré (I will work)

tendré (I will have)

viviré (I will live)

seré (I will be)

estudiaré (I will study)

### **Comparatives (more than/less than)**

**más + adjective + que**

Southampton es **más** grande **que** Salisbury

*Southampton is **bigger** (more big) **than** Salisbury*

**menos + adjective + que**

Salisbury es **menos** grande **que** Southampton

*Salisbury is **smaller** (less big) **than** Southampton*

### **Superlatives (the most/the least)**

To say the **most** you need to use **el, la, los, las**

+ **más** + adjective

Salisbury es **la más** bonita

(Salisbury is the prettiest)

To say the **least** you need to use **el, la, los, las** + **menos** + adjective

Salisbury es **la menos** bonita

Salisbury is the least pretty

## The simple future

This is how we say that we 'will' do something in the future. Typically, take the infinitive of the verb and add on the following endings. Notice that these endings come from the present tense of the verb 'avoir' (to have).

There are some exceptions, usually with irregular verbs (to do, to be, to have, to go etc)

person	ending
Yo	-é
tú	-ás
Él/ella	-á
Nosotros	-emos
vosotros	-éis
Ellos/ellas	-án

Spanish

veré– I will watch  
comeremos– we will eat  
trabajarán– they will work  
escucharás– you will listen

Exceptions:

**tendré**– I will have

**Haré** – I will do

**Saldré** – I will go out

(and there are some others)

## Key Grammar

### Talking about jobs / occupations

We don't use the word 'a' when talking about a job we do.

Quiero ser profesor = I want to be a teacher

Mi hermana trabaja como cocinera = my sister works as a chef

### Modal verbs

Reminder: modal verbs use a second verb in a sentence.

They help us to state what we CAN, MUST, OUGHT to do etc

deber – to have to / to must

poder– to be able to / to can

Debo ayudar en casa = I have to help in the shop

Mi tío puede construir casas grandes = my uncle can build big houses

**¿Tienes un trabajo? / ¿Recibes dinero de bolsillo? / ¿Necesitas ayuda en casa por tu dinero?**

Recibo (*I get*)

Mis padres me dan (*my parents give me*)

cuando / si (*when / if*)

Cinco euros cada semana (*five Euros every week*)

Trabajo (*I work*)

Tendo que ayudar en casa (*I have to help at home*)

Limpiar (*to clean*)

lavar(*to wash*)

arreglar (*to tidy*)

**Qué quieres hacer más adelante en tu vida?**

Quiero ser/ llegar a ser (*I want to be / become*) + raisons:

Porque me interesa...(because I'm very interested in)

Ya que es importante ayudar a los demas (*since it's important to help others*)

**¿Qué hacen tus padres como trabajo?**

Mi padre/mi madre trabaja como... (*my mum/ dad works as...*)

es... (*s/he is...*)

Medico/a (*a doctor*)

Professor/a (*a teacher*)

hombre / mujer de negocios (*businessman / businesswoman*)

En una fábrica (*in a factory*)

En un colegio (*in a school*)

**¿Es importante el trabajo voluntario hoy?**

organización caritativa (*charity*)

Ayudar a los demas (*to help others*)

Un año sabático (*gap-year*)

viajar (*to travel*)

Ir al extranjero(*to go abroad*)

**Spanish**

# ART TERMINOLOGY YOU SHOULD KNOW LEARN AND USE

## Shape, form, space

Closed  
 Open  
 Distorted  
 Flat  
 Organic  
 Deep  
 Positive  
 Negative  
 Foreground  
 Background  
 Composition  
 Curvaceous  
 Elongated  
 Large  
 Small  
 2D                  3D

## Tone

Bright  
 Dark  
 Faded  
 Smooth  
 Harsh  
 Contrasting  
 Intense  
 Sombre  
 Grey  
 Strong  
 Powerful  
 Feint  
 Light  
 Medium  
 Dark  
 Dramatic  
 Large  
 Small

## Pattern and Texture

Repeated  
 Uniform  
 Geometric  
 Random  
 Symmetrical  
 Soft  
 Irregular  
 Coarse    Bold  
 Uneven  
 Bumpy  
 Rough  
 Smooth  
 Uneven  
 Spiky  
 Broken  
 Furry  
 Fine Flat  
 Grid

## Line

Fluent  
 Free          Rough  
 Controlled  
 Powerful  
 Strong  
 Geometric  
 Angular  
 Light  
 Delicate  
 Flowing  
 Simple  
 Thick Thin  
 Horizontal  
 Broken  
 Interrupted  
 Rounded  
 Overlapping  
 Feint

## Colour

Bright    Bold  
 Primary  
 Secondary  
 Tertiary  
 Radiant  
 Dull          Vivid  
 Contrasting  
 Deep  
 Monochrome  
 Harmonious  
 Complementary  
 Natural  
 Earthy  
 Subtle  
 Pale  
 Cool Warm  
 Saturated  
 Luminous  
 Strong

Basic, simple, solid, loud, quiet, bright, realistic,  
 stylised, observed, busy, vibrant, strange, interesting,  
 balanced, lively, negative, recognisable, abstract,  
 tactile, meaningful, symbolic, depressing, unique,  
 emotive, hidden, textural, dynamic, powerful,  
 intentional, concealed, subtle.

# Identity

Identity is the qualities, beliefs, personality, looks and/or expressions that make a person (self-identity as emphasized in psychology) or group (collective identity as pre-eminent in sociology).... A psychological identity relates to self-image (one's mental model of oneself), self-esteem, and individuality.

## Self-Identity

What do you look like?

How can you represent yourself in Art?

Observe yourself – hands, feet, shoes, clothes, face and facial features.

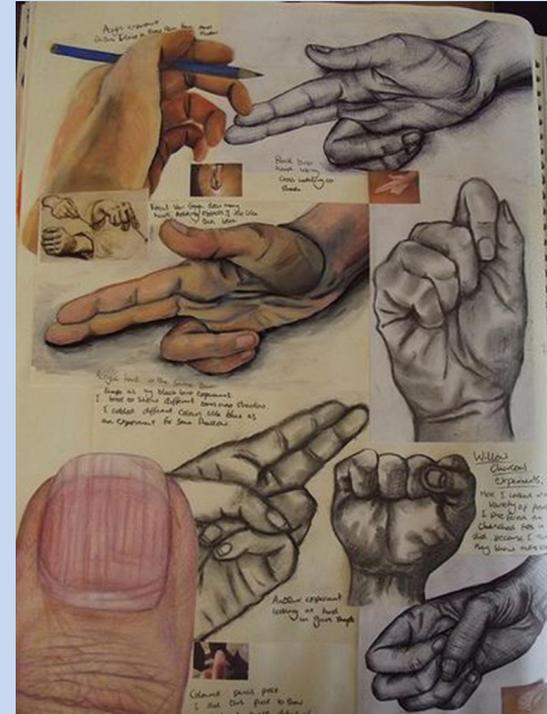
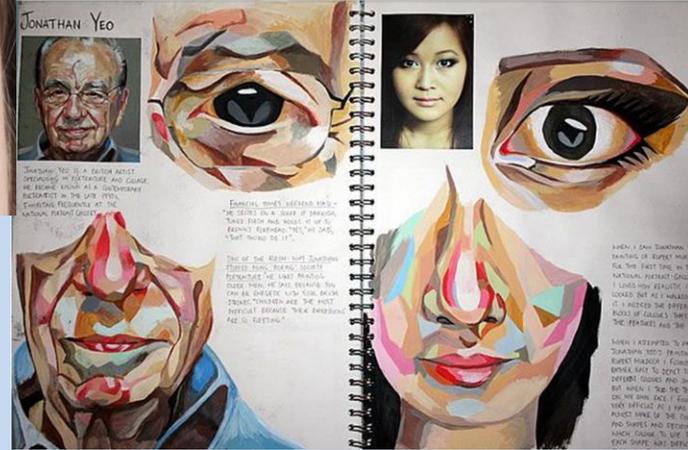
Find artists who use themselves for their art – start by looking at Antony Gormley, Mark Powell, Chris Drury, Jonathan Yeo, Chuck Close, Frida Khalo Edvard Munch, Cindy Sherman

Use different Art media to record yourself – pencil, paint, biro, mixed media, photography etc.

Judith Ann Braun – finger print artist



Mark Powell – biro art on old paper envelopes and maps



# Identity

## Exploring Yourself and Wider ideas

Ideas to start you thinking....  
What interests do you have?  
What pets?  
Family and friends?  
Your community?

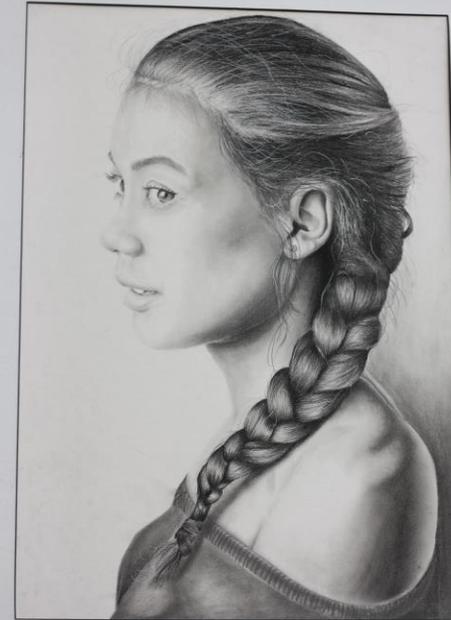
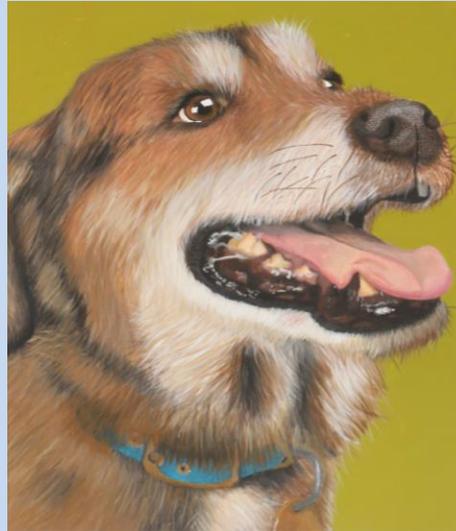
Any of these and more can be explored. Look at ideas using Pinterest/ TATE gallery/ Roche Court website to get ideas.  
Take lots of photos to work from.

The artist Banksy has been inspired to create art in a bathroom during lockdown – take a look

<https://www.abc.net.au/news/2020-04-17/banksy-bathroom-art-coronavirus-lockdown-united-kingdom/12156326>



Consider distortion – either by photoshop or making facial expressions



Look at different styles and art media eg. surreal art, impressionist, abstract, sculpture, painting, drawing



# Afro Celt Sound System: Release

## Context

This is a piece of fusion music, combining elements of African music, Celtic folk music and electronic dance music  
It was released in 1999

The band has featured a number of guest musicians over the year, including Sinead O'Connor who sings on "Release".

Key		
Grade 3	Grade 5	Grade 7



Kora



Talking drum



Bodhran



## Instruments/Sonority

African instruments: kora, talking drum  
Celtic instruments: hurdy-gurdy, uilleann pipes, bodhrán, fiddle, whistle, accordion  
Electronic Dance Music instruments: male/female vocals, synthesisers (including string pad, soft pad, bells, bass), breath samples, drum machine, electric piano, shaker and tambourine.

The piece is made from looping ideas (a common dance music technique)

Some of the playing techniques include glissando (a continuous slide of notes), ornamentation, double stopping (playing 2 strings together on the fiddle), open and closed hi-hat.  
There is a reverb effect on the vocals through the whole track.  
The synthesizer drone uses a filter (which automatically adjusts the EQ giving a "sweeping" sound)

## Tonality

The piece is in C minor

The piece has a modal feel at times.

## Tempo

The start of the piece is in free time (no set tempo/metre) Then when the bodhran comes in a steady tempo is set.

The piece is at 100bpm



Synthesizer

## Music



Uilleann Pipes

## Structure

The piece has a verse form (with no choruses)  
It contains an intro, verses, breaks, solos and an outro.

The full structure is:  
Intro, verse 1, verse 2, solos, verse 3, build, outro



Fiddle



Drum machine

## Rhythm, Tempo and Metre

The time signature is simple 4/4 (common to dance music)  
There are lots of repeating rhythmic riffs/ostinato patterns in the song. These are short phrases that are looped (repeated over and over again)

There is syncopation used throughout  
The repeating rhythms are mostly 2 and 4 bar loops

Triplets and sextuplets are used in the piece.  
The semiquavers are slightly swung (giving the piece a relaxed quality)  
Some notes are accented to make them louder than others



## Harmony

The piece is in a minor key (C minor)  
It uses repeating chord sequences over and over again  
There is a drone in this piece on the note C

The harmony is mostly diatonic  
There are some chromatic notes, such as the low synth strings that play an ascending chromatic line  
There are some extended chords (such as 7ths and 9ths)

The harmonic rhythm is slow—it feels like it stays on the same chord for a lot of the piece. This is common to dance music.

## Melody

There is a female and male singer.  
The vocal melody is repetitive  
There are some spoken parts, including vocal samples  
The singers sometimes sing vocables (nonsense lyrics) like ooh and aaah

The melody lines are all short phrases  
At the start (before the first verse) the female vocal part sounds like it is improvising.  
Solos are taken by the Uilleann pipe, whistle and hurdy gurdy

The female vocal part has a limited range (a 6th)  
The male vocal part has a bigger range (a 13th)  
The vocals use glissando (slides) and ornamentation (acciaccatura)  
The fiddle melody uses double stopping

## Texture

The main texture of the piece is homophonic.  
There are lots of layers of loops. And the loops drop in and out regularly making the texture constantly change. At the start of the song, the texture builds up by adding loops one at a time

The many overlapping loops give often the piece a poly- phonic feel.  
There is a heterophonic texture during the outro, with solo instruments playing the same thing, with slight variations.  
The very start of the piece is monophonic

## Music

## Key

Grade 3

Grade 5

Grade 7

## SONORITY/INSTRUMENTS

This piece uses a solo flute and violin, a harpsichord, and a string orchestra (including violin, viola, cello and double bass)

The group of solo instruments (violin, flute and harpsichord) are known as the concertino. The string orchestra are known as the ripieno. The bass/cello and harpsichord sometimes act as the basso continuo in the piece. This means the bass instruments play a bass line, and the harpsichord "realises" the chords on top (when it is not playing a solo part)

Bach broke with tradition in this piece by making the harpsichord part incredibly virtuosic (difficult and impressive!), with lots of fast scalar runs and trills in both hands at once. The baroque flute is different from the modern flute, as it was made of wood.

## DYNAMICS

There are only a few dynamic markings on the score, and these are there mostly for balance reasons, like having the violin play quieter so the flute can be heard

There are no dynamic markings for the harpsichord, because the harpsichord used in this piece would not have been able varied dynamics, it stayed at one volume

## STRUCTURE

The piece is in ternary form (ABA)

The opening A section begins in a fugal style. The B section is in the relative minor key, and contains a new theme which is similar to the first theme in the A section. There are also fragments of the A section theme in the B section.

## Bach: Brandenburg Concerto no. 5 movement 3

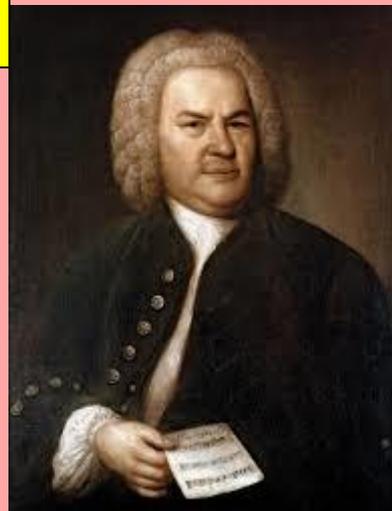
### BACKGROUND INFORMATION

This piece was written in the Baroque era. Bach wrote a set of six concertos for the Margrave of Brandenburg as part of a job application.

This is a concerto grosso. A solo concerto has just one soloist, but a concerto grosso has a group of soloists (the concertino)  
This is the third of three movements in the concerto.

This is chamber music, written for a small group of musicians rather than a full orchestra

### Music



### Key

Grade 3

Grade 5

Grade 7



### TEXTURE

The texture is polyphonic (more than one melody happening at the same time)  
There is use of imitation (when one part imitates another in a call and response style)

The movement begins in a fugal style. A fugue is a complicated piece which uses lots of imitation throughout. This movement is not an actual fugue, but it uses fugal techniques, like the start of the opening A section.  
Sometimes the solo flute and violin play the same thing in unison

When the flute and violin come in at the start, they are playing in two part imitation.  
When the harpsichord comes in at the start, it plays the subject in the left hand, then the answer in the right. The harpsichord plays in 2 part counterpoint.  
Once all solo instruments are playing, they are playing in 4 part counterpoint.  
Occasionally the flute and violin play in thirds.  
At the start of the B section there is a tonic pedal on B

## MELODY

Lots of the melody has a stepwise (conjunct) movement, although there are some leaps.

There are rising sequences (when a short phrase is repeated going one note higher each time)  
There are lots of scalar runs (notes going up and down a scale)

There are lots of ornaments such as grace notes (appoggiaturas) and trills

## TONALITY

The main tonality for the piece is D major

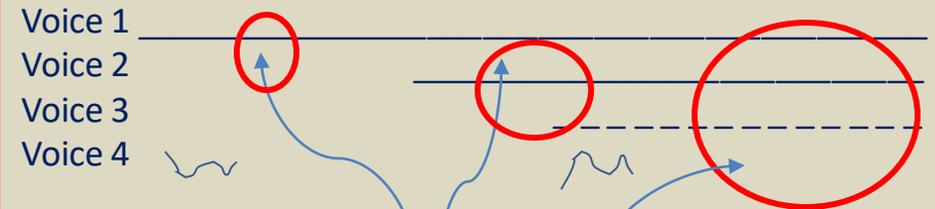
The B section is in the relative minor key of B minor  
The final A section is back in D major.

The key modulates often to the dominant (A major) and the dominant of the dominant (E major), indicated by the addition of accidentals.

## Textures

Things in Minimalism move

Layers of the music are built up one at a time by adding in new sounds and instruments.



This changes the texture!

Monophonic: One sound

Homophonic: Same sounds

Polyphonic: Many sounds

## HARMONY

The harmony uses standard chords of the time

The music is diatonic (all the notes/chords come from the key signature)  
Perfect cadences announce the ends of sections, such as the perfect cadence in B minor at the end of the B section.

The harmony uses standard chords of the time (mainly chords I, IV and V, with occasional use of ii and vi)

The harmony is functional (perfect cadences are used to move between closely related key signatures).  
The harmony uses mainly root position and first inversion chords.  
There are occasional suspensions.

## Music



## Key

Grade 3

Grade 5

Grade 7

## Structure

The piece is in sonata form  
Sonata form consists of an introduction then the main sections: exposition, development, and recapitulation. In the exposition two themes are introduced. In the development the themes are altered by changing key lots. The recapitulation is the same as the exposition, but with the two themes now in the same key.  
The piece finishes with a coda.

The themes in the exposition are linked by transitions (or bridges). There is a codetta at the end of the exposition, then the whole exposition is repeated.

Beethoven uses some techniques which are unusual for sonata form:

- The second theme starts in Eb minor instead of the expected Eb major. It
- moves to Eb major at bar 89.
- The development begins with 4 bars from the introduction—this is very
- unusual! When the development returns to the allegro tempo it is in the
- unrelated key of E minor.
- In the recapitulation the second theme starts in the key of F minor instead of
- the expected C minor. It then moves to C minor.
- The coda starts with 4 bars of the introduction again.

## BEETHOVEN—SONATA No. 8 IN C MINOR “PATHETIQUE” MOVEMENT 1

### Key

Grade 3

Grade 5

Grade 7



## Context

This is a piece of music from the classical era. Classical music has clear, catchy melodies and homophonic textures .

A piano sonata is a piece for solo piano. It has several movements—we are studying movement 1.

Beethoven was a forward thinking composer, and this piece shows signs of the romantic era. This piece was composed between 1796 and 1799.

Romantic music is all about expressing emotions. It does this through more dramatic use of dynamics, use of the sustain pedal on the piano, more complex, chromatic harmony, and more complex, altered structures (like how Beethoven alters sonata form in this piece).

## Instruments/Sonority

This piece is written for the piano. Unlike a harpsichord, the piano can play both loud and soft. The harpsichord did not have a sustain pedal.

Although it is not written in the score, Beethoven would have use the sustain pedal for greater expression.

The piano allowed Beethoven to make extensive use of all kinds of dynamic possibilities. This sonata has lots of crescendos, diminuendos and lots of other dynamic markings.

This piece was written for the fortepiano, which came before the more modern pianoforte. It had a smaller range and was not capable of as much dynamic contrast as a modern piano.

## Tonality

The piece is in the key of C minor (as mentioned in the title of the piece!)

The music modulates to different keys in the development section

The first subject is in C minor. The second subject starts in the unexpected key of Eb minor, then moves to the expected key of Eb major (the relative major of C minor) In the development the piece modulates to many different keys, including distant, unrelated keys such as

E minor (at the start of the development)

In the recapitulation the first subject is back in C minor. The second subject initially plays in the unexpected key of F minor, then moves to the expected key of C minor (to match the key of the first subject)

F minor is the subdominant of C minor.

Perfect cadences confirm changes of key throughout.



## Key

Grade 3

Grade 5

Grade 7

## THEME ONE

The first subject theme in C minor (tonic key of the piece) rises mainly scalically a distance of two octaves – over a tonic pedal in the bass. The music is marked with staccato – meaning detached (separate) notes. A second melodic idea begins at bar 27 and features sforzandos and descending arpeggios.

A transition based on the main theme – using sequences begins at bar 35 and modulates towards the expected key of Eb major through a dominant note (Bb) in the bass (dominant preparation)

## THEME TWO

The second subject begins in the unexpected key of Eb minor. The theme features a distinctive acciaccatura ornament and handcrossing technique, where the right hand moves down over the left hand to play four staccato notes, before returning. The theme continues with a stepwise descending phrase featuring mordents. A new theme begins in bar 89 in the relative major key of Eb. It has a new broken chord texture. There is a crescendo while the hands move in contrary motion.

## Rhythm, Tempo and Metre

The introduction is grave (very slow), and the metre is 4/4 (common time)

The main tempo for the rest of the piece is very fast.

The main tempo for the piece is allegro di molto e con brio (very fast with vigour), and is written in 2/2 (cut common time, also known as alla breve)  
There are some very rapid notes (short note values)

There are some very rapid notes (short note values), including septuplets and 1/128th notes in bar 10

## Texture

The texture is mainly homophonic

There is a monophonic section with a long descending scale leading into the recapitulation  
The right hand plays in octaves half way through the introduction

The intro is homophonic with all the notes playing together in chords. This is known as a homophonic chordal texture. There is a two part texture with melody and broken chords in the second (Eb major) idea of the second subject (bar 93)

## Harmony

The harmony is mainly diatonic, and mainly uses standard chords of the time.

There are also some more dissonant, complicated chords.

There are some more complicated, chromatic chords used, including a diminished seventh at the start of bar 2. This is the most dissonant chord available to Beethoven at the time.

Perfect cadences announce the ends of sections and changes of key. This is called functional harmony. There are big perfect cadences at the end of the piece.

There are pedal notes, like the dominant pedal at the end of the development section (dominant preparation).

There is an interrupted cadence in the introduction at bar 9

The harmony uses standard chords of the time (mainly chords I, IV and V, with occasional use of ii and vi)

The harmony uses mainly root position and first inversion chords.

There are dominant 7th chords at cadences.

There are occasional suspensions (including 9-8 suspensions)

There is a circle of fifths progression in bars 244-249.

Another chromatic chord used is the augmented sixth chord, used in bar 30.

## Melody

The main themes in the piece are the first and second themes, plus the six note rising idea from the introduction. The first theme (or subject) is a rising, scalar theme.

The second theme (or subject) features a theme which rises then falls, including use of ornaments.

There are a number of scalar passages in the piece, including the descending chromatic scale at the end of the introduction. Other melodic ideas include arpeggios and broken chords.

Ornaments are an important part of the melody, including acciaccaturas and mordents in theme 2, and trills just before the recapitulation.

The development uses ideas from the first theme in lots of different keys. It uses sequences.

## Dynamics

This piece has a wide range of dynamics, from very quiet (pp) to very loud (ff)  
There are crescendos (getting louder) and decrescendos (getting quieter)

The intro uses fp (fortepiano) markings, meaning loud then immediately soft).  
It also uses sf (sforzando) markings, meaning a sudden loud accent.

Dynamics markings in the piece are used expressively, showing Beethoven anticipating romantic era music. This is something which was very new and shows Beethoven taking risks and breaking the mould.

## Key

Grade 3

Grade 5

Grade 7

## Structure

There is a **verse chorus** form, but within that structure there are multiple sections defined by changes in tempo and mood

**Bars 1- 19** - Free tempo (like a recitative)

**Bars 20-33** - Andante (“you can still be with the wizard”)

**Bars 34-48** - Andante - verse 1 (“something has changed..”)

**Bars 49-87** - Allegro - Chorus, verse 2, chorus 2

**Bars 88-102** - Moderato - A contrasting section in G major (“unlimited”)

**Bars 103-110** - Allegro - Chorus, back in D major.

**Bars 111-128** Andante - Similar to the intro

**Bars 129-161** Allegro - Verse 3 and chorus 3. The climax of the song! Full orchestra and loud dynamics.

**Bars 162 - 177** - Andante to Maestoso - Outro - build up to finale.

## Defying Gravity from the musical “Wicked” by Stephen Schwartz

### Key

Grade 3

Grade 5

Grade 7

## Rhythm, Tempo and Metre

There are **lots of tempo changes throughout the song** and they are important to the structure (see the structure section).

The song **slows down** at the end.

There is frequent **syncopation** throughout.

The intro starts in **3/2 time**, then changes to **2/2**. When verse 1 starts it then goes into **4/4 time**. At bar 115 (“I hope you’re happy”) it goes back to **2/2 time**.

There are several **rallentandos** or “ralls” (when the tempo slows down), particularly at the end of sections. There is a rall at the end of the whole piece.

**Dotted rhythms** are used throughout, like the word “gravity” in the chorus. There are also triplets.

Rhythms in the vocal part are mostly **crotchets and quavers**, but there are some longer notes at the end of phrases.

**Rests** break up phrases, and phrases often start with a rest.

## Context

This is a song from the Musical “**Wicked**” which uses characters and ideas from “**The Wizard of Oz**”

It was written and first performed in **2003**

Music theatre uses **songs, spoken dialogue, acting and dance** in a popular style.

The piece is written by **Stephen Schwartz**, an **American composer and lyricist** who also worked on Disney musicals such as Enchanted and The Hunchback of Notre Dame

‘Defying Gravity’ is the **finale song** for the first act, when Elphaba discovers that the Wizard of Oz is not the heroic figure she had originally believed him to be. Realising this, Elphaba vows to do everything in her power to fight the Wizard and his sinister plans. She sings of how she wants to **live without limits**, going against the rules that others have set for her.

## Tonality

The piece is mainly in **D major**

At the start the **tonality is ambiguous**. It uses **unrelated chord sequences and chromatic movement**.

During the **intro** the piece **modulates** briefly to B major at bar 20, F major at bar 22, and finally gets to the **tonic D major** at the start of the verse.

The “unlimited” section is in **G major**, then it goes back to **D major** when it returns to the chorus.

The following andante section (“well, are you coming?”) returns to the **chromatic melody** of the intro.

It returns to **D major for the final verse** (“so if you care to find me”) The final maestoso section is in **B minor**, before finishing on a **D major chord**

## Texture

The main texture is **homophonic** (melody and accompaniment)

The intro has a **sparse texture** with chord stabs in the orchestra and **some monophonic bars**

Elphaba and Glinda **usually sing separately** but sometimes sing together in **unison** (“there’s no fight we cannot win”) or in **harmony** (thirds) (“I hope you’re happy my friend”) The outro is **polyphonic**, with Elphaba, Glinda and the chorus all singing different musical ideas at the same time.

There is an **ostinato accompaniment** at bar 88  
Sometimes the orchestra play **homophonic chordal textures**, like at bar 132

## Instruments/Sonority

‘Defying Gravity’ is a **duet** for the characters Elphaba and Glinda.  
The two vocal parts use a **big range** (fairly high and fairly low!) Originally they were performed by Idina Menzel (from Frozen) and Kristin Chenoweth (from Glee, American Gods, Rio)  
The two singers either **speak, sing**, or perform their lines **half sung half spoken**.  
The song uses a **big orchestra** plus **3 keyboards, drum kit** and **electric guitars** to create a modern sound

The vocal parts cover a **range of just under 2 octaves**.  
The large orchestra includes a woodwind section which features additional **piccolo, bass clarinet and cor anglais**. The string section includes a **harp**. The wide range of percussion instruments includes a **drum kit, tubular bells and timpani**.  
**Synthesizers and glockenspiels** are used for high pitched “magical” sounds, such as in the final chorus (also with “magical” sounding tubular bells)

The brass plays **homophonic chordal music**, like a **fanfare**  
The drum kit adds rhythmic momentum with a **repeated hi hat** in the first chorus. There is a **cymbal roll** moving into the chorus which adds excitement.  
The strings sometimes use **tremolo** to add tension (eg the start of verse 1)

## Harmony

The intro uses chords that are **unrelated**

Most chords are in **simple root position**  
There is some use of **dissonance** (eg bar 30 (“I don't want it, no”)) At the end there is a **pedal note** (bar 168)

## Melody

The word setting is **syllabic** throughout  
The melody has a **wide range** (fairly high and low!)  
The melody starts with **stepwise movement** (conjunct)  
The verse and chorus combine stepwise movement and **big leaps** (disjunct)

The **syllabic word setting** and **natural speech-like rhythms** make the words clearly understandable  
There is vocalisation at the very end of the song (“aah”)

Leaps often feature a **rising perfect fifth** (e.g. bar 34 “has changed”). There are some exceptionally large leaps such as a **compound perfect fifth** (13 whole notes! - e.g. bars 140 “told me lately everyone deserves..”). These big leaps could be described as **angular**.  
Often the melody is **legato** (“you can still be with the wizard”)  
Bars 6 and 7 show an **ascending sequence** (“hurt your cause forever, I hope you think you’re clever”)



## Key

Grade 3

Grade 5

Grade 7

## Leitmotifs

...a short musical idea which is repeated and adapted throughout an individual piece, or an entire show. Often used to represent characters, or places.

You need to be able to recognise the main Leitmotifs in the song

## BACKGROUND INFORMATION - context

This music is in the style of a type of fusion music called Bossa Nova. This style combines elements of Jazz and Brazilian Samba. The song was originally written in 1962. Esperanza Spalding's version was released in 2008.

The original song was written by Roberto Baden Powell, and the lyrics were written by poet Vinicius de Moraes, who were both influential Brazilian musicians.

### KEY

Grade 3

Grade 5

Grade 8

## HARMONY

The chords used are influenced by jazz—they are quite complicated! There are lots of extended chords, where extra notes are “piled up” on top of the normal 3 note chord, like 7ths, 9ths, 11ths and 13ths.

The main chords are mostly tonal (from the key signature). The main chords are mostly based around chords I II IV and V.

But there are some occasional chromatic chords (outside the key signature) such as C major and F major.

As well as extended chords, there are some diminished chords and flattened 5th chords.

The chord progressions sometimes create a descending chromatic bassline (bars 30-38, in the middle of verse 2). Cadences are not used in the same way as in classical music, but each section tends to end with a perfect cadence.

## Esperanza Spalding: Samba Em Preludio Knowledge Organiser



## RHYTHM and METRE

The piece is almost completely in 4/4 time. There are lots of syncopated rhythms.

Verse 1 has a lot of rubato (freedom of slowing down or speeding up expressively). The bass is playing complex rhythms, but we can just about find the beat of the song. Verse 2 has a faster tempo, and features a “standard” bossa nova rhythm played by the bass (like a slowed down samba beat). When the guitar part comes in it adds to the rhythmic interest by playing both syncopated and on the beat at times.

The vocal part mostly keeps to the printed melody, but varies the rhythms using rubato. In verse one in particular the vocal part is singing lots of triplets and semiquavers with frequent rests. In verse 2 the vocal part is singing lots of longer note values, but these are often syncopated so they start off the beat. When verse 1 and verse 2 are played together the rhythms are less syncopated, to help them fit together more easily.

## MELODY—GENERAL

There are two main melodies in the song—verse 1 and verse 2, which are then combined after the guitar solo. The lyrics are in Portuguese. It is a sad song about longing for a lost love. The melody line goes very low for a female vocal, going down to a low E.

The vocal line covers the range of a minor tenth.

## MELODY—VERSE ONE

Verse one is an 8 bar idea which is then repeated with a different ending.

Many of the phrases use a rising arpeggio (going up the notes of a chord—like bar 4). The first or second note of each phrase descends downwards in a long downward sequence.

The melody mostly moves in leaps of a third or a seventh, which is unusual. The melody changes in bar 18, which includes a jazzy flattened 5th.

## MELODY—VERSE TWO

Verse two is another 16 bar idea which is repeated like verse 1, but with a different ending.

There are some use of sequences, such as bars 23–26 and 31–34.

Unlike verse 1, verse 2 uses almost completely stepwise (conjunct) movement. There is another jazzy flattened fifth at the end of the first repeat.

## TONALITY

The piece is in B minor

Many Bossa Novas are in minor keys. Despite the complicated harmony, the piece doesn't modulate—it stays in the same key

## INSTRUMENTS/SONORITY

The song uses a female voice, acoustic bass guitar and acoustic guitar

The vocal part is low in pitch for a female singer

The acoustic guitar only joins in at verse 2

The acoustic bass uses double stopping (playing multiple strings together)

It also uses harmonics

The acoustic bass is tuned just like an electric bass or double bass.

In verse 1 the bass sounds like it is playing 2 parts, with a bass notes and alternating chords, like a ragtime piano

## TEXTURE

The main texture of the piece is homophonic.

The intro is monophonic (just the bass) except for a few double stops (when the bass plays more than one note at once)

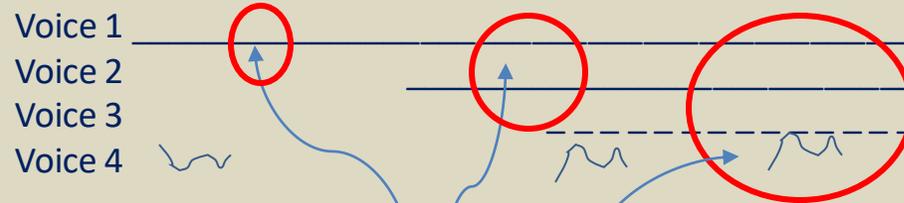
The voice and bass duet verse is polyphonic with two clear melody lines—verse 2 being sung and verse 1 being played on the bass

The bass part is complicated and doesn't just play the roots of the chords. Sometimes it begins to sound like it is playing its own melody line, giving the piece a polyphonic feel

## Textures

Things in Minimalism move

Layers of the music are built up one at a time by adding in new sounds and instruments.



This changes the texture!

Monophonic: One sound

Homophonic: Same sounds

Polyphonic: Many sounds

## KEY

Grade 3

Grade 5

Grade 8

## TEMPO

The start of the piece is very free time, it's hard to pick out the beat of the song. Verse 1 has a slow tempo.

Verse 2 until the end of the song has a faster tempo

Verse 1 uses lots of rubato (freedom to slow down or speed up expressively) In the link before verse 2 the tempo almost doubles

## STRUCTURE

The piece has a two main vocal sections (verse 1 and verse 2), plus solos.

After the guitar solo, Esperanza sings verse 2 again, but plays the melody of verse 1 on the bass, like a duet between the bass and voice.

The full structure is:

Intro, Verse 1, link, Verse 2, Guitar solo, Verse 1 and 2 voice and bass duet, coda (outro)

## STRUCTURE

The piece has a verse-chorus structure

The full structure is:

Intro (clicks), verse 1, chorus, instrumental, verse 2, chorus, guitar solo, verse 3, chorus, outro

## TEXTURE

The main texture of the piece is homophonic.  
The texture builds up gradually at the start of the song with each instrument entering one at a time.

The guitar solo uses a three part texture. Sounds are spread out using panning

The interweaving guitar and vocals parts from the second verse give the piece a polyphonic feel at times  
The guitar solo uses imitation  
The use of panning in the backing vocals creates an antiphonal feel

## INSTRUMENTS/SONORITY

The vocal part is sung by Freddie Mercury, who has a high tenor voice.  
The piece uses piano, electric guitar, bass and drum kit.

There are overdubbed backing vocals.  
There are 4 guitar parts that have been overdubbed to create a richer texture  
There is a slightly out of tune "jangle" piano recorded on top of the main piano line  
The song uses studio effects like multi track recording, EQ, flanger, distortion, reverb, wah-wah and panning.

The guitar part uses slides, bends, pull-offs and vibrato

## Killer Queen: Queen

### BACKGROUND INFORMATION

This is a Glam Rock song from the band's third album.  
It was released in 1974

Queen's sound is unlike many "standard" rock bands as they use adventurous harmonies and structures, and a theatrical style influenced by musical theatre and opera. They also create complicated arrangements of layered guitar parts and backing vocals in the recording studio using multitrack recording.



### RHYTHM and METRE

The time signature is mainly in 12/8 time  
This gives the piece a swung feel. (it uses swung rhythms) There is a regular, danceable beat with a steady tempo.

There is syncopation used throughout  
Every verse and chorus start with an anacrusis (upbeat)

There are occasional extra bars of 6/8 time to extend phrase lengths  
There are some use of triplets (bar 18)



### Key

Grade 3

Grade 5

Grade 7

### TEMPO

Moderate tempo.

A dotted crotchet is measured at 112 bpm



## HARMONY

Queen liked to use adventurous chord sequences  
The song uses several altered or extended chords (such as 7ths and 11ths)

Most of the chords are in root position, but there are some chord inversions.

There is a circle of 5ths chord progression in the chorus  
The modulations to different keys are shown by perfect cadences  
The song starts with a C minor chord—you can't tell that the piece is in Eb major until the chord is played half way through the verse—this is

Some parts of the chord sequence contain a faster harmonic rhythm (like one chord every beat on “guaranteed to blow your mind”)

The chord inversions create descending and ascending basslines (such as the descending bassline during “built in a remedy”)  
In the instrumental before the second verse there is a “vamp” based around an F chord  
There is a pedal note used in bars 27-30



## TONALITY

The main tonality for the piece is Eb Major (this is unusual because it's a hard key to play in on the guitar!)  
The key changes (modulates) during the song.

The chorus is in Bb major  
There are points where the tonality is not clear (“tonal ambiguity”) - like in the first verse which starts with a C minor chord, making the key signature unclear.

The chord sequences move quickly through different key signatures—for example in the first half of the chorus the chord sequence moves quickly through D minor and C major. The last chorus ends in Bb major, so the outro features a repeated Eb chord to reestablish the original key signature

## MELODY

The word setting is mainly syllabic throughout  
The melody has a wide range (goes very high and very low!)  
The guitar solo borrows ideas from the chorus and verse sections of the song

The backing vocals use words and vocalisations (like oohs and aahs!)  
The melody is often conjunct, but with some wide angular leaps, including intervals of 6ths and octaves.  
In the chorus the melody is harder to spot on it's own because of the backing vocal harmonies

The vocal part sometimes uses falsetto.  
The vocal part also includes spoken text  
The vocal part contains a slide upwards (on the word “queen”)  
The length of the melodic phrases are often uneven (like when the extra 6/8 bar is added)  
Word painting is used on the words “drive you wild”. Effects are added to give

## Key

Grade 3

Grade 5

Grade 7

# Music for a While: Henry Purcell

## RHYTHM and METRE

4/4 metre  
The ground bass uses repeated quaver rhythms

There are a wide variety of rhythms, but quavers and semiquavers are the most common in this piece

There are some dotted rhythms in the vocal part  
There is occasional syncopation

## Context

This piece was written in the Baroque era. It was composed in around 1692. It was written for a play telling the Greek myth of Oedipus.

This is the second of four movements Purcell wrote for the play as "incidental music" performed between the dramatic parts of the play

It is a Lament – a song of sorrow and loss

## Key

Grade 3

Grade 5

Grade 7

## HARMONY

The accompaniment is provided by the ground bass played by the bass viol and the left hand of the harpsichord  
Chords are diatonic

There are perfect cadences throughout the piece (as the ground bass ends with a V chord, then repeats again with a I chord)

There are a couple of dissonances used for word painting, such as the word "pains"  
Another type of dissonance used is a "false relation", like in bar 1 with the ground bass playing F sharp while the right hand plays F natural.

Suspensions are used very occasionally. For example, there is a 4–3 suspension in bar 3 beat 4 1/2 in the harpsichord part.

The right hand of the harpsichord plays an elaborate realisation, which has been interpreted from the original figured bass



Music for a while  
from "Oedipus"

HENRY PURCELL  
(1659-1695)  
Z.582, no.2



## THE GROUND BASS

The ground bass is a 3 bar loop  
It consists entirely of quaver rhythms It has a rising pattern

The first 4 sets of 4 quavers use an ascending sequence, starting one note higher each time At the end of the ground bass there is a fall of an octave  
It uses intervals of semitones

After 4 and a half repeats of the ground bass it begins to modulate into different keys. In the final A section (bar 29) it returns to the repeating pattern from the start of the piece.

## TEXTURE

The texture is homophonic - one main melody and an accompaniment.  
The accompaniment is provided by the ground bass

The elaborate realisation played by the right hand of the harpsichord makes the texture feel polyphonic at times

## TEMPO

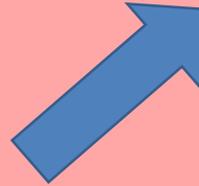
There is no tempo marking on the score, but a slow tempo would be appropriate

## TONALITY

The main tonality for the piece is A minor

This reflects the sombre, sad nature of the lyrics

During the middle (B) section the piece modulates through several related keys—E major (the dominant key—bar 15 & 28), G major in the middle of bar 18, C major (relative major—in bar 22), A major (the tonic major—middle of bar 23) and finally back to A minor in bar 29



## WORD PAINTING

The (mostly) minor key is appropriate for the serious, sad mood of the text. The word "eternal" (bar 20) is sung as a long melisma. The word "drop" (bar 23) is repeated in a descending pattern (going down) representing the snakes dropping from Alecta's head.

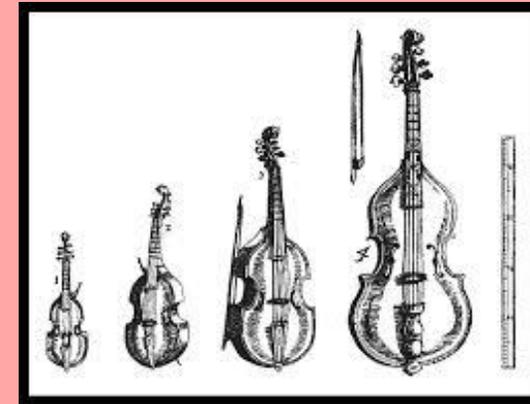
The phrase "free the dead" (bars 16-17) is set to a triumphant section in the bright key of G major. The word "wondering" (bar 10) uses a wandering, descending legato (smooth) melismatic melody. The phrase "pains were eased" (bars 12-13) features a dissonance and resolution.

## MELODY

The main melody is sung by a soprano singer. The word setting is mostly syllabic (each syllable of the text given its own note), with some melismatic sections (like the word "eternal"). Word painting is used to make the music reflect the meaning of the

Most of the melody notes move in steps, with lots of passing notes (the notes in between chord notes). There are lots of uses of ornaments (common to Baroque music) in the right hand of the harpsichord and the soprano line, such as trills, appoggiaturas, grace notes and mordents. Some of the text has been repeated, such as the word "drop".

There are some descending sequences, such as in bar 20. Rests are used to break up melodic phrases. The stepwise movement of the melody means it can be described as a "conjunct" melody.



### Key

Grade 3

Grade 5

Grade 7

## DYNAMICS

There are no dynamic markings on the score – why?

## INSTRUMENTS/SONORITY

Main Title/Rebel Blockade Runner uses a full symphony orchestra — Strings, percussion, woodwind and brass.

The instruments used are a full string section, plus:

- Woodwind: flute, piccolo, oboe, clarinet, bass clarinet, bassoon
- Brass: Horn, trumpet, trombone, tuba
- Percussion: Timpani, triangle, tam tam (gong), vibraphone, glockenspiel, cymbals.

Plus a piano, celeste and harp

The orchestra is used in the style of a traditional romantic-era orchestra, with much doubling of parts an octave or more apart.

## Star Wars: Main Title/Rebel Blockade Runner

### BACKGROUND INFORMATION

This is a piece of music written for the film Star Wars Episode IV: A New Hope in 1977

It uses a main theme (which is a leitmotif for Luke Skywalker).

### TEXTURE

The piece is mainly made up of homophonic textures. There are only a few solo or lighter textures, it is mostly very

The main theme is mostly accompanied by block chords or arpeggios.

The piece uses pedal textures, such as the inverted tonic pedal (repeated Bb note played by the violins) during the introduction and A theme, and the dominant pedal (repeated 5th note played by the brass) in the B section.

### Key

Grade 3

Grade 5

Grade 7



### TONALITY

The main theme is in Bb major. After the theme finishes, during the rebel blockade runner section the tonality is less clear, using more unstable harmonies.

From when the spaceships appear, there is lots of use of dissonance. The piece is almost atonal at times, and as the action switches to inside the craft there is some use of bitonality.

As the planets are revealed the piece switches to C major (with an added Ab) for a short while. When the spaceships appear the music is more based around the note C, which is heard as a bass pedal.

## RHYTHM, TEMPO and METRE

The fast tempo matches the mood and feel of the film—an exciting action movie!

The 4/4 metre, steady tempo and use of brass give it a “march” like feel—which reflects the battles going on in star wars

There is repeated use of triplets in the melody lines

After the main theme, the pulse becomes harder to follow.

Both themes use an anacrusis.

The main theme (A) is accompanied by syncopated block chords which create excitement.

When the large spaceship appears, the time signature changes to 3/4

The tempo changes during the “rebel blockade runner” section of the piece to emphasize the action on screen.

The “Mars” like chords when the large spaceship appears are homorhythmic (all playing the same rhythm).

### STRUCTURE

The main theme uses an AABA structure After this, the music follows the action on the screen.

To get higher marks within structure you must recognise how the music blends with the images on the screen and mirrors the changes in action.

## MELODY

John Williams writes catchy, memorable melodies, which is one reason why his film scores have been so popular.

The piece starts with a fanfare (grand and heroic).

Then the leitmotif is played by trumpets and other brass. It uses intervals of 4ths and 5ths and lots of 7ths

Then the B theme is scalar and played by the violins and other strings

There is a full descending scale to end the B theme

Then the A theme returns but with small changes.

After the theme, there are not many main melody ideas in the “rebel blockade runner” section—just a short piccolo melody during the “star filled sky” section

The fanfare-like intro uses rapid repeated notes using tonic (Bb) triplets—which are used throughout the main theme. It also uses imitation (the melody ideas are repeated by different brass instruments). There are 7th intervals in the fanfare, like in the main theme.

The main theme consists of a 4 bar idea which balances stepwise motion and leaps. There are repeated use of triplets and long minims to create excitement and tension The B theme is contrasting to the A theme—it feels less forceful. It uses scalar patterns, but does contain some leaps and triplets to remind us of theme A. At the end of the B theme there is a descending Bb minor melodic scale. Both themes use an anacrusis.

The main A theme can be broken down as follows: Bar 1 contains a rising perfect 5th (tonic to dominant) which creates a heroic feel. Bars 2 and 3 are identical, including a leap of a minor 7th. Bar 4 uses an auxiliary note (not in the main chord) to reach the note C, preparing for the repeat of the 4 bar phrase.

## HARMONY

The harmony of the main theme is mostly diatonic (uses chords and notes that fit with the key signature)

The melody is accompanied by mostly major and minor chords.

There are not many perfect cadences, which we normally expect in this kind of music.

After the main theme, the harmony is complicated and often feels dissonant and atonal (not in any key signature)

The harmony in the fanfare and A theme uses quartal harmony—chords made up of notes that are 4 steps apart.

In the main theme the chords are syncopated. When the A theme repeats, it is slightly changed to create a descending bassline.

When the bigger spaceship appears the “Mars” like hammered unison chords are dissonant (clashing). This also uses a tritone (an augmented 4th.. the devil’s interval!).

The theme does use some chords not in the key of Bb major, such as the Ab major at the end of the first A theme (before the imperfect cadence). The B section also uses a Db major, which is not in the key of Bb major.

In the intro and A theme there is an inverted tonic pedal played tremolo in the violins. In the B theme there is a dominant pedal played by the brass instruments.

During the “star filled sky” section, the harmonies mix unrelated chords together (like Db major and C major) to create strange, unstable effects.

When we see the two planets, the strings and the brass are playing in two different keys.



### Key

Grade 3

Grade 5

Grade 7

# Drama & Theatre Studies

Year 11 - Term 1 & 2 Knowledge Organiser

## Study Focus: What am I required to do?

**Component 1: Devising Theatre** (40% of qualification).

Your Devised play, portfolio & Evaluation

You must produce the following:

1. **A performance recorded audio-visually** from the audience perspective
2. **A portfolio** of supporting evidence
3. **An evaluation** of the performance.

## What does this mean?

You are required to **devise a piece of original theatre in response to a stimulus**, using the techniques of an influential theatre practitioner. E.g. Brecht.

### **Group arrangements (40% of qualification)**

You work in groups of between **two** and **five** actors. The group sizes and the choice of practitioner then allow you to adopt safe working practices. This component involves **devising** and **realising** work for performance and **evaluating** the final piece of theatre that you produce.

### Assessment in Component 1

You are assessed on the performance of your play (10%) and an accompanying portfolio in three parts and 900 words documenting your creative journey (20 %). You are also sit a 90 minute written and invigilated evaluation examination in the hall where you evaluate your contribution IN THE PERFORMANCE (you must say nothing about rehearsal or what other people did in this written evaluation)..

### This component assesses:

- **Devising:** *create and develop ideas to communicate meaning for performance* (AO1, 30 marks). This is assessed through the portfolio of supporting evidence.
- **Realising:** *apply theatrical skills to realise artistic intentions* (AO2, 15 marks). This is assessed through the performance (realised in performance).
- **Evaluating:** *analyse and evaluate their own work* (AO4, 15 marks). This is assessed through a written evaluation completed under exam conditions.

## Part I: Devising

You devise a piece of theatre **in response** to the stimulus which demonstrates the techniques of a theatre practitioner. You create and develop ideas to communicate meaning to an audience by:

- Researching** and developing ideas using the techniques or characteristics of the practitioner.
- Rehearsing, amending** and **refining** the work in progress.

You should consider the following when devising your piece of theatre:

- structure**
- theme/plot**
- form and style**
- language/dialogue**

You should consider how meaning is communicated through the following, as appropriate to the piece of theatre:

- Performance conventions**
- Use of space** and **spatial relationships** on stage, including the choice of stage (e.g., proscenium arch, theatre in round, traverse or thrust)
- Relationships between** performers and audience
- Design elements** including lighting, sound, set and costume
- The physical and vocal** interpretation of character.

You must produce a portfolio of supporting evidence which demonstrates the research, creation and development of ideas. This is a working record and therefore should be compiled **during** the process and edited to ensure a balanced composition.

## Part 2: Realising

You realise your piece of theatre. The length of the piece will depend on the number of actors in the group and should be as follows:

Group of two actors: 5-10 minutes

**Group of three actors: 7-12 minutes**

**Group of four actors: 9-14 minutes**

Group of five actors: 11-16 minutes.

The Portfolio evidence should focus on **three stages** which are significant to the development of the devised piece of theatre. The three stages should demonstrate:

**1. How ideas have been researched, created and developed in response to the chosen stimulus.**

**2. How ideas from the chosen practitioner/genre have been incorporated in the piece to communicate meaning.**

**3. How ideas have been developed, amended and refined during the development of the devised piece.**

For each stage, candidates must provide **illustrative material** (as listed to the right) and a commentary, which may include annotations on the illustrative material.

**The commentary** for each stage should be approximately **250 words** and total to **900 words** for the complete portfolio.

### Illustrative material

This may include any of the following:

- sketches
- photographs
- ground plans
- diagrams
- storyboards
- mood boards
- sections of script

**The portfolio is intended to highlight the creative and developmental process of devising the piece of theatre.**

It is not intended to be a full record of the rehearsal period, and you **should choose carefully** the evidence **which best supports** the **three significant stages** of development of your piece of theatre.

You must interact with other performers and/or the audience **for a minimum of five minutes.**

## Part 3: Evaluating

You will evaluate the final performance under supervised conditions. You indicate your chosen stimulus and chosen practitioner. You evaluate in **3 sections**:

1. Analyse and evaluate **your** interpretation of character/role in the final performance.
2. Analyse and evaluate how **your own** performance skills contributed to the effectiveness of the final performance and the audience's interpretation of it.
3. Analyse and evaluate **your individual contribution** to the final performance, including how effectively you fulfilled your initial aims and objectives (referring back to stimulus and practitioner).

You will have **1 hour 30 minutes** to complete the evaluation. You may have access to two sides of A4 in bullet point notes when writing the evaluation. The notes must be handed in with the evaluation.

### TOP TIPS:

- you should write many versions of your bullet points before the evaluation assignment. Really consider how your performance and overall contribution to the process shaped your final piece.
- Your final notes should be concise and relevant.
- Don't forget to analyse your performance in relation to the stimulus and your practitioner of study.

### Homework Tasks

These will be tasks to come up with ideas, prepare your portfolio and later, your notes to take into the Evaluation examination.

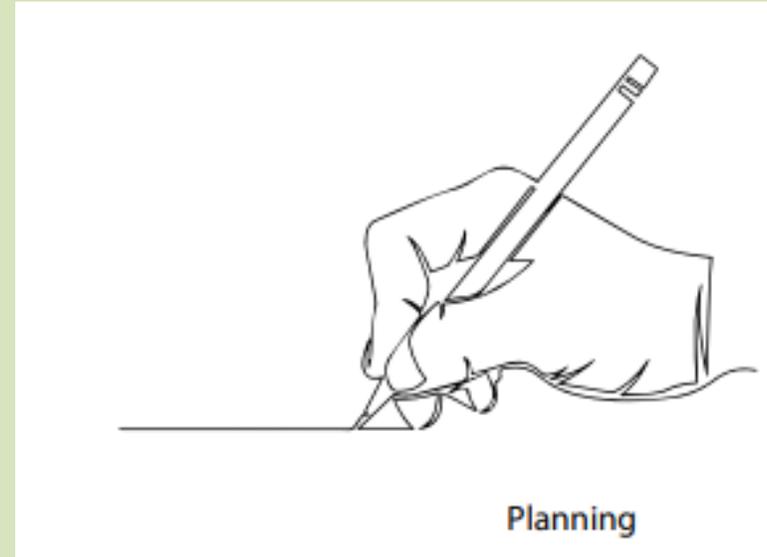
1. Writing up the research that you did each day
2. Writing up the ideas that you discussed in a rehearsal and tried out on the floor.
3. How you used your practitioners ideas in each rehearsal.
4. Collating and selecting your notes to prepare your Portfolio.
5. AFTER SCHOOL REHEARSALS- You must agree a rehearsal timetable with your group and turn up !
6. Preparing your 2 sides of A4 notes for the Evaluation examination.

## Analysing & evaluating your work and other people's work

Your ability to analyse and evaluate drama work is a major assessment skill in GCSE. To be clear, 70 % of your GCSE grade in drama will count on your ability to analyse how drama skills and techniques are used to create and communicate meaning and evaluate how effectively you and others have used these skills and techniques. This KO contains a reminder of the skills that you have already learned that are required as well as some new ones you will need.

Remember to use **Evaluative Vocabulary (EV)** when you are evaluating in class and when you are doing written evaluations at home. Here's the list again with a few additions now that you are more experienced.

These are a collection of words that enable you to evaluate drama work specifically instead of saying something is, 'good' or 'bad' which doesn't mean very much in drama.



### Evaluative Vocabulary

Intelligent Imaginative Creative **Skilful** Exciting Informative Dull **Inspiring**  
Clear Unclear **Muddled** Confused **Misguided** Shallow **Compelling**  
Moving **Heart - Wrenching** Pedestrian **Emotionally -**  
**Draining** **Spirited** **Believable** Credible **Convincing** Powerful **Entertaining** R  
**iveting** **Gripping** Captivating **Engaging** vapid **vacuous** **Harrowing**

## Key knowledge & skills to use in this Component

Remember that everything you need to consider when making a play are exactly the same things as you need to write about in your **Portfolio** and **Evaluation**.

## **The Ingredients of a Play- (IOP)**

Here they are once more with definitions. I include them because they are easy to overlook in the midst of all the other information you are being given but they remain the bedrock of all devising work and the main things to remember, particularly when you are stuck and struggling for ideas.... a play is always made from these:

- **Characters**- the people in the play
- **Plot**- The storyline- Your characters in this topic are all part of a family.
- **Setting**- Where & when the scene is set. Your play story and play will change settings because the characters are going on a journey. Different scenes will have different settings.
- **Speech** – The words that the characters say
- **Theme** – What the play is about- its meaning- its message
- **Genre** – The style of the play. You are writing in the comic genre in this topic.

## **Freeze Frame**

A still image like a photograph. The actors must be perfectly still- even their eyes. Organiser. Freeze frames are an excellent way to get out of your head.

**Personal & Interpersonal Skills (PIPS)** discussions that seem to be going nowhere. They can be like a physical way of brainstorming ideas. I recommend them.

Remember the things that you need to consider in a Freeze frame.

**Gesture.. Facial expression.. Posture.. Body Language.. Space.. Levels**

## **Mime**

Mime is the technique of creating an **illusion**, of making something appear to be there when it is not. To do this successfully, the actor needs to **picture** the object clearly in their mind's eye and then **show** its shape, weight, size etc. so that the spectators can also 'see' the object in their imagination.

# Internal & External Character

## Internal character

Personality

Feelings

Thoughts

Background

Attitude

Motivation

## External character

;' Accent

Tone

Pitch

Volume

Facial Expression

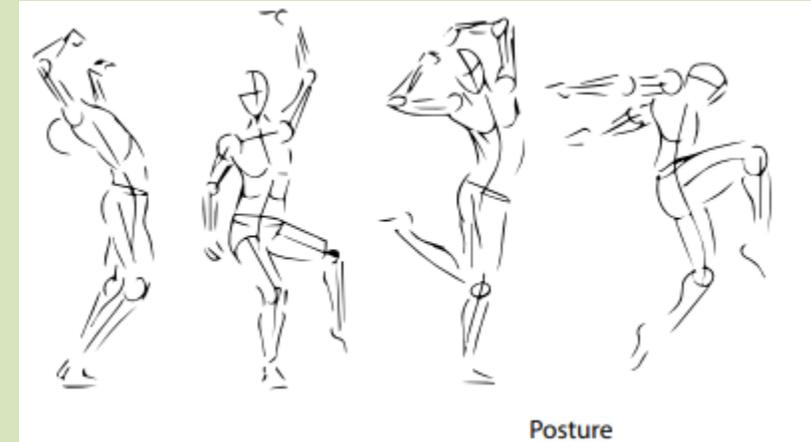
Gesture

Posture

Body Language

Costume

Make up



## Bertolt Brecht: Epic Theatre

Epic Theatre style has many characters, many locations and the action takes place over many years. It is written in episodes- not acts and scenes. There is a singer narrator who addresses the audience. Characters often speak in the third person (he / she) which is strange and captures the audience's attention.

### Brecht's staging ideas:

There would be few lighting changes to distract the audience, the lights would have been visible so the audience were reminded that it was a play, in a theatre, lit by artificial lights- often plain house lights.

There would only be a few essential, **representative** props and items of set – not a Naturalistic full-scale attempt to make a life like representation. Again, the audience are reminded that they are in a theatre **watching a play**. In your production you should bear this in mind.

**The Episode titles** or scene titles would have been announced or put on screens, banners, placards. You should do this. Placards and banners would also be displayed by the actors to highlight key social questions or the main political message of the play.

**The costumes** would also clearly show the social class of the character and what part of society they represented. Often sound effects are made by the actors in full view of the audience. This also makes it clear to the audience that they are watching a play.

**Hair and make-up** would also be used to show clearly defined individuals – like what Strata of society are they from... are they an **Exploiter or the Exploited?**

**New skills. New ideas for this component.**

### **Practitioners**

You have met the ideas of two practitioners before. You now need to choose which ones (very different) styles you want to devise your component 1 play in. You can also choose to do it as a piece of Theatre In Education (TIE) or Physical Theatre. I recommend that you choose Brecht. You should use all the information you gained from studying The Caucasian Chalk Circle.

## Key Skills

Working with others can be difficult. They may have different ideas to you, they may not have any ideas, they might not listen to you etc. It can be tricky..

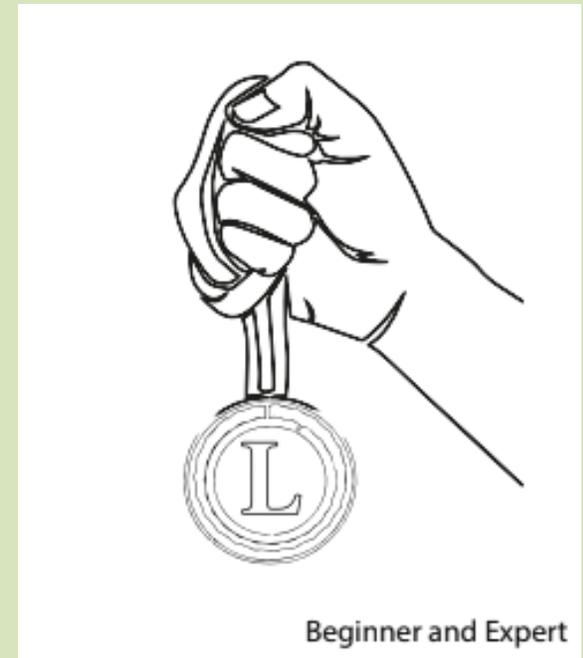
PIPS are the skills and qualities that you need to work effectively in a group, they include; **tolerance, courage, kindness, honesty and many more.**

**Do you remember when you designed your PIPS poster for home work? What skills and qualities are you bringing to your group work? What skills and qualities are you still working on?**

Students do not generally put their hands up in class unless they want to ask a specific question or have a request. Most class activities and discussions take place without raising hands. The teacher will invite different students to contribute at different times so that everyone participates in lessons. The teacher will always either, give you an opportunity to discuss and prepare a response first with other students or, frame the question in such a way as you cannot be wrong. We are not interested in being right or wrong- we are interested in learning. So, no hands, unless there is an emergency of course, otherwise, no hands. You will be reminded and have lots of time to practise so that it becomes a habit for you in drama.

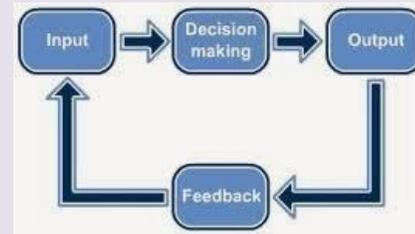
**Speaking in the first person singular – its importance in your written exams**

Since your very first lesson in Y7, you have been encouraged to speak in the 1st person singular – that's; **I, me, my & mine**, in lessons when speaking about your own experience. This avoids confusion and allows you to begin to take responsibility for your ideas and what you are saying. This has been vital work. Your practise and persistence in this will be called upon here in your **Portfolio** and in your 90 minute written **Evaluation of your Performance**. These two parts of this examination are worth 30% of your final grade, and it is essential that you write about **your** contribution, **your** research, **your** views, **your** ideas, how your individual performance went and you use; **I, me, my & mine.**



## 4.1 Skill and ability

<b>Skill</b>	A learned action or behaviour, with the intention of bringing about pre-determined results, with maximum certainty and minimum outlay of time and energy
<b>Ability</b>	An inherited, stable trait that determines an individual's potential to learn or acquire a skill.
<b>Trait</b>	Distinguishing qualities or characteristics belonging to a person
<b>Basic skill</b>	A simple skill that does not require much concentration – throwing, running, catching
<b>Complex skill</b>	A skill that requires a great deal of concentration and coordination to perform.
<b>Open Skill</b>	A skill that is performed on a certain way to deal with a changing unstable environment.
<b>Closed skill</b>	A skill that is not affected by the environment or performers within it. The skill tends to be done the same way each time.
<b>Self Paced skill</b>	A skill that is started when the performer decides to start it. The speed, rate or pace of the skill is controlled by the performer.
<b>Externally paced skill</b>	A skill that is started because of an external factor. The speed, rate or pace of the skill is controlled by external factors, such as an opponent or the environment.
<b>Gross movement skills</b>	A skill that uses large muscle groups to perform big, strong, powerful movements.
<b>Fine movement skills</b>	A skill involving small, precise movements, showing high levels of accuracy and coordination. It involves the use of a small group of muscles.



## 4. Sports Psychology

### 4.2 Goals Setting

When appropriate goals are set performers have something to focus on and work towards, and more likely to be motivated to succeed.

Performance Goals	These are focused on the end result, winning or coming second or third.
Outcome Goals	Personal goals that an individual wants to achieve.



### 4.2 SMART Targets

<b>Specific:</b>	The target must be specific to the demands of the sport, muscles used or movements used.
<b>Measurable</b>	It must be possible to measure whether the specific target set has been met.
<b>Accepted:</b>	The target must be accepted by the performer and others involved in training and competition, such as the performer's coach.
<b>Realistic</b>	The target must actually be possible to complete and attain.
<b>Time-bound:</b>	The target covers a set period of time so that the performer knows whether or not they have achieved it.

### 4.3 Information processing

<b>Input</b>	This is the data received from the display. IN the case of a performer, the information will be received via the senses. Lots of information is received so they must use selective attention and choose what to focus on.
<b>Decision making</b>	The selected data is analysed and an appropriate response is selected. In the case of a performer, this means they will access memories of similar experiences and will choose an appropriate response accordingly. (Short term/ Long term memory)
<b>Output</b>	The decision is acted on. Information is sent from the performer's brain to the working muscles to carry out the required response.
<b>Feedback</b>	Data is received in response to the output. This can become the input for future decisions. (Intrinsic/ Extrinsic feedback)

## 4.4 Guidance

<b>Verbal guidance</b>	When a coach describes how to perform a skill or tells a performer something.
<b>Visual guidance</b>	presented in a form that the performer can see it, demonstration, video
<b>Manual guidance</b>	Involves the coach physically moving a performer into the correct position or supporting them as they perform the skill.
<b>Mechanical guidance</b>	When objects or aids are used to assist in the coaching process.



## 4.4 Feedback

<b>Positive Feedback</b>	What was correct or good about the performance.
<b>Negative Feedback</b>	What was incorrect or bad about the performance
<b>Knowledge of results</b>	Provides the performer with information about their placing in a tournament or the time it took them to complete a race
<b>Knowledge of Performance</b>	Provides the performer with information about their performance generally and about their technique more specifically
<b>Extrinsic Feedback</b>	Feedback a performer receives about their performance from outside themselves, such as from their coach.
<b>Intrinsic Feedback</b>	Feedback a performer receives about their performance from within. Kinaesthetic feedback is a form of intrinsic feedback.

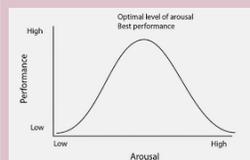


## 4.5 Arousal

Arousal is a physical (or physiological) and mental (psychological) state of alertness or readiness.

### The 'inverted u theory'

This states that an optimal performance occurs when a performer reaches an optimal level of arousal. You are more likely to perform at your best when you are in the best possible physical and mental state



## 4.6 Aggression

Direct Aggression	Indirect Aggression
<ul style="list-style-type: none"> <li>Involves physical contact to cause physical harm</li> <li>Normally outside the rules of the sport</li> <li>Players do it in the hope they do not get caught</li> </ul>	<ul style="list-style-type: none"> <li>Doesn't involve physical contact</li> <li>Could be a nasty remark</li> <li>Could be an act against an object to gain an advantage</li> <li>The intended harm is usually mental rather than physical to put them off their game</li> </ul>



## 4.8 Motivation

### Intrinsic Motivation

The drive comes from within you. It is driven by personal feeling e.g.

- Pride
- Satisfaction
- Accomplishment
- Self-worth
- Achievement

## 4.7 Personality Types

Introvert	Extrovert
<p>An introvert is:</p> <ul style="list-style-type: none"> <li>Shy and quiet</li> <li>Reserved</li> <li>Thoughtful</li> <li>Enjoy being on their own</li> <li>Associated with individual sports which require concentration, precision and low arousal</li> </ul>	<p>An extrovert is:</p> <ul style="list-style-type: none"> <li>Active, talkative and outgoing</li> <li>Sociable (aroused by others)</li> <li>Enthusiastic</li> <li>Prone to boredom (when on own)</li> <li>Associated with team sports which are fast paced (high arousal), concentration levels are low and gross skills are used</li> </ul>



### Extrinsic Motivation

The drive comes from external rewards such as:

- Money/Prizes
- Trophies

Praise (feedback applause)

#### Tangible rewards:

- Those that you can touch

#### Intangible rewards

- Those that you can't touch



### Evaluation

- Any type of motivation is useful.
- Intrinsic is thought to be more effective as it doesn't rely on external rewards
- If you are only extrinsically motivated you may not try your best when no rewards are available
- Receiving extrinsic rewards may lead to feelings of self-satisfaction and pride that are associated with intrinsic motivation
- Overuse of extrinsic motivation can reduce intrinsic motivation as you can become reliant on receiving rewards

## 5.1 Engagement Patterns

Engagement patterns are the general trend of different social groups participation in physical activity and sport.

<b>M</b>	<b>Media</b>	Lack of TV coverage of female role models
<b>I</b>	<b>Inclusiveness</b>	Facilities may not run sessions for people with disabilities
<b>R</b>	<b>Role Models</b>	Lack of female role models in many sports
<b>A</b>	<b>Attitudes</b>	You may not play a sport because your friends don't like it.
<b>C</b>	<b>Culture/ Religion</b>	Family/peer influence on whether you do something. Religious festivals take precedence over playing sport
<b>L</b>	<b>Leisure time</b>	Less time available owing to work commitments
<b>E</b>	<b>Education</b>	School may not offer or have the facilities to play some activities.
<b>S</b>	<b>Sexism/ Stereotyping</b>	Some girls do not want to play football as they may be thought of as masculine. Some men do not want to dance or play netball as they think these activities are for females only.
<b>S</b>	<b>Socio-economic/ Disposable income</b>	Some people in minority groups have less money, someone without a permanent job will have less money.
<b>A</b>	<b>Accessibility</b>	Lack of facilities or clubs as well as physical barriers, lack of ramps, pool hoists.
<b>F</b>	<b>Family</b>	Family commitments, looking after younger siblings.
<b>F</b>	<b>Familiarity</b>	You may do activities the same as other members of your family.

## 5. Socio-cultural influences

### 5.1 Social Groups

Social group	General Information	Reasons affecting engagement patterns/ Barriers to participation
<b>Gender</b>	Gender groups are determined by a person's sex – male or female.	Role models, Media coverage, Sexism/ stereotyping, Funding, Body Image, Attitudes, Family Commitments, Accessibility
<b>Age</b>	People are split into groups based on their age: Children, teenagers, adults, retirees	Accessibility, Education, Socio-economic/ disposable income, Leisure time, Sexism/stereotyping
<b>Socio-economic</b>		
<b>Ethnicity</b>	Race/Religion/ Culture – People are grouped on their culture or specific origin.	Cultural influences, Religious festivals, Stereotyping, Socio-economic/disposable income, Family Commitments, Accessibility
<b>Disability</b>	A physical or mental condition that limits a person's movements, sense or activities.	Adaptability, Inclusiveness, Accessibility, Socio-economic/disposable income, Stereotyping, Media coverage, Role models
<b>Family/Friends</b>	You can be grouped by those you spend time with the most: parents, relations, guardians, friends, siblings, classmates	Attitudes, Role models, Cultural influences,

### Key Vocabulary

Barrier to participation	An obstacle that prevents a group within society from participating in sport or physical activity and therefore reduces overall levels of participation
Engagement patterns	Trends/ tendencies in involvement
Ethnic group	A group of people who share common origins – be they racial, religious or cultural
Social group	People who interact with one another, share similar characteristics, and have a sense of unity/ togetherness
Stereotyping	Widely held but fixed and over simplified idea of a particular type of person
Discrimination	The unjust or prejudicial treatment of different groups of people, especially on the grounds of race or gender

## 5.2 Commercialisation

### Sponsorship



A sponsor is an individual or group that provides support in the form of sponsorship in return it is seen by millions, via advertising, sponsorship and endorsement  
It can be for:

- An individual (Ronaldo sponsored by Nike)
- A team (Man City sponsored by Etihad)
- An event (Olympics sponsored by MacDonald's)

Different types of sponsorship include:

- Money
- Clothing and equipment
- Facilities



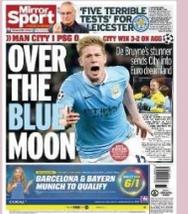
### Media

The media are a broad range of technologies that act as the main means of communication. They include:

- Printed media (newspapers and magazines)
- Broadcast media (TV and radio)
- Internet and social media

#### Sponsorship and the media

- Sponsors want to promote their products via the media as they can reach millions of potential customers
- Media companies need high viewing figures to make them more attractive to sponsors
- Media companies therefore pay sports clubs to allow them to televise matches as this attracts lots of viewers, making it more likely that they will get funding from sponsors



### Sport

The player/performer and the sport need funding for:

- Facilities
- Equipment
- Competitions

Both the media and commercialisation can help promote sports. The media can also provide opportunities for the spectator



### The Advantages of Commercialisation

#### Sponsor or company



- Excellent and relatively inexpensive advertising of their products as:
- Media can show products during breaks in play
- Brand names can be seen around venues and on clothing
- Raised awareness of brands increase sales
- Products associated with high quality performance give it a high status
- Media hype gets more viewers which means more exposure of the brand

#### Sport



- Raised awareness = increase participation
- Higher profile = commercial interest
- Increases funding from sponsors
- Funding means that you can run events, develop the sport and facilities

#### Player Performer



- Paid millions to endorse products
- Train full time and focus on being the best in their sport
- Receive top quality products to use to improve performance

#### Spectator



- More coverage and top event
- Red button/Replays
- Player cam
- Buy the same clothes and equipment to their role models

#### Official



- Sponsors can provide kit
- Media can support correct decisions
- More likely to become role models

### The Disadvantages of Commercialisation

#### Sponsor or company



- The media may not get a high number of viewers
- The company doesn't get the amount of exposure they wanted
- The player/team doesn't perform well
- The player who becomes a bad role model due to cheating, violence, infidelity, racism etc.... affects popularity and sales

#### Sport



Fixtures can be changed to maximise viewing opportunities  
Breaks in play for advertising purposes  
Minority sports not shown on TV which decreases sponsorship  
Negative reporting can give a sport a bad name  
Clothing and rule changes are more appealing to viewers

#### player performer



Event times make it less favourable for performers  
Withdrawal of sponsorship could cause financial difficulties  
Required appearances take time away from training  
Pressure to win at all costs to keep a sponsor  
No privacy and negative reporting can lose sponsorship

#### Spectator



High costs for subscription fees to sports channels  
Pay per view for certain events  
High cost of merchandise  
Minority sports not shown  
Sponsors keep best tickets for hospitality

#### Official



Under the spotlight for all decisions as they can be replayed, so poor decisions are highlighted undermining the official  
They have to wear the sponsors logo

## 5.3 Impact of Technology

The Advantages of Technology		The Disadvantages of Technology	
<b>To the sponsor</b>	<ul style="list-style-type: none"> <li>Easier to see logos due to enhanced viewing quality</li> <li>More coverage of sports provides more opportunities to see products</li> <li>Advertising opportunities during breaks on TV</li> <li>Better standard of play using improved equipment encourages more sales</li> </ul>	<b>To the sponsor</b>	<ul style="list-style-type: none"> <li>They need to provide more funding to buy equipment for performers so they stay at the top of their game and give access to the best medical support to keep them fit such as ice baths and hypoxic tents</li> <li>Sponsored players may be found cheating which reflects badly on the sponsor</li> </ul>
<b>To the performer and sport</b>	<ul style="list-style-type: none"> <li>Improved equipment, clothing and footwear to improve <b>performance</b> such as running blades for disabled athlete</li> <li>Improved equipment, clothing and footwear to improve <b>safety</b> such as ski helmets and head guards in boxing</li> <li>Improved security at venues such as cameras and metal detectors</li> <li>Better facilities such as velodromes for cycling</li> <li>Better decisions by officials due to technology support such as VAR</li> <li>Better drug testing to prevent cheating</li> </ul>	<b>To the performer and sport</b>	<ul style="list-style-type: none"> <li>The cost of equipment increases</li> <li>State of the art facilities cost more</li> <li>Technology can go wrong</li> <li>Repairs are expensive</li> <li>Technology can be inaccurate</li> <li>The human part of lucky decisions is lost</li> <li>People can watch at home rather than attend live games</li> <li>Players/performers unable to afford modern technology are at a disadvantage</li> </ul>
<b>To the spectator</b>	<ul style="list-style-type: none"> <li>Multiple viewing platforms such as TV tablet, mobile phone</li> <li>Better picture and sound creating a better viewing experience</li> <li>Interactive options such as player cam</li> <li>Increases enjoyment as a result of better performances due to technology</li> <li>Increased interaction at live games for decisions VAR and Hawkeye</li> </ul>	<b>To the spectator</b>	<ul style="list-style-type: none"> <li>Breaks in play waiting for decisions is boring</li> <li>Technology changes the nature of the sport</li> <li>They have to pay to view some sports</li> <li>They have to pay for specialist sports channels</li> <li>Technology is expensive 3D and ultra HD TV's</li> <li>They don't experience the excitement of watching the match live</li> </ul>
<b>To the official</b>	<ul style="list-style-type: none"> <li>Technology support means less chance of errors as it provides additional help to reach the right decision (VAR, Hawkeye, Hot spot)</li> <li>Improved timing devices mean more accurate results</li> <li>Wifi allows for improved communication with officials and technicians</li> </ul>	<b>To the official</b>	<ul style="list-style-type: none"> <li>They become reliant on the technology</li> <li>Technology can go wrong</li> <li>Technology highlights the official's errors</li> <li>Decisions are challenged more owing to loss of respect for officials and judgement</li> </ul>

## 5.4 Ethical Conduct of performers

<b>Etiquette</b>	A convention or unwritten rule in an activity. It is not an enforceable rule but is usually observed.
<b>Sportsmanship</b>	Conforming to the rules, spirit and etiquette of a sport
<b>Gamesmanship</b>	Attempting to gain an advantage by stretching the rules to their limit.
<b>Contract to compete</b>	An unwritten agreement between opponents to follow and abide by the written and unwritten rules of the sport.

## 5.4 Ethical Conduct of performers – Performance Enhancing Drugs

### Advantages to the performer from PED's

Level playing field	If every athlete were to take them it would make things equal when competing
Fame	The more successful you are the more famous you can become owing to more publicity
Wealth	If you are successful you are more likely to win more prize money and attract sponsorship deals
Increase chance of success	An archer taking beta blockers to reduce anxiety may be more accurate and have a greater chance of winning

### Disadvantages to performer from taking PED's

Cheating/immoral	If caught everyone will know you cheated
Fines	If caught you may have to pay an expensive fine
Bans	If caught you will not be able to compete, when the ban is over you may be past your peak fitness
Associated health risks	Many performance enhancing drugs have health risks. Taking diuretics can cause kidney damage
Damage to reputation	If caught you will not be able to compete, when the ban is over you may be past your peak fitness

### Disadvantages to the Sport when performers take PED's

A bad reputation	If a performer takes drugs the sport may not get the respect it deserves
Poor Credibility	If a performer takes drugs the sport may be seen as untrustworthy or unreliable

Drug	Effect on Performance	Health risks	Which Sports
<b>Anabolic Agents</b>	Allows performers to train longer and harder. It increases protein synthesis helping develop lean muscle mass and speeds up recovery time.	<ul style="list-style-type: none"> <li>Liver damage/CHD</li> <li>Testicular atrophy</li> <li>Infertility</li> <li>Skin problems</li> <li>Mood swings</li> <li>Aggression</li> <li>Baldness</li> </ul>	Activities that require power: Sprinters Rugby players Weightlifting Boxers Baseball
<b>Beta Blockers</b>	Beta blockers improve fine motor control by slowing heart rate and reducing anxiety which allow the performer to remain calm and controlled.	<ul style="list-style-type: none"> <li>Nausea</li> <li>Sleep disturbance</li> <li>Tiredness/weakness</li> <li>Lower blood pressure</li> <li>Slow heart rate</li> </ul>	Activities that require precision: Archery/shooting Snooker Gymnastics
<b>Diuretics</b>	Diuretics achieve quick weight loss (fluids). They also mask other drugs making them harder to detect.	<ul style="list-style-type: none"> <li>Dehydration</li> <li>Nausea</li> <li>headaches</li> <li>Heart/kidney failure</li> </ul>	Drug cheats and sports with weight categories: <ul style="list-style-type: none"> <li>Boxing</li> <li>Jockey</li> </ul>
<b>Narcotic Analgesics</b>	Narcotic analgesics increase the performer's pain threshold so can mask injuries, also give a feeling of invincibility.	<ul style="list-style-type: none"> <li>Nausea/vomiting</li> <li>Anxiety/depression</li> <li>Kidney/liver damage</li> <li>Addiction</li> <li>Risk further injury</li> </ul>	Any sport that a performer is injured: <ul style="list-style-type: none"> <li>Boxers</li> <li>Sprinters</li> <li>Football</li> </ul>
<b>Peptide Hormones</b>	<b>EPO</b> Erythropoietin (EPO) Can increase red blood cell production increasing O <sub>2</sub> delivery.	<ul style="list-style-type: none"> <li>Thickening of blood</li> <li>Blood clots</li> <li>Strokes</li> <li>Heart attack</li> </ul>	Aerobic events e.g. long distance: <ul style="list-style-type: none"> <li>Running</li> <li>Cycling</li> </ul>
	<b>HGH</b> Human Growth Hormone Helps muscle mass and burns fat.	<ul style="list-style-type: none"> <li>Arthritis</li> <li>Heart failure</li> <li>Abnormal feet/hands</li> </ul>	Strength events: <ul style="list-style-type: none"> <li>Weightlifting</li> <li>Sprinting</li> <li>Rugby</li> </ul>
<b>Stimulants</b>	Stimulants increase alertness, reduce tiredness and increase heart rate (therefore oxygen delivery).	<ul style="list-style-type: none"> <li>Insomnia</li> <li>Anxiety</li> <li>Aggression</li> <li>Irregular heart rate</li> </ul>	Alert/aggressive sports: <ul style="list-style-type: none"> <li>Rugby</li> <li>Boxing</li> <li>Ice hockey</li> </ul>
<b>Blood Doping</b>	Blood doping involves the removal of blood a few weeks prior to competition. The blood is frozen and re-injected just before competition. (increase red blood cells)	<ul style="list-style-type: none"> <li>Infection</li> <li>Thickening of blood (viscosity)</li> <li>Heart attack</li> <li>Embolism (blockage of vessel)</li> </ul>	Aerobic events e.g. long distance: <ul style="list-style-type: none"> <li>Running/cycling</li> <li>Cycling</li> <li>Swimming</li> <li>Games players</li> </ul>

## 5.5 Spectator Behaviour

Advantages of spectators	Disadvantages of spectators
<p><b>Creation of atmosphere:</b></p> <ul style="list-style-type: none"> <li>• A large crowd creates excitement interest and enjoyment</li> <li>• Player can be more motivated</li> <li>• Interaction for the fans</li> <li>• Positive experience leads to more fans who want to attend</li> <li>• Raises income and raises the profile of the sport, increasing participation</li> </ul> <p><b>Home-field advantage:</b></p> <ul style="list-style-type: none"> <li>• Teams and individual performers can gain an advantage from being in familiar surroundings, with fan support and referee bias.</li> <li>• You feel lifted with the majority of spectators cheering for you and so you play better</li> </ul>	<p><b>Increasing pressure:</b></p> <ul style="list-style-type: none"> <li>• With spectators wanting you to win can lead to an increase in anxiety causing performance to drop</li> </ul> <p><b>Safety costs/concerns:</b></p> <ul style="list-style-type: none"> <li>• It is expensive to employ security staff and repair damage caused by spectator behaviour</li> </ul> <p><b>Negative effect on participation numbers among young people:</b></p> <ul style="list-style-type: none"> <li>• The reputation of a sport due to spectator behaviour can cause a drop in the number of young people interested and therefore a loss of potential elite performers</li> </ul> <p><b>Potential for crowd trouble/hooliganism:</b></p> <ul style="list-style-type: none"> <li>• Hooliganism can lead to fans not attending matches leading to a loss in ticket sales, support and sponsorship</li> </ul>

## 5.5 Hooliganism

Reasons for	Strategies to prevent	Implications of preventing hooliganism
<b>Rivalries (local derby)</b>	Segregation All seater stadiums	Cost Groups of fans can still sit together People can buy tickets for known hooligans
<b>Hype (from media)</b>	Travel Restrictions Bans, fines, prison Educational Campaigns	Fans arrange fights elsewhere Cost Impact of educational campaigns – do they make a difference?
<b>Fuelled by drugs/alcohol</b>	Early kick-offs Alcohol restrictions	Loss of income for pubs Fans will drink at home before the match
<b>Gang culture</b>	Bans, fines, prison Increased security Travel restrictions	Cost and police time Fans arrange fights elsewhere
<b>Frustration (official's decision)</b>	Don't show controversial replays on the big screen	Media and social media highlight decisions, therefore causing unrest amongst fans
<b>Displays of masculinity</b>	Bans, fines, prison Alcohol restrictions	Loss of income for pubs Fans will drink at home before the match



# RO45 Sports Nutrition– Diet, Weight, Nutrition & Hydration

**A balanced diet** – eating the right foods in the correct proportions to maintain a healthy body weight.  
Insufficient macro and micronutrients can cause health issues *i.e. anaemia, rickets and scurvy.*

7 components of a balanced diet:

## Macronutrients

- **Carbohydrates** – Main energy source. *i.e.* Complex starch (pasta & potatoes) & simple sugars (glucose, chocolate, sweets)
- **Fats** – Secondary energy source & provides insulation. *i.e.* Saturated fats (butter) & unsaturated fats (vegetable oil)
- **Proteins** – Help growth and repair of muscles. *i.e.* eggs, meat & fish



## Micronutrients

- **Minerals** – Maintains healthy bodily functioning. *i.e.* iron and calcium
- **Vitamins** - Maintains a healthy immune system. *i.e.* vitamin A, C, D, E, K



## Other components

- **Fibre** – Aids digestion of food in the gut. *i.e. cereals & nuts*
- **Water** – Maintains cell function and hydrates an athlete.



## **Hydration and physical activity**

**Water** is necessary for:

- Transportation of nutrients
- Removes waste products through urine
- Regulates body temperature



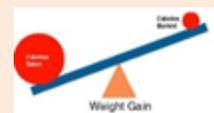
A lack of water can cause **dehydration**. Symptoms are tiredness, lack of concentration and headaches.



**After the event** - An athlete will continue to drink fluids to replace the water and carbohydrate levels that are depleted.

**Organising meals around exercise** – it is recommended to eating 2-3 hours before exercise. This is due to redistribution of blood during exercise (Blood Shunting)

When exercising, the distribution of blood around the body changes according to the demands. *i.e. away from digestive system and to working muscles.*



## **Dietary manipulation to optimise performance**

**Carbohydrate Loading** – a strategy used by endurance athletes to increase carbohydrate stores



**Protein intake** – the intake and timing of this consumption is vital to maximise the repair of muscle tissues after training. Protein should be taken straight away to increase muscle repair. Used by **sprinters, shot putters & power events**.



## Glycogen stores

Optimum energy at muscle level through carb-loading. Other ways to keep this high are to:

- Consume carbs 2-4 hours before exercise
- Consume very small amounts of carbs half an hour before exercise
- Eat carbs straight after exercise for up to 2 days to replenish stores

## Other factors

- Timing of meals around training
- Adequate fluid intake
- Adequate iron intake
- Adapt diet depending on workload
- Psychological well-being
- Sharing of ideas between coach, dietician and athlete
- Obsession with food by athletes should be strongly avoided
- Possible use of supplements for high performing athlete within the restrictions of the sport

1 week before competition – train and eat normally

3-4 days before competition – reduce the amount of exercise. Increase carbohydrate intake

24 hours before competition – no exercise and large carbohydrate intake

# RO45 Sports Nutrition– Effects of a Poor Diet on Performance

## Malnutrition

A condition which results from an unbalanced diet in which some nutrients are lacking, missing, taken in excess or taken in the wrong proportion

## Overeating

Overeating is the excess food consumed in relation to the energy that an organism expends, leading to weight gaining and often obesity. It may be regarded as an eating disorder.

### The effects of overeating on sports performance and participation

- ☒ Your fitness will deteriorate (E.g, flexibility, agility and stamina will decrease)
- ☒ You lose confidence and become anxious about participating
- ☒ You can develop a range of illnesses (E.g, high blood pressure, arthritis) which prevent you from participating in certain activities
- ☒ Eating large amounts immediately before participating in a sporting activity can make you feel sick during participation

## Undereating

A negative energy imbalance that results when energy intake is less than energy that is expended. This negative energy imbalance can occur as a consequence of social conditions (E.g., poverty), medical conditions (e.g., cystic fibrosis), or psychological conditions (e.g., depression)

### The effects of undereating on sports performance and participation

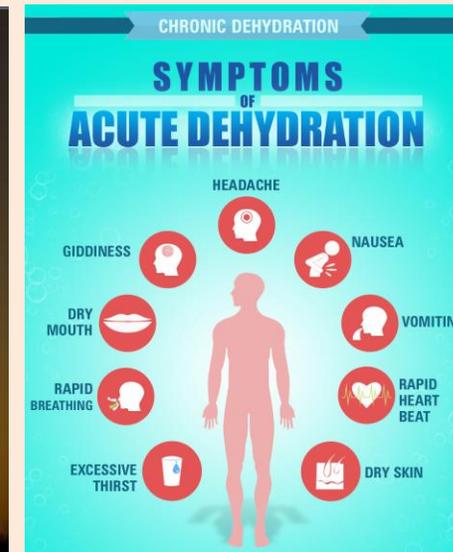
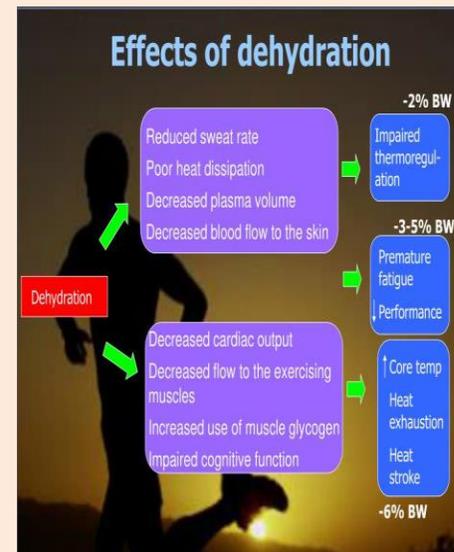
- ☒ You will have less energy (E.g, not taking in enough carbohydrates) and tire quickly
- ☒ Your Muscles and bones weaken, increasing the risk of injury
- ☒ Your concentration becomes impaired
- ☒ You may develop an eating disorder (E.g, Anorexia) and train too hard leading to injury and/or illness
- ☒ You may develop an illness which prevents you from participating (E.g, kidney infections)

## Dehydration

A condition caused by the excessive loss of water from the body, which causes a rise in blood sodium levels. Since dehydration is most often caused by excessive sweating, vomiting, or diarrhea, water loss is usually accompanied by a deficiency of electrolytes. If untreated, severe dehydration can lead to shock.

### The effects of dehydration on sports performance and participation

- ☒ You can overheat leading to heatstroke
- ☒ Your concentration becomes impaired
- ☒ You will tire more quickly
- ☒ You become ill during participation (eg, vomiting)



## Hydration

When athletes are in training, they need to replace and of the water lost by the body through sweat. Being hydrated is also key to recovery and helps digestion. So whilst a lot of people focus on the water lost during exercise as a reason for athletes level of water consumption.

### How to design a diet plan

- ☐ Details about the performer that the diet plan is for (e.g. age, gender, any allergies or religious beliefs, food budget, cooking skill level, the type of activity they perform in)
- ☐ Clarify the aims of the diet plan (e.g. to lose weight, to increase length of time for which they can train prior to taking part in an event)
- ☐ Set realistic goals that can be measured (SMART targets, e.g. to lose 2 pounds per week)
- ☐ The time of year (e.g. is the performer training for an event, is it off season, what fruit and vegetables are available at that time of the year)
- ☐ Duration of the diet plan (e.g. suitable length to achieve goals)
- ☐ Suitability of the diet plan (e.g. diet meets the needs of the performer, proportions of the various nutrients are appropriate)
- ☐ Organisation of diet plan (e.g. meals scheduled for set intervals, timing of a meal fits around other activities)

### How to evaluate the effectiveness of a diet plan

- ☐ Recording the outcomes objectively (e.g. measuring weight, diaries/journals of plan put into action)
- ☐ Recording the outcomes subjectively (e.g. Interviewing performer- is training feeling easier?, are you more tired after training?, are you bored of eating the same thing?)
- ☐ Improvement (E.g. increase the number of meals but reduce the portion sizes)

	Monday	Tuesday	Wednesday	Thursday	Friday
<b>Breakfast</b>	cottage cheese & peaches (130)	cranberry muffins (216)	oatmeal bar (310)	hard boiled egg on toast (180)	hard boiled egg on toast (180)
<b>Snack</b>	granola bar (180)	banana (90)	grapes (60)	banana (90)	applesauce (50)
<b>Lunch</b>	meatloaf (355), honey ginger carrots (200)	meatloaf (355), honey-ginger carrots (200)	broccoli cheddar soup (340), saltines (120)	broccoli cheddar soup (340), saltines (120)	deli meat sandwich, peppers & hummus (390)
<b>Snack</b>	banana, grapes (150)	cottage cheese & peaches (130)	peppers & hummus (80)	granola bar, grapes (250)	almonds & grapes (240)
<b>Dinner</b>	broccoli cheddar soup (340), saltines (120)	quesadilla, peppers & hummus (580)	deli meat sandwich, banana (390)	meatloaf(355), veggies (40)	broccoli cheddar soup (340), saltines (120)
<b>Snack</b>	(optional)	(optional)	(optional)	(optional)	(optional)
<b>Calories</b>	1475	1571	1300	1375	1320

## SMART Nutrition Goal Setting



### Specific

A specific goal has a much greater chance of being accomplished than a general goal. To set a specific goal, you must ask the following questions: who, what, where, when, which, and why?

### Measurable

In order to create a measurable goal, establish criteria for measuring your progress towards your goal. To determine if your goal is measurable ask questions like "How much?" or "How many?"

### Attainable

Making your goal attainable makes it more likely to accomplish. Ask yourself what can be done to make this goal happen.

### Realistic & Relevant

To be realistic, a goal must represent an objective toward which you are both willing and able to work. The bar should be set high enough so that it is realistically attainable. Ask yourself if completing the goal is possible and worthwhile.

### Time Bound

Goals need a time frame in which to be completed. Leaving a time frame too vague can lead to a lack of progress. Make sure to establish a deadline for your goal in order to help your success.

Principles of training - **Guidelines** that ensure **training is effective** and results in **positive adaptations**. These principles are used when planning an Exercise Programmes

**PAR-Q – Physical Activity Readiness Questionnaire**

Conducted before fitness testing or an activity programme to examine the performer’s readiness for training or any health conditions/lifestyle choices that may affect the successful completion.

**FITTA Principle**

<b>Frequency</b>	How often training takes place.	<i>Increase training from once a week to two</i>
<b>Intensity</b>	How hard the exercise is.	<i>Increase resistance from 10kg to 15kg or increase incline on the treadmill.</i>
<b>Time</b>	The length of the session.	<i>Increase training session from 45 minutes to 55 minutes.</i>
<b>Type</b>	The method of training used.	<i>Change to from interval training to Fartlek training.</i>
<b>Adherence</b>	Being motivated to stick to the training programme	<i>Include a variety of training methods and progressive exercises</i>

**Progression**

Using overload in a progressive way over the course of a programme. Once adaptations have happened overload needs to be applied to make gains again, e.g. lifting more in week 12 than in week 2 of the programme.



**Overload**

Working the body harder than normal/gradually increasing the amount of exercise you do. *i.e. bench press 50kg x 10 repetitions and increase to 55kg x5 repetitions.*

**Reversibility**

If training is not regular, adaptations will be reversed. This can happen when:

- Suffering from illness and cannot train
- Injury
- After an off-season.

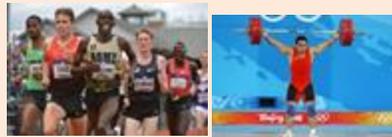


**Specificity**

Training should be **matched** to the requirements of the sport or position the performer is involved in.

Training must be specifically designed to develop the right:

- Muscles
- Type of fitness
- Skills



**Individual needs (Moderation)**

All athletes programmes would differ depending on:

- Performer’s goals/targets
- Strength and weaknesses
- Age/gender
- Current health/fitness levels
- Experience

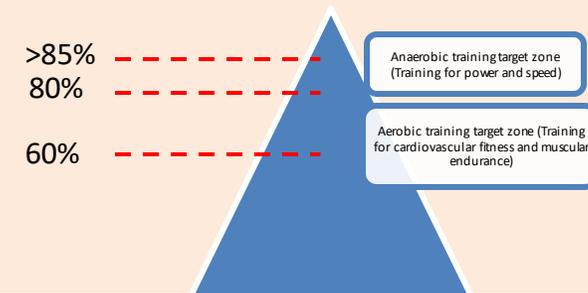


**Overtraining**

Occurs when you **train too hard** and do not allow the body enough **rest/recovery time**. Signs/symptoms include: extended muscle soreness, frequent illness & increase injuries.

**Calculating Training Zones/Thresholds of Training**

Maximum Heart Rate (MHR) = 220 – age	<b>Aerobic target zone: 60–80% of MHR</b> (60% = x 0.6 / 80% = x 0.8)	<b>Anaerobic target zone: &gt; 85% MHR</b> (85% = x 0.85)
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## RO42 Applying Principles of Training – Methods of Training

**Continuous training** - Involves a steady but regular pace at a moderate intensity (aerobic) which should last for at least 20 minutes. i.e. running, walking, swimming, rowing or cycling.  
Used by a **marathon runner**.



Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Ideal for beginners</li> <li>• Highly effective for long distance athletes</li> </ul>	<ul style="list-style-type: none"> <li>• Can be extremely boring as repetitive</li> </ul>

**Interval training** - Involves periods of work followed by periods of rest. i.e. *Sprint for 20 metre + walk back to start.*  
Used by a **200m sprinter**



Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Quick and easy to set up.</li> <li>• Can mix aerobic and anaerobic exercise which replicates team games.</li> </ul>	<ul style="list-style-type: none"> <li>• It can be hard to keep going when you start to fatigue (high motivation and self discipline needed)</li> <li>• Over training can occur if sufficient rest is not allowed between sessions (48 hours)</li> </ul>

**Fartlek training** – Referred to as ‘**speed play**’

This is a form interval training but without rest. Involves a variety of changing intensities over different distances and terrains.



i.e. *1 lap at 50% max, 1 lap walking, 1 lap at 80% (aerobic and anaerobic used)*

Used by **games players – Hockey players**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• More enjoyable than interval and continuous training</li> <li>• Good for sports which require changes in speed</li> <li>• Easily adapted to suit the individuals level of fitness and sport.</li> </ul>	<ul style="list-style-type: none"> <li>• Performer must be well motivated particularly when intensity is high</li> <li>• Difficult to assess whether performer is performing at the correct intensity</li> </ul>

**Plyometrics training**

Involves high-impact exercises that develop **power**. i.e. *bounding/hopping, squat jumps.* Used by **long jumpers, 100m sprinters or basketball players.**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Easy to set up requiring little or no equipment</li> <li>• Hugely effective in developing power</li> </ul>	<ul style="list-style-type: none"> <li>• Can result in injury if not fully warmed up.</li> <li>• Can place a great stress on joints and muscles.</li> </ul>



**Weight/Resistance training** – A form of training that uses progressive resistance against a muscle group. Used by **cyclists**.

Muscular strength:

**High weight x low repetitions**

Muscular endurance:

**Low weight x high repetitions**



Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Variety of equipment to prevent boredom</li> <li>• Strengthens the whole body or the muscle groups targeted.</li> <li>• Can be adapted easily to suit different sports</li> </ul>	<ul style="list-style-type: none"> <li>• Requires expensive equipment</li> <li>• If exercises are not completed with the correct technique it can cause injury to the performer</li> </ul>

**Circuit training** - A series of exercises completed one after another. Each exercise is called a station. Each station should work a different area of the body to avoid fatigue.

i.e. *press ups, sit ups, squats, shuttle runs.*



Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Quick and easy to set up</li> <li>• Easy to complete with large groups</li> <li>• Can be adjusted to be made specific for certain sports. i.e. <i>netball specific circuit</i></li> </ul>	<ul style="list-style-type: none"> <li>• Technique can be affected by fatigue and can increase risk of injury</li> <li>• Must have motivation and drive to complete the set amount of repetitions and sets.</li> </ul>

**HIIT Training**

These are **High Intensity Interval Training** activities where speed and recovery are used throughout the session. Exertion levels are high (7/10) for between 30 secs and 3 mins. Work output is much shorter than recovery time. Examples might be Body pump, High Impact Aerobics, Spinning.



Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Variety avoids boredom</li> <li>• Instructor will challenge &amp; motivate</li> <li>• Great way to meet new people</li> </ul>	<ul style="list-style-type: none"> <li>• Gym membership can be expensive.</li> <li>• Group classes are not tailored to individual needs.</li> </ul>

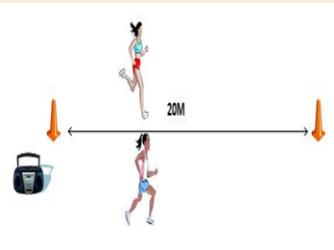
## RO42 Applying Principles of Training – Components of Fitness

Health Related Component of Fitness	Definition	Sporting Example	
<b>Cardio-Vascular Endurance</b>	The ability of the heart, lungs and blood vessels to deliver oxygen to working muscles and tissues, as well as the ability of those muscles and tissues to utilise that oxygen.		<b>Marathon runners</b> require excellent cardiovascular fitness to be able to run for the entire <b>duration of the race without getting tired.</b>
<b>Muscular Endurance</b>	A measure of the length of time your voluntary muscles can contract without getting tired. This can be repeated muscle contractions, or one contraction held for a period		<b>Boxers</b> require good muscular endurance to be able to <b>repeatedly contract their muscles</b> when <b>throwing punches</b> many times without getting tired.
<b>Muscular Strength</b>	The amount of force a muscle can generate when it contracts to overcome resistance.		<b>Powerlifters</b> require excellent muscular strength to be able to generate large amounts of force when <b>lifting heavy weights.</b>
<b>Flexibility</b>	The ability of your joints to move through their full range of movement.		<b>Gymnasts</b> require large amounts of flexibility to be able to <b>move their joints through their full range of motion</b> when performing moves and routines.

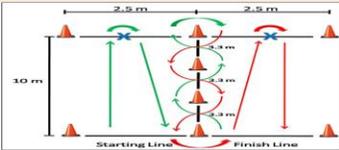
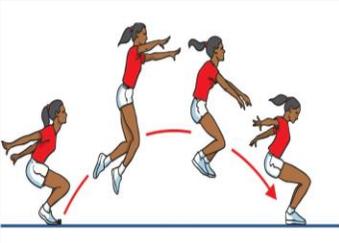
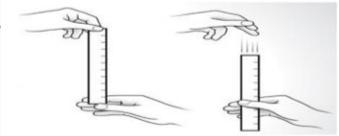
## RO42 Applying Principles of Training – Components of Fitness

Skill Related Component of Fitness	Definition	Sporting Example	
<b>Agility</b>	A measure of how quickly you can change the position of your body, while keeping your entire body under control.		<b>Footballers</b> require high levels of agility to be able to <b>change direction</b> at speed when running with the ball to get <b>around their opponents</b> .
<b>Balance</b>	The ability to keep your body mass or centre of mass over a base of support.		<b>Dancers</b> require large amounts of balance to ensure that they <b>maintain control</b> when in a <b>static position</b> , such as <b>standing on one leg</b> .
<b>Co-ordination</b>	The ability to move two or more body parts together, accurately and smoothly.		<b>Tennis players</b> require excellent levels of coordination to be able to make contact with the <b>ball and racket at the same time</b> when performing shots.
<b>Power</b>	The ability to combine strength with speed to perform a strong muscular contraction very quickly.		<b>Long jumpers</b> require great amounts of power to be able to <b>push off the ground</b> to <b>propel</b> themselves into the air in order to <b>travel a long distance in their jump</b> .
<b>Reaction Time</b>	The amount of time it takes you to respond to a stimulus.		<b>Sprinters</b> require excellent levels of reaction time to be able to get <b>out of their starting blocks as quickly as possible</b> at the beginning of a race.
<b>Speed</b>	The rate at which your body, or part of your body, is able to perform a movement.		<b>Rugby players</b> , particularly <b>wingers</b> , require high levels of speed to be able to <b>travel down the wing</b> at a fast pace to be able to <b>score a try</b> .

## RO42 Applying Principles of Training – Testing Components of Fitness

Health Related Component of Fitness	Test(s)	Advantages	Disadvantages	
<b>Cardio-Vascular Endurance</b>	Multi-stage Fitness Test & 12 Minute Cooper Run	Large groups can perform at the same time and it is simple to perform.	Keeping track of an individual's lap number / level can be difficult when there is a large group performing the test at the same time.	
<b>Muscular Endurance</b>	1 Minute Press Up Test & 1 Minute Sit Up Test	It is simple to perform and requires very little equipment. Large groups can be tested at once.	It can be difficult to determine when a correct sit-up / press up has been performed. Difficult to accurately measure large groups	
<b>Muscular Strength</b>	Hand Grip Dynamometer Test	A simple test which is very easy to conduct.	Only focuses on forearm strength and not on any other areas of the body. Cost of dynamometer.	
<b>Flexibility</b>	Sit and Reach Test	It is easy and quick to perform. There is lots of published data for comparison.	The test only focuses on the flexibility of the lower back and hamstrings. Cost of sit and reach box	

## RO42 Applying Principles of Training – Testing Components of Fitness

Skill Related Component of Fitness	Test	Advantages	Disadvantages	
<b>Agility</b>	Illinois Agility Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
<b>Balance</b>	Stork Balance Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
<b>Co-ordination</b>	Alternate Hand Wall Toss Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
<b>Power</b>	Vertical Jump Test & Standing Broad Jump	Quick and easy to perform.	Technique plays a big part in achieving a good score. Assistant is required to administer the test. Human error recording distance / height jumped.	
<b>Reaction Time</b>	Ruler Drop Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test.	
<b>Speed</b>	30m Sprint Test	It can be performed anywhere where there is a flat surface which is 50m long.	The running surface and weather conditions can affect the results. Human error with timing.	

## Test Protocols

Test should be carried out according to the protocols and guidelines set down by the fitness industry.

- Does the subject need to seek medical advice?
- How does the test procedure ensure accuracy?

## Maximal vs Sub-maximal

### Maximal

Performer works at maximum effort or is tested to exhaustion (e.g. 12 min cooper run)

### Sub-Maximal

Performer works below maximum effort (e.g. Harvard step test)

## Interpreting Results

Compared to normative data – how do outcomes compare to average results?

Before and after comparison – measure an individual's progress over time.



Rating of Perceived Exertion Borg RPE Scale		
6		
7	Very, very light	How you feel when lying in bed or sitting in a chair relaxed. Little or no effort.
8		
9	Very light	
10		
11	Fairly light	
12		Target range: How you should feel with exercise or activity.
13	Somewhat hard	
14		
15	Hard	
16		
17	Very hard	How you felt with the hardest work you have ever done.
18		
19	Very, very hard	
20	Maximum exertion	
		Don't work this hard!

## Sit ups Test

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>30	26 - 30	20 - 25	17 - 19	<17
Female	>25	21 - 25	15 - 20	9 - 14	<9



## Test Sequence

Test should be carried out in a set sequence to ensure validity of results.

The order in which they are performed can affect the outcome of further tests and influence comparison of data.

## Reliability

How accurate are the results?

- Are conditions always identical?
- Is it performed correctly?
- How difficult to record or calculate the score?
- How motivated do the performers need to be?

## Validity

Does it measure what it is supposed to?

- Specific to only that component of fitness?
- Does it only test one specific part of the body?
- How much does technique play a part?

# RO42 Applying Principles of Training – Developing and Evaluating a Training Programme

## Fitness Programme Design

- Gather details about the person (e.g. age, injuries, health, access to facilities, etc.)
- Clarify aims of programme (which components of fitness & how much improvement)
- Set realistic goals which can be measured (e.g. 2 minutes off 5km time)
- Duration of training programme (suitable to achieve goals)
- Suitability of activities (specific to needs and goals)
- Organisation of activities (variety of training methods, rest days)
- Adaptability (inside or outside options in case of bad weather)
- Progression (apply the principle of FITTA)

## Fitness Programme Evaluation

- Collect measurements - repeat fitness tests and compare results against original tests to see progress over time.
- Reflect on self / interview the subject:
  - Were the goals met?
  - Was there an appropriate range of training methods?
  - Did the training methods use target specific needs?
  - Did you stick to the training programme?
- Recommendations to improve:
  - Changes to the programme (e.g. longer duration, higher intensity, more variety in training methods, etc.)
  - More results or more accuracy in results?

**SMART TARGETS**

When you train, it is important to set targets and goals. Setting SMART targets will help you:

- Stay motivated and focused
- Monitor your progress
- Plan your training sessions

**S SPECIFIC**  
Clearly explain what you want to achieve and ensure your target is specific and relevant.  
✓ Specific – I want to improve my pass completion percentage.  
✗ Vague – I want to be better at hockey.

**M MEASURABLE**  
Set measurable targets so you can track your progress and measure if your target has been achieved.  
✓ Measurable – I want to improve my 50-km time by five minutes.  
✗ Unmeasurable – I want to be better at cycling.

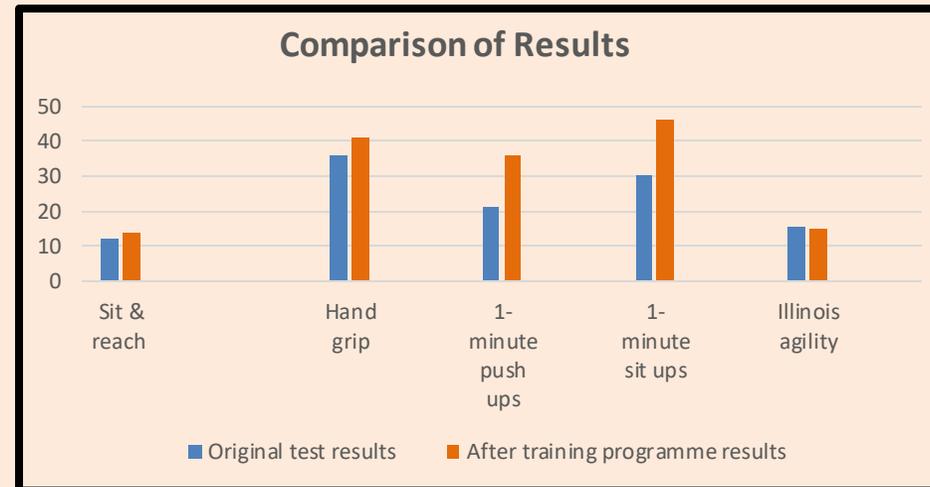
**A ACHIEVABLE**  
Set targets that you have the ability to reach. Unattainable targets are demotivating and result in failure.  
✓ Achievable – I want to improve my shooting accuracy by 10%.  
✗ Unachievable – I want my shooting accuracy to be 100%.

**R REALISTIC**  
Ensure your target is realistic for you personally. Factors, such as work and hobbies, affect your ability to meet your targets. As such, the second target below is likely to be unrealistic.  
✓ Realistic – I want to train three days a week.  
✗ Unrealistic – I want to train seven days a week.

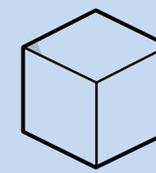
**T TIMED**  
Create a timeframe for you to achieve your targets. Set an end point as a deadline for achieving your final goal. Establishing a timeframe can also help you stay focused.  
✓ Timed – I want to beat my personal best (PB) within two months.  
✗ Not timed – I want to improve my swimming.

Having SMART targets will motivate you to stay on track!  
Always check that your targets are SMART!

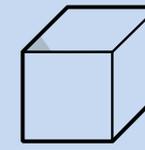
☑ Specific ☑ Measurable ☑ Achievable ☑ Realistic ☑ Timed



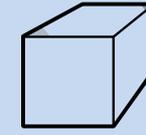
## How to creatively and effectively communicate your design ideas.



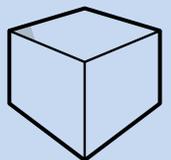
Isometric



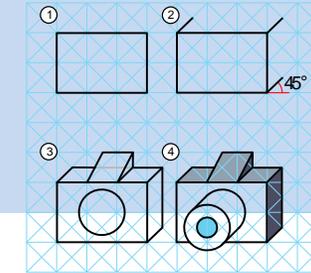
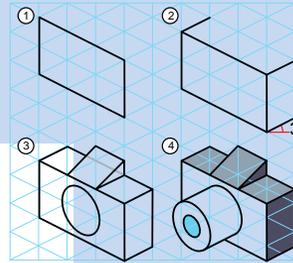
Oblique



One-point perspective



Two-point perspective



### Isometric

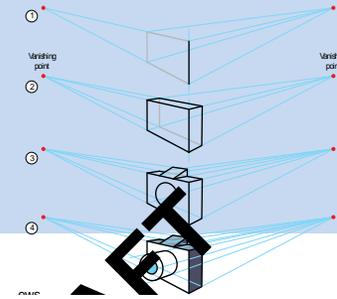
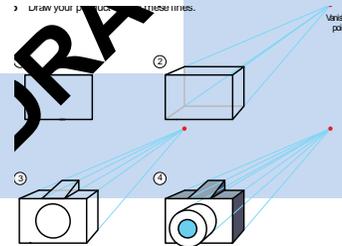
Isometric drawings look more realistic than oblique ones and are based on 30-degree lines. For support, use isometric grid paper to guide your angles:

- 1 Instead of drawing the 2D front view in oblique, you begin with an edge of the product – draw this as a vertical straight line.
- 2 From this line, create **construction lines** going off at 30 degrees.
- 3 Fill in the next vertical lines.
- 4 From these vertical lines, draw your next construction lines going off at 30 degrees (repeat steps 3 and 4 depending on the complexity of your drawing).
- 5 Within these construction lines, draw your product.

### Oblique

Oblique projection is the simplest method of creating 3D designs based on 45-degree lines. For support, use oblique grid paper to guide your angles:

- 1 Draw the front view in 2D.
- 2 From each corner, draw construction lines projecting out at 45 degrees.
- 3 On the construction lines, measure half the true length.
- 4 Draw the back of the product to complete the product.



### One-point perspective

One-point perspective is often used in interior design, as it quickly creates an image with a good sense of depth that enables the customer to rapidly visualise the designer's idea. This then allows the designer and customer to work together to develop and adjust the idea to suit the customer's requirements.

One-point perspective is the easier type of perspective drawing.

- 1 Just like oblique drawing, start by drawing the front view in 2D.
- 2 From each corner, create construction lines to a point in the distance called a single **vanishing point**.
- 3 Draw your next vertical lines between your construction lines.
- 4 Join up your vertical lines with horizontal lines (keep these faint).
- 5 Draw your product within these lines

### Two-point perspective

Two-point perspective is often used by architects when developing their ideas in 3D, as it gives a speedy realistic interpretation. Like interior designers, the architects can work alongside their customer to develop their ideas to the customer's requirements. Two-point perspective uses two vanishing points either side of the object to produce a more realistic representation of the product.

- 1 Just like isometric drawing, you begin with an edge of the product – draw this as a vertical straight line.
- 2 From each corner, create construction lines to two vanishing points.
- 3 Draw in your next vertical lines between the construction lines.
- 4 From these vertical lines, draw construction lines going off to the vanishing points.
- 5 Draw in your product between your construction lines.

# D&T - Timbers

## The types, properties, structure and uses of the main natural and manufactured timbers

### Natural timbers: hardwoods

A **hardwood** comes from a broad-leaved tree whose seeds are enclosed in a fruit, such as an acorn. Hardwood trees grow quite slowly, often taking more than 100 years to be big enough to use for timber. This means hardwoods are rarely planted and they are increasingly rare and expensive.

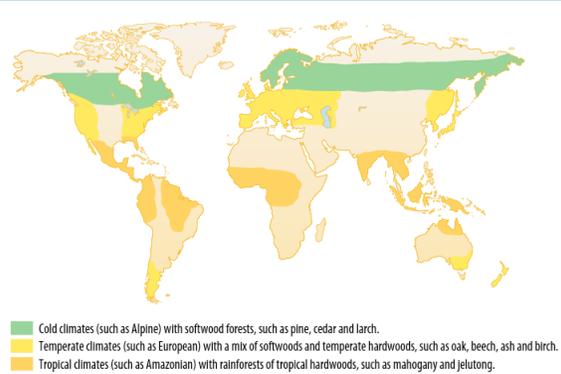


Figure 7.2.1 Where different types of timber can be found in the world

### Stock forms/types

Timber is available in a variety of stock forms.

Name	Availability	Picture
<b>Regular sections</b>	<ul style="list-style-type: none"> <li>Timber is sold in a standard range of cross-sectional shapes and sizes – sawmills do this for convenience, so there is a limited range of sizes to cut</li> <li>Designers can use the standard sizes when designing products</li> </ul>	<p>Commonly available sizes and shapes of timber</p>
<b>Mouldings</b>	<ul style="list-style-type: none"> <li>Lengths of timber cut into decorative shapes</li> <li>There are lots of shapes available for different purposes, such as skirting boards or decorative edging</li> <li>Saves time but can be relatively expensive</li> </ul>	<p>Common moulding shapes</p>
<b>Dowels</b>	<ul style="list-style-type: none"> <li>Wooden rods that are round in cross-section</li> <li>Have a variety of uses, from model making to furniture construction – can be used to strengthen simple joints</li> <li>Short lengths of dowel are used to join pieces of wood with a dowel joint</li> <li>Requires accurate drilling of holes</li> </ul>	<p>Different-sized dowels</p>
<b>Sheets</b>	<ul style="list-style-type: none"> <li>Manufactured boards come in standard-sized sheets in a range of thicknesses</li> <li>Available in large sizes but large sheets are relatively difficult to cut and edges may splinter</li> </ul>	<p>A stack of manufactured boards in a warehouse</p>

### Natural timbers: softwoods

A **softwood** comes from a tree with needle-like leaves and seeds in a cone. Most softwood trees are **evergreen**, meaning they have leaves all year. Softwood trees grow quite quickly, and can be used for timber after about 30 years. This means they can be grown commercially, which is why softwood timber is a lot cheaper than hardwood timber.

Type	Description	Advantages	Disadvantages	Common uses
<b>Pine</b>		<ul style="list-style-type: none"> <li>Very durable</li> <li>Easy to work</li> <li>Quite cheap as it grows quickly enough to be forested</li> <li>Reasonably strong, lightweight and easy to work with</li> </ul>	<ul style="list-style-type: none"> <li>Can warp, crack and splinter more than some other woods</li> </ul>	<ul style="list-style-type: none"> <li>House construction, for roof joists and floorboards</li> <li>Furniture, doors, interior woodwork</li> </ul>
<b>Cedar</b>		<ul style="list-style-type: none"> <li>Natural oils make it resistant to water and fungal growth</li> </ul>	<ul style="list-style-type: none"> <li>More expensive than pine and not as strong</li> </ul>	<ul style="list-style-type: none"> <li>Outdoor furniture, fences, sheds, boats</li> </ul>
<b>Larch</b>		<ul style="list-style-type: none"> <li>Tough, durable and resistant to water</li> <li>It can be used outside untreated, and fades to a silvery grey</li> </ul>	<ul style="list-style-type: none"> <li>Costs more than some other softwoods</li> </ul>	<ul style="list-style-type: none"> <li>Small boats, yachts, exterior cladding on buildings</li> </ul>

### Key term

**Veneer:** a thin slice of wood, about 1 mm thick. Used as a decorative surface and to make plywood.

### Manufactured timbers

Natural timber is a useful material, but because of the size of a tree trunk, it is only available in fairly narrow planks. If you want a large, thin sheet of wooden material, you need a manufactured board. Manufactured boards use timber to make a board that has different properties to plain timber.

Type	Description	Advantages	Disadvantages	Common uses
<b>Plywood</b>	<ul style="list-style-type: none"> <li>A tree trunk is sliced into thin layers called <b>veneer</b></li> <li>These layers are glued together with the grain lines going in alternate directions</li> </ul>	<ul style="list-style-type: none"> <li>Flat and structurally strong</li> <li>Surface looks like wood</li> <li>Resistant to warping, cracking and twisting</li> </ul>	<ul style="list-style-type: none"> <li>Quite expensive</li> <li>Edges can look rather rough</li> <li>Susceptible to water damage if wrong grade is used</li> </ul>	<ul style="list-style-type: none"> <li>Building and furniture panels that need some strength</li> </ul>
<b>Medium density fibreboard (MDF)</b>	<ul style="list-style-type: none"> <li>Wood dust and fibres are mixed with a glue and pressed into flat sheets under extreme heat and pressure</li> </ul>	<ul style="list-style-type: none"> <li>Cheap (made from waste wood)</li> <li>Smooth ungrained surface is good for painting or staining</li> <li>Easy to machine</li> </ul>	<ul style="list-style-type: none"> <li>Does not look good, so needs coating</li> <li>Weak compared to real wood or plywood</li> <li>Tools blunt quickly due to the glue</li> </ul>	<ul style="list-style-type: none"> <li>Cheap flat-pack furniture, wall panels, display cabinets, storage units</li> </ul>
<b>Chipboard</b>	<ul style="list-style-type: none"> <li>Wood chips are mixed with glue and pressed into flat sheets</li> </ul>	<ul style="list-style-type: none"> <li>Uses waste materials so is cheap to produce</li> </ul>	<ul style="list-style-type: none"> <li>Not much structural strength, especially in damp conditions</li> <li>Surface is very rough, so usually plastic coated</li> </ul>	<ul style="list-style-type: none"> <li>Desktops, kitchen worktops, cheap flatpack furniture</li> </ul>

Type	Description	Advantages	Disadvantages	Common uses
<b>Oak</b>		<ul style="list-style-type: none"> <li>Strong and durable</li> <li>Has an attractive <b>grain</b> when well finished</li> </ul>	<ul style="list-style-type: none"> <li>Expensive</li> <li>Becoming rarer</li> <li>Harder to work with than some woods</li> <li>Corrodes iron and steel</li> </ul>	<ul style="list-style-type: none"> <li>Used a lot for building houses and boats in the past</li> <li>Now used for high-end furniture and wine and whisky barrels</li> </ul>
<b>Mahogany</b>		<ul style="list-style-type: none"> <li>Has a very attractive finish</li> <li>Quite easy to work</li> </ul>	<ul style="list-style-type: none"> <li>Expensive</li> <li>Environmental problems with sourcing from tropical forests</li> <li>Oils in the wood can give some people a skin rash or breathing problems</li> </ul>	<ul style="list-style-type: none"> <li>High-quality furniture, jewellery boxes, windows</li> </ul>
<b>Beech</b>		<ul style="list-style-type: none"> <li>A tough wood</li> <li>Does not crack or splinter easily</li> <li>Hard</li> </ul>	<ul style="list-style-type: none"> <li>Expensive</li> <li>Not very resistant to moisture</li> <li>Not suitable for exterior use</li> </ul>	<ul style="list-style-type: none"> <li>Toys, cooking implements, solid and laminated furniture</li> </ul>
<b>Balsa</b>		<ul style="list-style-type: none"> <li>Very lightweight</li> <li>Easy to cut</li> </ul>	<ul style="list-style-type: none"> <li>Much too soft and weak for most products</li> </ul>	<ul style="list-style-type: none"> <li>Model making, primary school projects, surf board cores</li> <li>Used for rafts in ancient times</li> </ul>
<b>Jelutong</b>		Even, close grain is easy to cut and shape	Soft and not very strong, so not good for structural uses	Model making, moulds for casting or vacuum forming
<b>Birch</b>		Regular, even grain and easy to work	Low resistance to rot and insect attack	Veneers: to make plywood and to surface cheaper materials that are used for interior door and furniture
<b>Ash</b>		Strong, tough, flexible and finishes well	Low resistance to rot and insect attack	Handles for tools, sports equipment, ladders

# D&T - Timbers

## The physical characteristics of timber

Because of the way trees grow, all timbers have a similar set of physical characteristics.

### **Knots**

A knot in timber appears where a branch grew out of the tree: the grain swirls around and the wood can be harder, so a knot can make that part of the timber harder to cut with saws and chisels. Knots also fall out, leaving a hole, so it is good to use timber that is free from them. However, knots can also make timber visually appealing, but if timber is to be painted, knots should be treated with knotting (shellac dissolved in methylated spirits) to prevent resin in the knot from staining the painted surface.

### **Colour**

Different woods have different colours, from the pale colours of pine to the rich, dark reddish browns of mahogany. But trees are living organisms and their colours will vary from tree to tree and within the tree itself. This means that when buying timber it's important to remember that colour may vary from plank to plank.

### **Grain structure and density**

Timbers are split into hardwoods and softwoods. Hardwoods have two types of long vessels, known as fibres and pores, which run the length of the tree. Softwoods have one main cell called tracheids. Both have annual rings, produced as growth is added under the bark each year. These give timber its grain. Slow growth and narrow annual rings is sometimes called close grained. Birch and holly do not have clear growth rings but they can be seen by staining. Parana pine has almost no discernible growth rings and its small cells give it a very fine texture, whereas pitch pine and western red cedar have clear growth rings. In some hardwoods such as utile or iroko, the vessels spiral through the tree, giving an attractive interlocking grain, which is difficult to work with as it tears whichever way you plane it.

Open grain refers to hardwoods where the vessels are quite large and show at the surface (also called coarse grained). Birch and holly are close grained timbers with small vessels similar in size, hence fine grained. All hardwoods are somewhere between open and close grain. For example, red oak is very open, birch is close.

When applying finishes to grain, softwoods generally require sanding first. With most hardwoods, grain filler is needed before painting or polishing, otherwise the vessels will show through. Even very dense hardwoods like rosewood need grain filler.

Density varies from timber to timber; balsa wood has a density of 60 kg per cubic metre, while oak has a density of 750 kg.

### **Working properties**

When talking about materials, you must use the correct meaning of the words that describe the properties of materials. It is helpful to compare properties of materials when describing them. For example, rubber is more elastic than metal.

### **Elasticity**

The elasticity of a material is its ability to stretch and return to its original length or shape. Rubber is an elastic material. Wood is not very elastic, although some woods are a little more elastic than others. Yew is excellent for making bows (archery).

### **Tensile strength**

The tensile strength of a material is the amount of force it can withstand when being pulled. The tensile strength of most timbers is three to four times the compressive strength. Ash and oak have high tensile strength, more than double that of western red cedar.

### **Compressive strength**

The compressive strength of a material is the amount of force it can withstand from a crushing force. The denser the wood, the more likely it is to have good compressive strength. Hickory has approximately double the compressive strength of western red cedar.

### **Social footprint**

#### **Trend forecasting**

Manufacturers and retailers try to forecast the trends there will be in a year or two, so they can invest in designing and making products people will want in the future.

One current trend is the increase in the use of softwoods from sustainable sources. Tropical hardwoods are being used much less, partly because of the damage their loss causes to rainforest areas and the impact that has on the people and wildlife that rely on those rainforests.

Another current trend is towards greater use of sustainable timbers in construction, with builders using manufactured I shaped beams for joists instead of the traditional solid timber.

#### **Impact of logging on communities**

Sometimes logging (cutting trees for timber), an industry, brings jobs and money to an area. However, in many poorer regions, such as the Amazon rainforest, logging is badly managed and large companies log in areas where indigenous people live. Logging activity often pushes them out of their ancestral homes, leaving them with nowhere to go, and destroys their traditional way of life and the wildlife they depend on for food.

# The types, properties, structure and uses of the main natural and manufactured timbers

### **Recycling and disposal**

Timber is a natural material that will biodegrade and rot away in time. Composite materials, such as chipboard covered with plastic, are much harder to dispose of. Timber cannot be recycled by melting it down and re-moulding it like plastics and metals can. Sometimes timber can be reused for something else, e.g. by cleaning it up and sawing it into smaller pieces. Timber can be disposed of by burning to create heat, which can be useful if it is well managed, and biomass boilers generate electricity from burning wood. 'Clean' timber – meaning a supply of timber that is not mixed with manufactured boards and other rubbish – is sometimes turned into boards such as chipboard or MDF. Timber can be disposed of by burning to create heat, which is useful if it is well managed.

### **Ecological footprint**

At its simplest, it is the amount of the environment required to produce the goods and services necessary to support a particular lifestyle. It includes the whole product life cycle, from cutting the trees down and seasoning the timber, to manufacturing, use of the product and disposal after use.

### **Sustainability**

Sustainability of timber is the idea that there are always trees available to be used. Hardwood trees take a long time to grow, so are rarely replanted once cut down. Softwood trees grow more quickly and are often planted in large areas of forestry. Some forests now are sustainably managed, which means that trees are being replanted as soon as others are cut down, so that there is always an area of the forest that is mature enough to be cut down.



The Forest Stewardship Council lets timber producers use its logo on their timber if that timber comes from forests that are shown to be sustainably managed. Schemes like this help consumers make informed choices

### **Deforestation**

Deforestation is a global problem, with trees being cut down faster than they grow. Most of Europe was deforested hundreds of years ago and deforestation is now a major problem for areas of the developing world, such as South America and West Africa. Deforestation can cause a lot of accompanying environmental issues such as soil erosion. For example, in Nepal deforestation has caused problems with landslides. Worldwide about 46,000–58,000 square miles of forest are lost each year. That is an area the size of England every year, or equivalent to 48 football fields every minute.

Because trees absorb carbon dioxide from the air, scientists think that having fewer trees will make the greenhouse effect worse, which will warm the Earth and affect the climate and sea levels for the whole world.

### **Habitat destruction and loss**

When an area of forest is destroyed, the animals that live there lose their habitat, and they usually have nowhere else to go. Some well-known animals including tigers, gorillas, orangutans and elephants are in danger due to loss of habitat, and there are hundreds more species of animals, birds and insects that are at risk of extinction if deforestation continues.



This photo shows a large area of forest cut down: the land is likely to be used to grow crops or keep cattle, not replanted with trees

### **Processing**

When a tree is cut down it needs to be processed to make usable timber. A tree trunk will be sawn into planks and then dried out in a process called seasoning (natural or kiln-drying). These processes, particularly kiln-drying, use energy which adds to the ecological footprint of the timber. Waste material such as leaves and small branches are no use, so are often burnt or left to rot.

### **Transportation**

When a tree is cut down in a forest, it must be taken out of the forest to go for processing, either on lorries or sometimes by being floated down a suitable river. Most of the timber used in Britain has been imported. As most transport burns fossil fuels this increases the carbon footprint of the timber.

### **Wastage**

The trunk of a tree will be used for planks, but other parts of the tree such as small branches and leaves that are not useful will be left to rot or burnt if the land is being cleared for farming. Larger branches and the waste from the trunk after cutting into useful planks may be turned into chipboard or MDF. As timber has become scarcer it has become more expensive. It is also becoming increasingly important to reduce wastage. It is important to note that many of these timbers and manufactured timbers (such as MDF) appear on the toxic wood list. When prolonged turning and routing take place, the exposure to toxicity can be high and can cause health problems such as skin, nose and eye irritation, and respiratory issues such as asthma. The Health and Safety Executive produces Woodworking Information Sheet Number 30, which covers how to reduce negative effects. This includes ensuring that work areas are well ventilated and that protective equipment, such as gloves and masks, are used.

### **Pollution**

Trees absorb carbon dioxide from the atmosphere and release oxygen, so living trees are very good for the environment. When wood is burnt for firewood, or to clear land, it releases carbon dioxide into the air, which increases the greenhouse effect. The other pollution from timber comes from the transportation of it around the world.

# D&T - Timbers

## Environmental factors

Designers and manufacturers need to consider certain environmental factors in order to choose the most suitable material for their product/ chosen application.

## Sustainability

If timber from sustainable sources is used, it does less damage to the environment. This is better for the long-term health of local ecosystems and global climate.

## Genetic engineering

Genetic engineering allows scientists to make changes to the DNA of a tree. If they can work out how to change the right parts of DNA in the right way they can create a tree that is different from natural trees. It is possible to make a tree resistant to particular diseases. Scientists are also trying to develop trees that grow faster than they do naturally. This would mean timber could be grown more quickly.

Campaigners against genetic engineering of plants are concerned that we do not know enough about the long-term effects of releasing genetically engineered plants into the environment.

## Seasoning

A freshly cut tree is about 85 per cent water, so it's very wet. It must be dried out to below 18 per cent water, and is often dried to 10–12 per cent water for indoor use. Drying timber is called **seasoning**.

Seasoned timber has increased strength, resistance to decay, and stability, meaning it is less likely to **warp** (bend).

Air seasoning stacks the planks outside and after a few years they have dried out to about 18 per cent water. This is a slow process, and does not get the timber dry enough to use indoors. Kiln seasoning stacks the planks in a room and pumps first steam then warm dry air around them. This dries them to the required level in a few weeks. Kiln-drying is much quicker, it kills insect eggs in the timber, and it can dry the wood to the 10 per cent needed for use in our warm, dry, centrally heated houses. A designer will select timbers that have been correctly and appropriately seasoned for their intended purpose. This ensures that the final product, for example a wooden window frame, will not warp in use.

## Upcycling

A timber product can sometimes be given a new lease of life by upcycling. A designer may specify used timber to create a particular style, such as rustic or shabby chic. A piece of old furniture might be repaired and then painted to make it look more modern and stylish. Old pallets can be turned into a product such as a garden table. This continued use of the timber is better than burning it.

## Availability factors

### Use of stock materials

Materials are processed and sold in standard sizes, called stock materials. A sawmill cuts timber into standard sizes. If a designer uses stock sizes it saves time cutting the wood again to make it smaller, and saves a lot of wasted timber.

### Use of specialist materials

There are some specialist timber products that can be used for specific purposes, for example:

- marine plywood is waterproofed for outdoor use
- expensive hardwood veneers can be laminated on the outside of cheaper timber
- structural house timbers can be treated with flame retardant chemicals to slow the spread of fire.

### Hurricanes, storms and disease

Trees can be affected by naturally occurring events. Hurricanes and severe storms can blow trees over. It can take a long time for trees to grow again.

Disease can kill trees. If a new disease arrives in a country it can spread and kill off a particular type of tree. In Britain a lot of elm trees were killed by a disease called Dutch elm disease. More recently ash trees have died from a disease called ash dieback, and about 126 million trees in British woods are at risk from this disease.

## Cost factors

### Quality of material

Timber is a natural material, and trees grow with variations and defects. Sometimes timber can warp (bend), depending on how it is cut and seasoned. Some pieces of timber have more knots than others; some develop splits as they dry. Timber is sorted, graded and sold for different purposes.

Constructional carcassing timber is used for structural applications, such as joists, roof trusses (the wooden frames that support roofs) and stud walls (plasterboard walls supported by a wooden frame), where it will not be seen. It is graded for strength. For softwood C16 is the most common grade. C24 is also quite common and is a bit stronger.

Joinery timber comprises the better-looking pieces of timber, and is used for products where the timber will be seen, e.g. window frames and doors. It has low knot content, straight grain and a smooth finish.

### Manufacturing processes necessary

The manufacturing processes required affect the cost of the product. The scale of production chosen will depend on how many products are to be made. The scale of production needed will also affect the choice of manufacturing processes. The designer will use stock sizes and standard components bought in, so that their company does not need the specialist equipment to prepare timber or make parts that can be bought ready made.

## Aesthetic factors

Aesthetics is about how a product looks.

### Form

The form of a product is the way that the overall shape and structure looks. Some products are designed to be purely functional; some are designed to look good to the consumer. A good product manages to do both. Timber's flowing, sometimes twisting grain patterns make it particularly attractive.

## Treatments

Timber will burn and rot quite easily and quickly. It can be treated with chemicals to reduce this.

Timber can be pressure treated with a preservative. The pressure treatment forces the preservative chemicals deep into the wood, and makes it resistant to rotting. Pressure treated timber can be used outside for years. A common chemical used is called Tanalith E, and the treated timber is called tanalised timber.

Timber can be treated with fire proofing chemicals that make it burn less well. Correctly treated wood can slow the spread of flames, allowing more time for people to escape, reducing damage to the wooden structure and giving more time to extinguish the blaze.

## Social factors

### Use for different social groups

Groups of people of different ages or interests will like different things. If a product designer can create a product that is appealing to a particular social group the product may sell well to that group of people. That product may be less appealing to other groups, so it can be a difficult balance between making it acceptable to everyone or desirable to only some people.

Cheaper materials, such as chipboard and MDF, are more likely to be used in the mass-consumer market, such as for flat-pack furniture. Bespoke furniture made by a local carpenter for a wealthier clientele is more likely to be made of more expensive hardwood, such as oak.

### Trends, fashion and popularity

Trends and fashions come and go. The popularity of a product depends on lots of factors. It has to work well, but it also has to look good and appeal to consumers.

## Colour and texture

Timber can vary in colour from light yellowish brown to dark browns, even to almost black. Lighter timber, such as pine, is sometimes stained to make it look like a darker wood, keeping the distinctive grain pattern that gives natural wood its characteristic look. The texture of wood can be quite rough, but it finishes to a smooth surface that feels quite warm to the touch. Ash is light brown; western red cedar is dark brown/red; sycamore is white; beech is pinkish-brown to white.

Solid timber was used more in the past as newer, cheaper materials were not available. A hundred years ago children's toys would often be made of wood, but now such products are usually made of plastic. Bespoke wooden toys are still very popular, for example wooden rocking horses, but they are often very expensive. Most furniture was made of solid wood and people expected it to last their lifetime. But the trend now is using chipboard, or veneered chipboard, and many people only expect furniture to last for a few years.

## Cultural and ethical factors

### Avoiding offence

It is obvious that if people find your product offensive they are not going to buy it. It is less obvious that people in different parts of the world, or other cultures and religions, might be offended by something that is not offensive to the product designer. It is important to have some understanding of different cultures and religions so that you can avoid accidentally causing offence with a word, symbol or picture that has a different significance to other people.

### Suitability for intended market

It is important to understand the intended market for a product, so you can make sure a product is suitable.

It is also important that a product designed for a user of a particular age, or with a particular need, is suitable for people of that age or need. If you understand the needs of your user, you can make sure they can use the product and that it is safe for them.

### The consumer society

In Britain, and much of the richer developed world, we live in a consumer society. We are relatively wealthy and products are quite cheap, so some people can afford to buy a lot of things they do not really need. There are lots of companies advertising products to try to sell us these things we do not actually need.

There is nothing wrong with people having nice things or useful things if they are affordable, but some people can go so far as to get themselves into debt consuming too much. From an environmental point of view, some people think that as a society we are using up limited resources too quickly and damaging our environment.

## The effects of mass production

Carpenters used to make products one at a time. Now products tend to be mass produced. Mass production and manufactured boards have made products a lot cheaper than they used to be. This means they are more affordable and people can buy more things than they used to be able to.

Mass production also means factories are more automated than before. Lots of people used to have jobs in factories making the same thing every day. Now machines do more of that work, so there are fewer low-skilled jobs. These have been replaced by jobs for smaller numbers of engineers and computer programmers to run the machinery that has taken the jobs of the manual workers.

## Built-in product obsolescence

A lot of products only have a short lifespan. Manufacturers deliberately make some products with parts that fail after a time and cannot be replaced. This process of making products with a short lifespan – that are intended to be thrown away and replaced – is called built-in obsolescence. Manufacturers like it because it means people buy new products more often. For example, using lower quality boards such as chipboard will lead to early product failure. It is not very environmentally friendly because it means a lot more rubbish is created when people dispose of things rather than mending them or replacing a part.

## Processes to cut and shape materials

### Routing

A router contains a rotating cutter. It can be used with lots of different-shaped cutters. It can be used to make a straight slot in wood, it can be used with a jig to cut shapes or it can be used with a bearing-guided cutter to profile the edge. Routing can also be carried out with a computer-controlled router/milling machine. It removes material quickly and there are a wide range of cutters available. Large cuts may burn/blacken timber so must be used with extreme care.

### Sawing

Sawing machines are used to prepare timber quickly, with the circular saw and bandsaw being the most common. Small ones are used in a workshop to cut timber to the required size and shape. Sawmills use much larger versions to cut whole tree trunks into planks. Cutting thicker timber on a bandsaw may result in edges not being square.



A table circular saw used to cut timber to size: the circular blade makes straight cuts in timber



A hand-held router being used to cut a decorative shape into the edge of a piece of timber. The man in the picture above is not following correct health and safety procedures. What is he doing wrong?



A bandsaw: the blade is one long band with teeth that can make straight and curved cuts in timber. What's wrong in this photo?

Name	Appearance	Advantages	Disadvantages
Butt		Easy to make, it is just square ends glued together	<ul style="list-style-type: none"> <li>Weak: there is no mechanical strength, just the glue</li> <li>Not aesthetically pleasing</li> </ul>
Dowel		Automated machines can drill the dowel holes quickly and accurately	Hard to line up the dowels accurately by hand
Lap		Quite easy to cut	Not very strong
Housing		<ul style="list-style-type: none"> <li>Holds a shelf or divider securely in the middle of a carcass (frame)</li> <li>Very accurate marking out and cutting required to ensure a shelf is exactly level</li> <li>Pairs well with corner lap joints</li> </ul>	<ul style="list-style-type: none"> <li>Can be tricky to cut neatly on a wide board</li> <li>Very accurate marking out and cutting required to ensure a shelf is exactly level</li> </ul>
Mitre		<ul style="list-style-type: none"> <li>Looks good because no end grain shows</li> <li>Good for picture frames</li> </ul>	Weak, it is only a butt joint at 45°
Mortise and tenon		<ul style="list-style-type: none"> <li>A strong joint</li> <li>Good for joining a table or chair frame to legs</li> </ul>	Time consuming to cut by hand
Dovetail		<ul style="list-style-type: none"> <li>A very strong joint – the dovetails lock together securely</li> <li>Good for a drawer front that will get pulled hard</li> </ul>	Very tricky to cut accurately by hand

### Use of a mortiser

A mortiser makes a square hole. It gets its name from the mortise (slot) half of a mortise and tenon joint. The round centre of the chisel drills a round hole, and the square chisel around it cuts the corners out to make a square. Produces mortises quickly and accurately, but requires accurate marking out and care to get the exact size mortise required.

### Use of a bag press

A bag press is a bag that can be sealed and have the air sucked out of it. A mould and laminates are put inside it. When the air is sucked out of the bag, the laminates are forced into the mould, and are held there while the glue dries. Presses equally on all surface areas but may not work with thicker laminates.

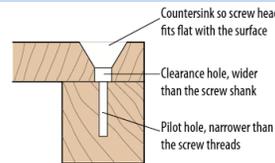


Figure 7.7.3 Drilling timber parts ready for a countersunk screw

## Fabricating and constructing

### Lamination

Laminating is joining layers together. Plywood is laminated, it is layers of veneer glued together. Laminate flooring is made up of layers. Laminating is useful in the workshop because thin layers can be bent and glued together, and they stay in the bent shape when the glue has dried. The bag press on page 293 is helpful for this.

### Veneering

Veneer is a thin layer of wood, which means it can be more prone to damage. Plywood is made of layers of veneer laminated together. Veneer can be glued onto the surface of a cheaper material, such as MDF, to make the surface look like more expensive wood. MDF can be bought covered with hardwood veneer.

### Use of screws

Screws are a very useful fixing for joining pieces of wood together. They create a tight fit to make a strong joint, and they can be unscrewed and removed if necessary.

There are two main head designs: slotted (also known as flat) and Phillips (a cross shape). You need the right screwdriver tip to fit the screw head.

A countersunk screw is useful in wood, because you can make the head of the screw fit flat with the surface of the wood. A clearance hole must be drilled first to accommodate the screw head. Drilling a pilot hole as well, which must be narrower than the screw thread, will make it easier for the screw to go in.

### Nailing

Nails come in a range of shapes and sizes. Nails are hammered into the wood grain, which pinches tight onto them so they are hard to pull out. It is quick and nails can be driven below the surface and covered over to improve appearance. However, holes may need to be drilled to prevent wood from splitting.

- **Round wire nails** usually have a large flat head so they do not pull through thin materials.
- **Oval nails** spread the grain less, so are less likely to split the wood when hammered in.
- **Panel pins** are small nails for small workpieces and for holding thin boards onto timber.

### Adhesives

**PVA** (polyvinyl acetate) is a commonly used wood glue. It is a thick white liquid, but becomes clear when it dries. It makes a strong joint in wood as long as the pieces are clamped tightly together while the glue dries. It is almost impossible to disassemble a joint without destroying it when PVA has set.

**Contact adhesive** is good for sticking a flat piece of a different material onto wood. Spread a thin film onto both surfaces, wait until it is nearly dry, then press the two parts firmly together. It is fast but there is little or no opportunity to reposition the pieces and it gives off solvent fumes.

Scale	Description	Advantages	Disadvantages
One-off	One product made at a time, either for a specialist product or to test an idea	<ul style="list-style-type: none"> <li>No set-up cost</li> <li>Made with existing equipment</li> <li>Product can be customised to the user's needs</li> </ul>	Slow, so expensive to make several
Batch	Several copies of the same product are made at the same time	<ul style="list-style-type: none"> <li>Jigs, templates and moulds speed up the process and can be kept for future use</li> <li>Special machinery is not needed, so set-up cost is not high</li> </ul>	<ul style="list-style-type: none"> <li>Labour intensive, so it is quite expensive per product</li> <li>Takes time to make jigs, moulds and templates</li> </ul>
Mass	Factory machinery set up to make lots of identical products	Can make a product quickly and cheaply	Machinery expensive to set up, so only worthwhile for making a lot of products
Continuous	Factory machinery making the same thing 24/7	Makes the product very quickly and cheaply	Machinery very expensive to set up, so only worthwhile for making huge quantities of a product

### Jigs

A jig can be put over a piece of work and guide a drill or a saw to cut in the required place. It is a quick and accurate way to make lots of holes or cuts in exactly the right place, as long as the jig is positioned correctly. Jigs are very useful for batch production because once you have the jig you can keep using it.

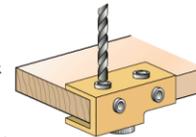


Figure 7.6.2 A drilling jig that has been clamped to the corner of the workpiece to get the holes in the correct place

sends cutting instructions to the CNC machine, which has cutters moved around by electric motors. This is very accurate and can operate 24/7. It has high initial costs and training is required for programmer.

CNC routers, milling machines and laser cutters can all be used in a workshop to make one of a product or a batch of lots of the same products. Factories use large machinery controlled by computers.

### Quality control

Quality control is a system for trying to make sure the products being manufactured are good enough for sale. It reduces waste and should help customers to receive a more reliable product. At stages through the manufacturing, a sample of the product is inspected to make sure it is correct. The more complex a product is, the more sampling is likely to take place. Careful planning and implementation is required. If the sampling finds a faulty product, the process might be stopped so it can be corrected before many more faulty ones are made.

### Working within tolerance

Manufactured parts will always have a tolerance. That is the range of sizes within which the part is acceptable. The designer will need to specify a tolerance for a part. If the holes on a flat-pack cupboard are the wrong size the fittings will not work. If the holes are 2 mm out of line, the pieces will not go together properly. Careful application of tolerances ensures a product with several components will always fit together and that spare/replacement parts will fit too. Manufacturing processes must be able to produce the right tolerance, and part of quality control is checking the parts are all within the required tolerance. Parts of a product are often made and assembled in different factories, so stating the acceptable tolerance for every part is essential for the parts to fit together. It requires accurate machine set-up and checking systems, for example go, no-go gauges.

### Efficient cutting to minimise waste

Material costs money, so it is important to use as little as possible when making products. This includes minimising waste to reduce costs and better use finite resources. When cutting out materials, the way shapes are marked out can make a big difference to waste. Using a template to mark out shapes so they are as close together as possible, and designing the part to ensure the closest possible fit to the next one, can make a big difference to the amount of material wasted, although this requires careful planning.

### Fixtures

A fixture holds the workpiece in place while it is being cut or shaped. This speeds up processes but a range of fixtures may be required, adding to initial costs.

### Templates

A template is a cut-out shape that you can draw around to mark out the shape you want to cut from a piece of material. A template might be made from paper or card for a single use, or it might be made from a thin sheet of wood or metal if it is going to be used a lot. A template is really useful in batch production because it allows workers to mark out the same shape quickly and accurately. Templates must be accurately produced and protected from damage.

### Patterns

A pattern is similar to a template, but the term is sometimes used to refer to a collection of templates used to make the complete product. The pattern for a product might include several individual templates needed to make the whole product. One pattern can result in multiple accurate replicas but the template must be accurately produced, which may be expensive.

### Sub-assembly

Sub-assemblies are components that have been assembled and used as an individual component in a larger product. The sub-assembly is built to a uniform specification, quality tested in its own right and can be entirely replaced. An example is a standard DVD module inserted into different desktop computers.

### Computer-aided manufacturing

Computer-aided manufacturing (CAM) uses a computer to guide the cutters on a computer numerically controlled (CNC) machine. The product outline will be drawn on a computer-aided design package (CAD). The computer

# D&T - Timbers: Term 1 & 2

## The purpose of a range of tools used for working wood

Name	Appearance	Use	Advantages	Disadvantages
Hand saw		Used to cut larger pieces of wood	Can cut long, deep cuts through big planks	<ul style="list-style-type: none"> <li>Blade can bend, so it's important to saw straight</li> <li>Harder work than a power saw</li> </ul>
Tenon saw		Used to cut smaller pieces of wood and accurate detail like joints	Stiffened blade makes it easier to make precise, straight cuts	Stiffened blade back means it cannot cut deeper than the blade, as the spine that keeps the blade stiff is thicker than the blade
Coping saw		Used to cut shapes out of thin wood and manufactured boards	<ul style="list-style-type: none"> <li>Thin blade can go around curves</li> <li>Blade can be taken out and put through a hole to cut internal shapes</li> </ul>	<ul style="list-style-type: none"> <li>Blade snaps quite easily</li> <li>Small teeth saw slowly</li> </ul>
Scroll saw		Used to cut shapes out of thin wood and manufactured boards	Can cut fine, accurate details	Large pieces of wood cannot be cut with it
Jigsaw		<ul style="list-style-type: none"> <li>The blade goes up and down</li> <li>Used to cut large thin pieces of wood clamped to a bench</li> </ul>	<ul style="list-style-type: none"> <li>Can cut quite quickly</li> <li>Thin blade can cut curved shapes</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to cut straight lines</li> <li>Blade can wander in thicker materials</li> </ul>

### Tools and equipment

#### Hand tools

There is a variety of useful hand tools for marking out, cutting and shaping wood.

Tools for marking out accurately are important. If you mark out your work accurately you can cut it accurately too.



A try square is used to mark a line at 90° to an edge and check if something is square – versatile, may be damaged if dropped



A marking gauge used to mark a line parallel to an edge – can mark out several pieces of timber at the same measurement, the scribing point (spur) scratches the timber so it is vital the gauge is set correctly

#### Machinery

The first woodworkers had to do everything with hand tools, which could be quite time consuming. Nowadays we have a lot of electrically operated machinery that makes woodworking much quicker and easier. The circular saw and bandsaw in Section 7.6 on page 292 are very useful machines for cutting timber to the required size.

#### Digital design and manufacture

Computer-aided design software is useful for drawing parts of a product accurately. It is essential if the work is going to be cut out with computer-aided manufacture, as the computer sends information from the drawing to the machine, such as a CNC router or a laser cutter. The big advantage of computer-aided design and manufacture is the speed and accuracy with which it can cut.

#### Shaping

##### Drilling

A drill makes a round hole in material. There are different types which all have their advantages and disadvantages.



A pillar drill: in a workshop work is held flat on the table and the drill makes accurate 90° vertical holes. It requires various clamping methods depending on the shape and thickness of the material to be drilled



A hand-held 'cordless' battery-operated drill is very useful on site or for big pieces of work that are hard to move – no power lead so it can work away from a power source, but requires a charged battery to work

Name	Appearance	Use	Advantages	Disadvantages
Twist drill		<ul style="list-style-type: none"> <li>Drilling smaller-sized holes in most materials</li> <li>The flutes lift the swarf out of the hole</li> </ul>	Readily available in a wide range of sizes from very small up	<ul style="list-style-type: none"> <li>Usually only up to 13 mm diameter</li> <li>Deep holes can block up the flutes</li> </ul>
Flat bit		Drilling larger holes in wood	<ul style="list-style-type: none"> <li>Centre spur gives an accurate starting point</li> <li>Drills quickly</li> </ul>	Cannot be used to make an existing hole bigger
Forstner bit		Drilling flat-bottomed holes in wood	Small centre spur can make a blind hole with a flat base	Slower than a flat bit
Auger		Drilling deep holes in wood	Can bore deep holes	Needs to be used at a slow speed
Hole saw		Cutting large holes	Can make a large hole in a sheet of manufactured board	<ul style="list-style-type: none"> <li>Only good for quite thin materials</li> <li>Limited range of sizes available</li> </ul>

	Description	Advantages	Disadvantages
Painting	A coloured pigment in liquid that dries out	Available in a range of colours	Covers up the natural wood grain
Staining	A coloured liquid that soaks into the wood surface	Makes a pale-coloured wood like pine a darker colour to mimic more expensive woods like oak or mahogany	Does not look quite like another wood as the pine grain still shows
Varnishing	A clear coating that dries to a shine	Gives a hardwearing finish that shows the grain of the wood Can be a high gloss or a matt finish	Can scratch or chip and expose the wood
Wax	A soft solid that is rubbed into the surface with a cloth	Easy to apply Gives a plain, natural look	Rubs away and needs reapplying Not a glossy finish
Oil	Is rubbed onto the surface and soaks in	Good waterproofing for timber Vegetable oil on kitchen ware is non-toxic	Surface feels oily
Shellac	A cloudy liquid made from a resin secreted by a beetle Lots of layers are rubbed on and polished to create a finish called French polish	Traditionally used on expensive furniture for its glossy lustre	Easily damaged by water and heat
Veneering	A thin layer of wood glued onto the surface	An expensive, decorative wood like mahogany can be put onto a cheaper wood like pine or chipboard	The veneer is natural wood, so it still needs a finish applied

#### Planing

A plane has a sharp blade, which must be kept sharp, protruding from a flat base plate. It is used to remove wood from the edge of a piece of timber, and is good for getting a crooked edge straight. Planes are available in different lengths and it is easy to adjust depth of cut.

A planer/thicknesser is a useful machine for preparing timber. A rotating cutter block planes the wood. The top of the table planes it to get flat, square faces and edges. Under the table the thicknesser draws the wood in and planes it to the set thickness.

#### Chiselling

A wood chisel is used for paring wood, that is, slicing between the grains. A mortise chisel has a much thicker blade and a heavier duty handle. It is used for cutting slots in wood, so it is hammered with a mallet a lot. Chisels are hard to use across end grain. A sharp chisel is easier and safer to use.

#### Turning

A wood-turning lathe holds a piece of wood and spins it. The operator holds a chisel on a rest and guides it over the spinning wood to chisel wood away. It requires careful preparation of material and setting up of the lathe.

Name	Appearance	Use	Advantages	Disadvantages
File		A range of tooth sizes and shapes available	Good for smoothing and shaping the sawn edges of manufactured boards	Small teeth are quite slow on wood
Rasp		<ul style="list-style-type: none"> <li>Large individual teeth</li> <li>Available in different shapes, usually flat, half-round and round</li> </ul>	<ul style="list-style-type: none"> <li>Big teeth cut soft woods quickly</li> <li>Good for rough shaping</li> </ul>	Big teeth leave marks in the wood that need removing with a file or sandpaper
Surform		A frame holds the blade with pressed metal teeth, rather like a cheese grater	<ul style="list-style-type: none"> <li>Good for rough shaping of soft materials</li> <li>Blade can be removed from frame and replaced</li> </ul>	<ul style="list-style-type: none"> <li>Leaves a rough surface</li> <li>Hard work on harder woods</li> </ul>

## Types of establishment

Commercial – Residential (A place that you can stay at overnight)	Commercial – Non – Residential (A place you cannot stay overnight)	Non-commercial (non-profit) (Providing a service rather than trying to make money)
Hotels Guest houses Bed and breakfasts Farmhouses Motels Holiday parks Some public houses	Restaurants Fast food outlets Public houses Bars Delicatessens Take away outlets School meals Burger vans	Hospitals Prisons Meals on wheels Residential care homes Armed services

## Chefs

**Head Chef: The boss.** The head chef is responsible for menu planning, food production, costing and purchasing, staff work rotas and training, hygiene of the kitchen and staff, stock control

**Sous Chef - The Sous chef (sous=under in french)** is directly in charge of food production, the minute by minute supervision of the kitchen staff, and food production

**Pantry chef - aka garde manger -** A pantry chef is responsible for the preparation of cold dishes, such as salads and pâtés

**Pastry chef - aka le pâtissier -** The King or Queen of the pastry section; baked goods, pastries and desserts are this chefs forte.

**Sauté chef - aka saucier or sauce chef -** They're responsible for sautéing foods, but their most vital role lies within the creation of the sauces and gravies that will accompany other dishes.

**Soup Chef - aka le potager -** Responsible for making soups and preparation of accompaniments for the dishes

**Vegetable Chef - aka le légumier -** The vegetable chef prepares all vegetables for dishes, in smaller restaurants the vegetable chef would also make soups.

**Fish chef - aka le poissonnier -** An expert in the preparation of fish dishes, and often responsible for fish butchering as well as creating the appropriate sauces.

## Styles of service

TABLE SERVICE	COUNTER SERVICE	PERSONAL SERVICE
<p><b>Plate:</b> Pre-plated meals from the kitchen. Can be a basic plated meal or a decorated nouveau cuisine style</p> <p><b>Family:</b> Dishes are put on the table where spoons are provided and the customers serve themselves. Suited to ethnic restaurants such as Indian, Chinese and Spanish tapas</p> <p><b>Silver:</b> Food is served by the staff using spoon and fork</p> <p><b>Gueridon:</b> Food is served from a side table or a trolley using a spoon and fork. Sometimes dishes are assembled or cooked in front of the customer</p>	<p><b>Cafeteria:</b> A single long display counter but can sometimes be multiple counters</p> <p><b>Buffet:</b> Set up in a room usually along one long table. It can be self service or staff can serve customers. Carvery service is where joints of meat are carved in front of customers and plated</p> <p><b>Fast Food:</b> Takeaway with eat-in areas where customers collect food from one small counter</p>	<p><b>Tray or Trolley:</b> An assembled meal provided or a choice of food and drink from a trolley</p> <p><b>Vending:</b> Sold from a machine</p> <p><b>Home Delivery:</b> Delivered to house individually or on a round</p>

Suppliers to the hospitality and catering industry:

- Specialist markets – e.g. butchers, fish markets. Some deliver
- Local suppliers – local deliveries are better for the environment but might not have a wide selection of stock
- Equipment suppliers – provide equipment and appliances to the catering industry
- Large wholesalers – large quantities of stock, can buy premade and proportioned food but can be expensive
- Independent suppliers

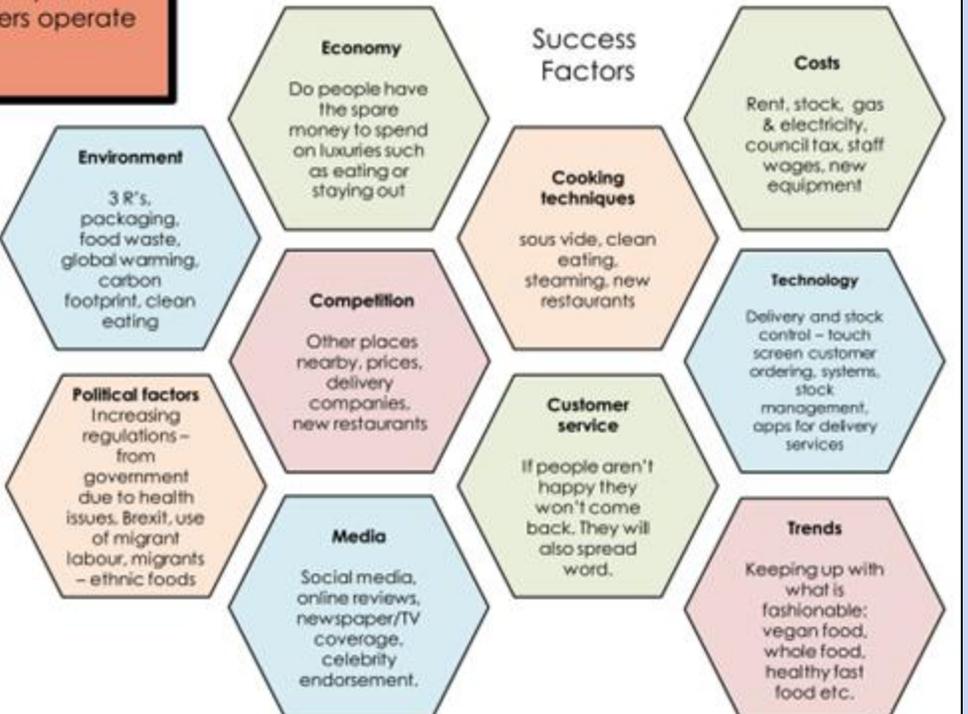
**Hotel job roles**  
Hotel manager  
Barman/maids  
Supervisor  
Waiter/waitress  
Housekeeper  
Chambermaid  
Receptionist  
Porter  
Concierge

**Minimum Wage**

21-24	£7.70 p/h
18-20	£6.15 p/h
16-17	£4.35 p/h
Under 19	£3.90 p/h

**LO1 The environment in which hospitality and catering providers operate**

Permanent (Over 36hrs a week)	Part time (4-36 hrs)
Have permanent jobs and work all year. Contract explaining the terms of their employment. They may work set shifts or have shifts that change daily/weekly/monthly. Entitled to sick pay and holiday pay. Entitled to maternity pay	Have permanent jobs and work all year. Contract. They will work mostly at the busiest times of the day/week including weekends. Entitled to sick pay and holiday pay (in proportion) Entitled to maternity pay
Temporary	Casual
Employed for a specific length of time such as the summer tourist season or the month of December. Temporary staff have the same rights as permanent staff for the duration of their contract. Temporary staff employed for longer than 2 years become permanent by law	Work for specific functions and can be employed through an agency. They do not have a contract or set hours of work. They are needed at busier times of the year e.g. At Christmas or for weddings. New years eve



## Key questions to check your learning for Learning Objective 1:

- Racap what makes a business successful e.g. social media, prices of food, customer service and the atmosphere of the restaurant
- What are the different salaries for jobs in the H&C industry?
- What are the different types of service available?
- What is the difference between commercial and non commercial?

**Food**

Kitchen

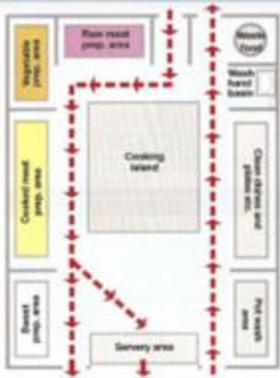
Temperature charts: fridge, freezer, display, point of sale. Taken at least twice per day.	Time sheets: logging staff working hours	Accident report forms: used to report any accidents and near misses	Food safety information: blast chill records, food related incidents and cleaning rotas	Equipment fault reports: What was the issue and how was it dealt with.	Stock usage reports: order books, stock control sheets, invoice, delivery notes
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Front of House

Bookings/reservations: Electronic booking system, electronic reservations system, diary with bookings and reservations Feedback forms	Personnel records: Hours worked, personal details, Wages, Taxation, National insurance, Training, Accidents, Staff rotas and timetables	Financial records: Incomings and outgoings for Income tax, VAT, Wages, Insurance, Profit & loss, Staff costs, Heating, lighting	Health and safety: Fire certificate, Staff training records, Accident book, Food hygiene checks, Cleaning checks, First aid records	Purchasing: Food and drink orders, Packaging orders, equipment Tables, chairs etc., Consumables and disposables, Cutlery and crockery, Staff uniforms	Stock control: Monitor stock levels for re ordering, Decide frequency of stock check, First in First out for items with a shelf life
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Documents should be:  
Legible (readable)  
At correct interval (daily, hourly),  
completed accurately,  
Signed and dated.

**Remember**  
Some information is confidential or sensitive i.e. staff personal information. There is a legal requirement under the data protection act to store this type of information securely



**Kitchen Workflow**  
Workflow in the kitchen should follow a logical process by using different areas so that the clean stages in food production never come into contact with the "dirty" stages

1. Delivery
2. Storage
3. Food preparation
4. Cooking
5. Holding
6. Food service area
7. Wash up
8. Waste disposal

Customer needs

<p><b>Local Residents</b></p> <ul style="list-style-type: none"> <li>• Value for money</li> <li>• Good standard of customer service so they return</li> <li>• Catering for local needs (culture, religion)</li> <li>• Consistent dishes served</li> <li>• Loyalty schemes</li> <li>• Recognised by staff- feel welcome</li> <li>• Menu specials</li> <li>• Theme nights</li> <li>• OAP discount day</li> <li>• Child friendly</li> <li>• Entertainment</li> <li>• Mailing list or email for special offers</li> </ul>	<p><b>Business Customers</b></p> <ul style="list-style-type: none"> <li>• Dedicated corporate (business) contact at establishment</li> <li>• Discounted rates</li> <li>• Meeting rooms</li> <li>• Water, juice on tables</li> <li>• Presentation equipment, projector, tv,</li> <li>• Office facilities- printer, phone, fax, internet, stationery</li> <li>• Tea and coffee for breaks</li> <li>• Lunch or other meals- buffet or restaurant</li> <li>• Accommodation if attendees are from a long distance</li> <li>• Quick service for lunch meetings</li> </ul>	<p><b>Leisure Customers</b></p> <ul style="list-style-type: none"> <li>• Value for money</li> <li>• Good facilities</li> <li>• Families want child menus, play area, child friendly</li> <li>• Tourists want local food, easy to communicate</li> <li>• Older people may want more formal service</li> <li>• Good customer service</li> <li>• Varied choice of menu</li> <li>• Dietary needs eg allergies, intolerances, vegetarian catered for without having to ask for special foods</li> <li>• Facilities for physically impaired customers</li> </ul>
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**LO2 Understand how hospitality and catering provisions operate**



Sous Vide



Blender



Oven



Hot plate



Bain Marie



Fryers



Blast Chiller



POS Till Point



Grill



Percolator

- Customer Rights**
1. The right to be protected (against hazardous goods)
  2. The right to be informed (about quality, quantity, allergies etc)
  3. The right to have their complaints be heard
  4. The right to seek redressal (compensation.)
  5. the right to receive satisfactory goods that match their product description

**DRESS CODE:**  
White shirt  
Formal trousers  
Formal shoes  
Apron  
Tie



**DRESS CODE:**  
Chef's jacket  
Chef's pants  
Hat  
Neckerchief  
Apron  
Hand towel  
Slip-resistant shoes

**Key questions to check your learning for Learning Objective 2:**

1. What documentations are used in an establishment by law?
2. What is the workflow of a kitchen?
3. What are the different types of customers you may come across in an establishment and what do they require?
4. What are customer rights?
5. What is a correct dress code to have when working in a kitchen?

### HASAWA – Health and safety at work act

- Employers must:
- To protect the health, safety and welfare of staff
  - Carry out risk assessments
  - To provide and maintain safe equipment and safe systems of work
  - Safe use, handling, storage and transport of articles and substances
  - Provide a safe workplace with a safe entrance and exit
  - Provide information, instruction, training and supervision on how to work safely
  - Provide a written safety policy
  - Make sure there are toilets, places to wash and drinking water for workers
  - Make sure that there is first aid provision
  - Provide PPE for jobs if needed
  - Have insurance to cover injury or illness at work
  - Ventilation lighting and emergency exits
  - Provide a health and safety law poster entitled "Health and Safety law: What you should know" displayed in a prominent position and containing details of the enforcing authority.

### COSHH – control of substances hazardous to health regulations

#### SUBSTANCES COVERED BY COSHH:

- Chemicals including cleaning chemicals
- Micro-organisms
- Dusts
- Medicines, pesticides, gases
- HSE list (Health and safety executive)

#### Employees must:

- Use control measures and facilities provided by the employer
- Ensure equipment is returned and stored properly
- Report defects in control measures
- Wear and store personal protective equipment (PPE)
- Removing PPE that could cause contamination before eating or drinking
- Proper use of washing, showering facilities when required
- Maintaining a high level of personal hygiene
- Complying with any information, instruction or training that is provided

### RIDDOR – Reporting injuries, disease and dangerous occurrences regulations

RIDDOR is the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013. The law requires employers and other people in control of work premises (known as the 'responsible person') to report to the Health and Safety Executive (HSE) and keep records of the following:

- Death
- Injuries resulting in over 7 days off work (7 day injuries)
- fractures (except fingers, thumbs and toes);
- amputation of limbs or digits
- loss or a reduction of sight;
- crush injuries
- serious burns (over 10%)
- unconsciousness caused by a head injury or asphyxia;
- any other injury needing admittance to hospital for more than 24 hours.
- Hypothermia

### Manual handling operations regulations

- Require you to avoid any manual handling operations at work which involve a risk to health – so far as reasonably practicable.
- If it is not reasonably practicable to avoid any manual handling operations, you must carry out a manual handling risk assessment to identify how the risk is caused, so each factor can be addressed and measures taken to control the risk.
- Provision of information, instruction and training to staff are legal requirements

#### What is manual handling:

Any transporting or supporting of a load by hand or bodily force  
Lifting, putting down, pushing, pulling, carrying or moving

### PPER – Personal protective equipment at work regulations

PPE is equipment that will protect the user against health or safety risks at work. Includes clothing and other items worn by staff to protect themselves from work hazards  
It can include items such as Gloves, goggles, hard hats, hearing protectors, warm clothing (in cold conditions), safety shoes or boots, respirators etc  
Hearing protection and respiratory protective are not covered by these Regulations there are specific regulations that apply to them. these items need to be compatible with any other PPE provided.

#### PPE could include:

- non-slip shoes where there is a slipping risk;
- 100% cotton garments (for example, chefs' whites) where there is a risk that the material may aggravate burns in the event of a fire
- where caustic cleaning substances are used, long-sleeved vinyl gloves, goggles, a visor and possibly respiratory equipment.

Key questions to check your learning for Learning Objective 3:

Can you recap all of the different health and safety requirements for each of these

- HASAWA
- COSHH
- RIDDOR
- Manual handling operations
- PPER
- What is a risk assessment?
- What are security hazards?

LO3 Meeting health and safety requirements

### Security hazards

Workers can be at risk from security hazards in the same way they are from safety hazards.  
Security risks include

- Disagreements between customers
- Customers being intoxicated (alcohol)
- Customers who have used drugs
- Verbal abuse
- Physical assaults

### Prevention

- Brightly lit areas
- CCTV
- Easy escape routes
- Area for handling larger sums of money
- Appoint more senior staff to deal with problems and complaints
- Train staff to diffuse angry customers
- Contact local police if necessary
- Make sure lone workers are aware of risks
- Keeping doors and windows secure and locked

### RISK ASSESSMENTS:

When you carry out a risk assessment you need to think about how likely it is to happen and what the consequence might be if it did. E.g. A spillage is very likely to happen in a restaurant kitchen.

	Probability	Severity
1	Not very likely to happen	1 If it did happen the harm would be minimal and could be dealt with by an untrained person (e.g. might just need a plaster)
2	1 in 4 (25%) chance	2 Might need to visit a professional for advice or treatment (e.g. might need stitches)
3	2 in 4 (50%) chance	3 Would take a few weeks to heal, but not a serious injury.
4	3 in 4 (75%) chance	4 Could cause serious injury or damage, but would eventually be resolved (e.g. broken leg)
5	Very likely to happen	5 The result could be permanent disability, destruction of a building or in extreme cases, death.

Food

**Allergies**  
A food allergy is a rapid and potentially serious response to a food by your immune system. It can trigger classic allergy symptoms such as a rash, wheezing and itching. Anaphylaxis is most commonly caused by food allergies, but can also be caused by other things, such as insect bites and drug allergies.  
Wait staff should have a good knowledge of which allergens are present. When using pre prepared ingredients, kitchen staff should check the labels carefully to identify any allergens

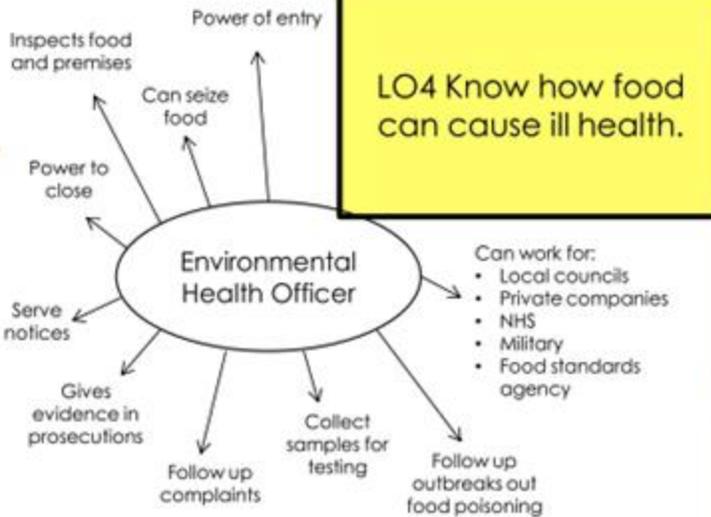
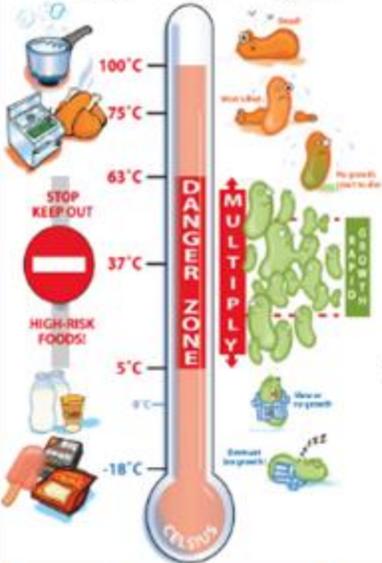


**Intolerances**  
Food intolerances are more common than food allergies. The symptoms of food intolerance tend to come on more slowly, often many hours after eating the problem food.

**Lactose intolerance**  
- Avoid milk and milk products  
- Experience nausea, bloating, pain in the abdomen and diarrhoea  
- Eat lactose-reduced products or alternatives such as goats cheese, soya milk, feta cheese, rice milk

**Celiac disease/gluten intolerance**  
- Causes diarrhoea, anaemia, weight loss  
- Gluten is found in many cereals plants primarily wheat, rye, barley and some oats  
- Avoid pasta, bread, cereals flour based foods

**Yeast intolerance**  
- Yeast is present in a variety of foods, commonly bread, baked products and alcoholic beverages. Very ripe fruits contain natural yeasts  
- Symptoms include flatulence, bad breath, fatigue, irritability, cravings for sugary foods, stomach cramps, bad skin and indigestion.  
- Fermented foods e.g. vinegar, wine, salad dressing



**LO4 Know how food can cause ill health.**

	Found In	Symptoms	Onset	Duration
Campylobacter	Poultry, raw meat, unpasteurised milk products, water	Headache, abdominal pain, bloody diarrhoea	2-5 days after infection	Up to 10 days
Salmonella	Raw meat, unwashed vegetables, eggs undercooked chicken	Fever, diarrhoea, vomiting, abdominal pain, blood in poo	12-72 hours	4-7 days can be up to 3 weeks
E-Coli	beef, chicken, lamb, unpasteurised milk cheese, spinach, salads, raw veg	Abdominal cramps, bloody diarrhoea, nausea	Up to 24 hours	Up to 24 hours
Clostridium perfringens	Undercooked meats, large volumes of food, casseroles, gravies	Stomach cramps, fever, diarrhoea (not usually vomiting)	6-24 hours	4-7 days can be up to 3 weeks
Listeria	Raw foods, fridge temperatures, unpasteurised milk, cheese, smoked salmon, pate, raw sprouts	Headache, stiff muscles, confusion, fever, convulsions	3-70 days (21 typical)	3 weeks
Bacillus cereus	Rice, leftover food, foods at room temperature, sauces and soups	1) Watery diarrhoea, cramps, 2) vomiting and nausea	1) 30 min-6 hrs 2) 6-15 hours	24 hours
Staphylococcus aureus	Foods made by hand and no additional cooking Salads, ham, tuna chicken, cream pastries, sandwiches, dairy products, meat, eggs	Projectile vomiting, diarrhoea, abdominal cramps, fever	1-6 hours	24-48 hours

**Food related causes of ill health**

Microbes - Some microorganisms cause food borne illness which is not classified as food poisoning because of other symptoms they cause. The two main ones are: Norovirus From leafy greens such as lettuce, fresh fruits and foods that are not washed before eating and Toxoplasmosis From infected meat (also cat poo but you wouldn't eat that)

Chemicals - Some chemicals can end up in our food and potentially make us ill. These chemicals could come from: hormones, pesticides, fertilizer, packaging additives, cleaning fluids

Metals - When ingested metals can be extremely harmful to the body. Some metals can be found in food because they occur naturally, they enter the food chain or residues of metals can be found in food.

Poisonous plants - Some plants can be poisonous when eaten, these could be contaminants such as weeds or naturally occurring foods such as rhubarb leaves, raw potatoes and uncooked kidney beans.

**Food Safety Act**  
Food businesses:  
- Must ensure that the food served or sold is of the nature, substance or quality which consumers would expect  
- Ensure that the food is labelled, advertised and presented in a way that is not false or misleading, e.g. photos on menus that do not look like the dishes served to customers

**Food Safety (General Food Hygiene Regulations)**  
- Food premises  
- Personal hygiene of staff  
- Hygienic practices  
Food businesses must:  
- make sure food is supplied or sold in a hygienic way;  
- identify food safety hazards;  
- know which steps in your activities are critical for food safety;  
- ensure safety controls are in place, maintained and reviewed.

**Food Labelling Regulations**  
This information is required on packaging by law:  
- the name of the food  
- weight or volume  
- ingredient list & allergen information  
- genetically modified ingredients  
- date mark and storage conditions  
- preparation instructions  
- name and address of manufacturer, packer or seller & place of origin  
- lot (or batch) mark  
- nutrition information

**Key questions to check your learning for Learning Objective 4:**

1. Name at least 4 different types of food poisoning bacteria, give the symptoms and where they are found
2. What does it mean to have an intolerance and what foods can this be for?
3. What is the Food safety act?
4. What are the food related causes of ill health?
5. What is an allergen? Name some
6. What is the danger zone?

# AQA Design and Technology Textiles 8552 – NEA Controlled Assessment

This project work is the coursework for your GCSE. It covers 50% of your GCSE marks and gives you the opportunity to show your ability to design and make a high quality product in answer to a specific design brief. The controlled assessment is split into three parts, AO1 (research) is 20% of the grade, AO2 (designing, modelling and making) is 60% and AO3 (evaluating) is worth 20%.

Your project will involve **a lot** of work. 30-35 hours in total in class time, plus you will need to put in time after school and at home on your folder work. It is therefore important that you choose to make a product you are interested in. It is expected that you plan and organize your time wisely during lesson time and for homework.

The assessment criteria for the NEA are split into six sections as follows.

	Section	Criteria	Maximum marks
AO1 (Phase 1) Identify, investigate & outline design possibilities	A	Identifying & investigating design possibilities	10
	B	Producing a design brief & specification	10
A02 (Phase 2) Design & make prototypes that are fit for purpose	C	Generating design ideas	20
	D	Developing design ideas	20
	E	Realising design ideas	20
A03 (Phase 3) Analyse & evaluate	F	Analysing & evaluating	20
Total			100

Each section of your coursework folder is worth a different amount of marks.

As you can see, the sections in AO2 covering the Development of your design and the practical (Making) are worth almost  $\frac{2}{3}$  of the overall folder grade.

REMEMBER: you should only have 20 pages in your folder so **WHAT you include** in your folder is important.

You can use the coursework guide to help you present your work. The following symbols

## HOW TO USE THE GUIDANCE TEMPLATES:

What do the symbols mean on each slide?

Red text must be read then deleted.



Each page will have guidance for you to follow. They will include **details of what to include** in your work. They will always be written in red and **MUST** be deleted.



This icon indicates that you must **add an image, graph or photograph** to help illustrate your work. You **MUST** add appropriate labels to whatever you use.



This icon is used to highlight sections of the project that require **feedback** from your client.



This icon is used to indicate which pages require a **summary / conclusion** needs to be added.

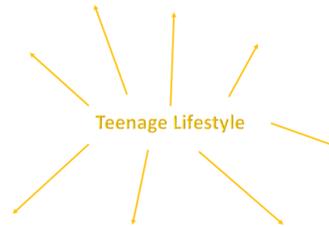


This icon is used to indicate which sections you have sought **inspiration** from other designers on.

# AO1: Investigating the Design Context

## Contextual challenges:

1. Multifunctional living
2. Teenage lifestyle
3. Nature and the environment



**WHAT'S THE PROBLEM?** Now describe several potential design possibilities that may exist within that area (For each possibility describe what they would do and how they may benefit the user). What problems exist for the client / user. Focus on the problems not the solution.

These are the things I need to think about in my project:

- How much space will it take up?
  - How hard will it be?
- Is there a power outlet nearby?
  - What's the scoring system?
  - How will you make it fun?
    - How durable is it?
    - Component cost?
- What are the available materials?
  - How safe will it be?
  - What is the set up time?
- What are the key game aesthetics?
  - What is the cost to use the game?
- What are the tools required to make the game?
  - How much power is required to run?
    - What is the weight?
  - What are the colour schemes?

1. Create a mind-map of your first thoughts.
2. **Describe your potential user.**
3. Make a list of ideas for potential products.
4. **Make a list of things you need to think about before you start the project.**
5. How can the work of others influence you? Who will you choose?
6. **Create a Research Plan. Make a list of research tasks you need to complete.**
7. Make a list of questions you need to ask your user.

You will be choosing **ONE** of these contextual challenges as the basis of your coursework so consider:

- What sorts of textiles do **YOU** like designing/making most? (Fashion? Furnishings? Toys?)
- What products are **YOU** good at making?
- Cost – **YOU** will be designing and making the product for quite a while. What will you parents want you to make and what can they afford? **YOU** will need to provide materials and components.
- Which target groups do **YOU** find most interesting to design for? (Teenagers, Men, Women, Children, Elderly?)

Use the Coursework guidance to help you and always refer to the coursework mark scheme to make sure you are on track.

## FEASABILITY STUDY

### Problem Outline

Begin by describing the context that you intend to investigate in order to bring improvement to it. Then describe several potential design possibilities that may exist within that area (For each possibility describe what they would do and how they may benefit the user).

State the area or project you have chosen. Give a detailed description of what your client or user would do in this situation if they have **not got** the product you are about to design. What problems exist for the client / user. Focus on the problems not the solution.

### Client Profile

Explain who your product is going to be designed for. State their age range and gender as well as their interests. Give as much detail as possible e.g. why do they need you to design a solution?

AND  
OR

### User Profile

Explain who, specifically your product is going to be used by. State their age range and gender as well as their interests. Give as much detail as possible e.g. disposable income available.

1. Read through the list of the 3 Contextual Challenges.
2. **Think** about them and what you believe each one means. Consider:

**Key words**....What is each **CONTEXTUAL CHALLENGE** asking you to do?

**Initial Thoughts**...What is interesting you about them?

**Images**....What colours, shapes, patterns, and images could be linked to the challenges?

3. Once you have had a really good think, create a mind-map of your thoughts about each one. You can keep adding to the mind-maps as more thoughts occur.



PICTURE OF PROBLEM



PICTURE TO ILLUSTRATE TYPICAL USER

# AO!: Identifying the needs of the user

## Customer/Client Profile:

This is an interview or an overview of your intended user. If you are making a costume it should be focused at the theatre your costume is for.

You should have a collection of **primary** and **secondary** research.

**Primary research is information you have gathered yourself**, e.g. interviews/questionnaires, evaluating existing products, visits, exhibitions, emails/letters.

**Secondary research is information that has already been collected by someone else**, e.g. trend predictions, books, Internet, magazines.



- One of the most important pieces of research a designer does at the beginning of a project is to investigate the client.
- This is a very **influential piece of research** as the client is the person they are making the product for so they **need to know exactly what the client wants** the product to be like.
- They **continue to have contact** with the client **throughout the project**.
- You will work in the same way as a designer, so the first piece of work you will do is a case study/client profile.
- A case study/client profile is a piece of **primary research**.

- A **CASE STUDY/CLIENT PROFILE** looks in detail at the person/people you are making the product for.
- It is a way of gathering information that will help the designer make sure they **MEET THE CLIENT'S NEEDS**.
- One product might have a **VARIETY OF CLIENTS**, e.g. a designer designing a product for a theatre production might have to consider the actor, the director as well as the audience!

Decide:  
 What do you need to find out?  
 What questions do you think you need to ask to get the information to help you progress further?  
 What type of questions can you ask?



**To make it easier to remember all the areas you might need information on, use ACCESS FM to help you...**

- Aesthetics**
- Cost**
- Customer**
- Ergonomics**
- Size**
- Safety**
- Function**
- Materials**
- Manufacture**

Consider how you will take the survey. How are these two examples presented?

### Survey

This is a questionnaire for a bag designed for holding personal items.

Question:		Person 1	Person 2	Person 3	Person 4	Person 5	Person 6
What colour would you want the main part of the bag to be?	Black Blue Green Red White						
How would you like to dispose of the bag when you no longer want it?	The bin Charity shop/ textile bank Pass down to family or friend						
Where would you use/ wear the bag?	Shopping Parties Gatherings Visiting attractions						
How much would you pay for a bag?	£15 £20 £30 £40 £50 £60+						

### Pyjama Questionnaire:

Please could you answer the following questions:

1. What age are you?  
 15-16yrs  17-18yrs  19-20yrs  21-22yrs
2. Where do you wear pyjamas most?  
 In bed - just to sleep in  On the sofa - for lounging around in  For sleep overs!
3. What time of year would you wear pyjamas the most?  
 All year round  Autumn/Winter  Spring/Summer
4. Which era are you most influenced by?  
 1920s    
 1930s   1940s  

## CLIENT / USER INTERVIEW

### Introduction -

Explain why you are going to carry out an interview with your chosen client (Primary research).

Use the headings below to help you structure your questions.

### Function -

- What do you want it to be able to do?
- Where?
- How often?
- How many should it hold?
- Storage issues?
- Is weight important?
- Desirable features?

### Aesthetics -

- Preferred styles / things it should match?
- Generic / bright / warm colours?

### Cost -

- Price range you might expect?

### Size -

- Things it needs to fit?

### Other -

- What else is important that you need to ask about?

### Client / User -

Name the person / persons you interviewed and state why you chose them.

### Answers -

Write down the answers that your client / user gave to your questions. The more detail they give the better.

## Summary

Summarise what you have learnt in this space.

# AO1: Investigating Existing Products

Product Analysis involves 'disassembling' an existing product to identify its key features.

## Analyse

- The function.
- The aesthetics.
- Key design features.
- Construction methods.
- Fibres.
- Environmental issues.

## Assess

- The ergonomics of the product.
- The size.
- Component parts.
- Method of manufacture.
- Cost.

Look at the examples of existing product analysis sheets. How do they compare?

IMAGE	SHOP/DESIGNER	PRICE (£)	PRODUCT DESCRIPTION	MATERIALS	SIZES	SUSTAINABILITY	ASPECTS I LIKE	ASPECTS I DISLIKE
	Louis Vuitton	£975.00	Silver coloured hardware - Natural cowhide leather handles - Zipped closure - Removable shoulder strap - Interior flat pockets - Burgundy textile lining	Leather	12.8 x 13.78 x 4.33 inches (length x height x width)	Natural material, more durable good for nature.	It's a strong material and will last a long time. It's not a throw away fashion.	The price is very high, some people may not afford it.
	Louis Vuitton	£1,060.00	- Rounded leather handles for a more comfortable grip - Adjustable and removable shoulder strap - Removable name tag - Padded for extra security - Internal D-ring for attaching keys - Cabin size	Leather	21.7 x 12.2 x 9.4 inches (length x height x width)	Natural material, more durable good for nature.	It's a strong material and will last a long time. It's not a throw away fashion.	The price is very high, some people may not afford it.

## Existing product analysis



## Young girls age 6-7 summer dress -

My existing product is a child's dress age 6-7 it is medium length, light weight and flowing, it fits nicely at the top and flows out at the waist, the dress is gathered from the bottom of the waist. It is a sleeveless dress this insures the child is cooler in the hot weather. It has a large collar which is hemmed with a white bow at the front of the neck, this is for decorative purposes and give more shape to the neck of the dress.

The bottom of the skirt is hemmed and dress has an inside lining this is to provide more comfort for the child as if there was no lining the fabric where the seams have been sewn would rub against their skin causing irritation, especially when the child is running around. The dress is fastened with buttons at the back of the garment this is in order to prevent choking hazards as the child cannot pull the buttons off as they are unable to reach the back whilst they are wearing the dress, However the dress is easy to take on and off.

The care label shows the temperature at which it can be washed at, where it is made, where it was purchased, if it is flammable, the age, whether you need to wash it inside out or not, what material it is made from and if it can be ironed. This garment is made from 100% cotton, this means the child will not get too hot as it does not contain fibres like polyester. It shows the product is best to be washed at 30 degrees, this is sustainable as it is a climate wash meaning it uses less energy.

### What is it made of?

100% cotton

## Existing Product Analysis

To get a better understanding of what is available on the market today, I am going to investigate and look at different soft furnishings and consider their target audience, function, cost, ergonomics and anthropometrics and suitability for use.

I to visit Dunelm to look at soft furnishings, as it is a popular 'high street' chain, and found that cushions were really popular and they had many different ones in stock. Cushions are a popular choice for soft furnishings as they can be practical and decorative. They can be used around the home in a variety of ways; in living rooms, bedrooms, conservatories and can make the user more comfortable as well as complementing the interior decor of the users home.

This cushion is rectangular, it is made from soft luxurious velvet and has a decorative beaded peacock feather design on the front. The most popular shape on display was square so this stood out from the others available making it more unique.



The cushion cover is fastened with a zip. Zips are a good practical way of fastening products and are easy to use. Although this zip matches the fabric colour, there is a facing which hides it and as well as hiding the zip this also stops it from being a finger trap hazard - important around young children. Having a fastening means that the cushion cover is removable for washing or changing the cushion pad.



This cushion cost £22. It is quite expensive so would not appeal to all customers users on a budget. It could be given as a gift for birthdays or young professionals/new homeowners.



The front of this cushion had a decorative beading/stitch design inspired by peacock feathers. This explains the high cost as this feature would take time to apply is very intricate. The colours harmonise well together and match the gold fringing around the edge of the cushion. The beaded design would mean that this cushion would probably be more decorative and the beads could be a choking hazard and could be swallowed by young children.



There is gold fringing around the edge of the cushion which adds extra decoration and complements the peacock feather design on the front. This type of feature adds elegance.

I think that this cushion is very decorative and I like unique shape and design. I like the complimenting colour scheme and beaded feather design. I think it would appeal to young professionals/new home owners or to be given as a gift because of the price. The intricate beading detail is also reflected in the cost. The materials are sophisticated, luxurious yet hardwearing and the lining adds to durability meaning that it will last a long time and not become a fast-fashion/throwaway item. Because it cannot be machine washed it makes it impractical to care for and this can be off putting. I really liked the fringing and think that having detail around the edge completes the product.



The cushion measures 30cm x 50cm. It is made from a mix of synthetic and natural materials - viscose and cotton and has a polyester lining. I can see that it is not able to be machine washed. The care label also informs the user that they must keep the cushion away from fire meaning that this product is potentially flammable.

Use the Coursework guidance to help you and always refer to the coursework mark scheme to make sure you are on track.

## EXISTING PRODUCT ANALYSIS

Introduction - Explain here you are going to do and state why you will need to know about it during your project.



FULL PICTURE OF PRODUCT

### Function

Describe what it does, then describe the features that make it work well.

### Aesthetics

Describe the features that make it look good. Why is it / that part that shape? Why is it / that part that colour? Will it blend in or stand out.

### Materials

Name the specific materials used and describe the properties that make them suitable. (Strong, tough, hard, durable, malleable, etc.)

### Ergonomics & Anthropometrics

Describe the features that make it easy or difficult to use by people. Focus on the position and size of parts. Describe how it has or hasn't been made safe. (Sharp corners, finger traps, small parts that could get swallowed, etc.)

### Cost

State how much it costs. In your opinion is this expensive or cheap? Do you think it gives the user value for money? Why?



FULL PICTURE OF PRODUCT

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Describe what it does, then describe the features that make it work well.

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### Cost

State how much it costs. In your opinion is this expensive or cheap? Do you think it gives the user value for money? Why?

Summary Summarise what you have learnt in this space.



# AO1: Further Research

**Vivienne Westwood**

Vivienne Westwood has been at the centre of fashion for the last 34 years and is one of the most inventive and influential designers. She played a vital role in the beginning of Punk Rock in the 1970s and has gone on to become one of the most original designers of our time. She has inspired many people over the years and is still continuing to design now.

I visited the Victoria and Albert museum to give me more information on Punk clothing and to also give me some inspiration for my own design.

I visited Vivienne Westwood's shop on Conduit Street in London, to give me more inspiration for my own design and to give me further information on the punk style.

**CONDUIT STREET WI**  
CONDUIT STREET

What were the main styles of Vivienne Westwood's collection?  
Most of the clothes in Vivienne Westwood's shop had very bold, black colours. Most of the jackets and dresses were made of a lot of draped or gathered fabric. In addition, all of her clothes had a little twist on a simple garment. For example, an ordinary black jacket would have a topstitched cut at the bottom, to make it look more edgy. Mainly the clothes in Vivienne Westwood's shop were made out of either cotton or silk. The clothes in her shop weren't very casual and you would most likely wear them out to a special occasion.

What I found out:  
I found a bondage outfit in the V&A which was created by Vivienne Westwood and Malcolm McLaren in 1977. It was worn by the London night club owner Michael Costiff, in New York. The suit is made out of cotton, the scarf is silk and the boots are made out of leather. It was a typical and traditional Punk outfit. In the V&A, I also found out that torn clothing, safety pins and spikes worn as jewellery were what Punk style was all about.

My opinion of Vivienne Westwood's clothes:  
I really liked all of the clothes in Vivienne Westwood's shop. I liked the style and shape of the clothes. They looked very well fitted and as if they would suit a lot of different people. Her designs were very bold and different, unlike most of the clothes in high street shops today. I think that this makes them more interesting and exciting.

How has this influenced my own design?  
Going to Vivienne Westwood's shop and the V&A has given me a lot of ideas for my own design. Vivienne Westwood's shop has made me think in a more creative way and has made me want to experiment with more bold colours and shapes. In addition, the V&A has given me a better insight of what traditional Punk clothing was. It has also given me ideas of what type of fabric and colour I could use for my own design.

Vivienne Westwood's collection on the runway.

Look at the work of others and investigate how they were influenced. It is worthwhile researching other designers and organisations and how they have developed. You can link this back to your client – who appeals to them.

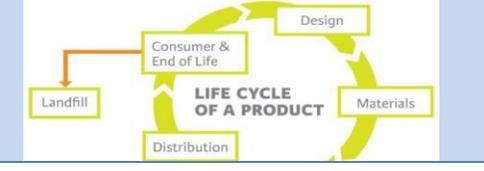


Think about the 6 R's of sustainability – explain how they can be incorporated into your product:

- Recycle
- Reuse
- Rethink
- Refuse
- Reduce



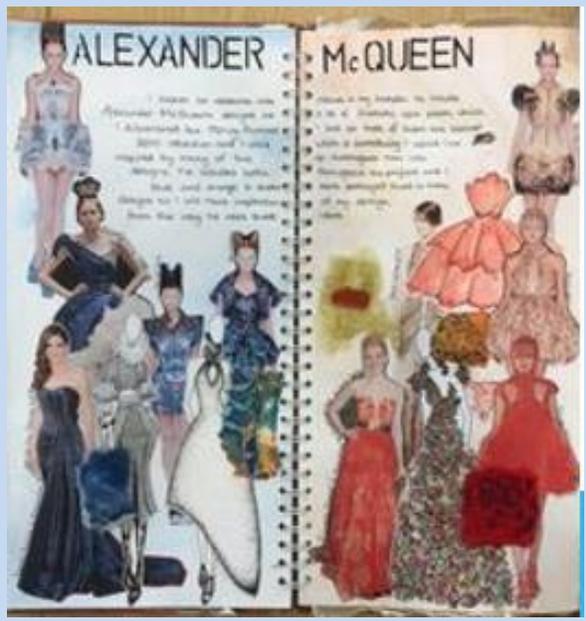
**Discuss Social, Moral and Ethical Implications of your product.** Consumer values and choices are influenced by societal, cultural, moral and environmental issues. Societal, cultural, and moral factors that impact on textile design.



Be very aware of what is acceptable and what is not acceptable in society. Issues with making products: Most people would prefer the products they want to be low cost and good quality.

**Ways to be more sustainable:**

- Use less material: *can you make things smaller, thinner lighter or with less parts?*
- Use renewable material/energy: *materials that can be regrown or recycled easily like wool or steel. Solar or wind power, no batteries.*
- Be more eco-friendly: *Reuse old materials, recycle waste, and refuse polluting materials.*



Use the Coursework guidance to help you and always refer to the coursework mark scheme to make sure you are on track.

## FURTHER RESEARCH

**Introduction** – Explain here what further research you need to do and state why you will need to know about it during your project.

**Environment**

PICTURE ILLUSTRATING FACTOR

Description – Get a picture(s) of what your design has to fit. Add the sizes - cms. Explain why this will have an impact on your design.

**Anthropometrics**

PICTURE ILLUSTRATING FACTOR

Description – Insert a table of the important human sizes your project needs and highlight the specific sizes in the table. Use this information to decide on a size, (or range of sizes) for specific parts of your project, state the size and say why?

**Social Impact**

Description – Explain the benefits that owning this product will bring to peoples lives. Eg.:

- Helps the user achieve a task quicker/easier/safer.
- Enjoy a task more improving quality of life.
- Helps them stay healthy.

**Economic Impact**

Description – Explain how this product may save the user money in the long run. Eg.

- Items may not get damaged / lost and need replacing.
- A bird box would stop birds nesting in gutters which would then need a tradesman to be hired to come and clean it out.

**Properties**

Description – Describe the main properties that will be needed and why. The main ones are, for example:

- Strength
- Toughness
- Durability

**Summary**

Summarise what you have learnt in this space.

# AO1: Design Brief and Specification

Write your brief as a short paragraph. It should include what you intend to make, the context you are working in and the benefits it will bring to the clients. Start it with the phrase below.

I am going to design and make a...

## Design Brief Examples:

### Design Brief

Many young people choose to express their individuality through the clothes they wear, the accessories they use and the products they decorate their rooms with. Alternative, offbeat, unusual, out of the ordinary, the 'in thing', the chic, a new trend and street style are all words that inspire our nations up and coming textile designers.

I will **DESIGN** and **MAKE** a textile product suitable for the **18-23 YEAR AGE RANGE** taking your inspiration from **'THE AGE OF PUNK'** and **VIVIENNE WESTWOOD**.

If the product is successful it will form part of a **LIMITED RANGE** to be sold at **MUSIC FESTIVALS** throughout the country.

I am going to design and make a pair of shorts for teenagers to wear when they go to the beach.

When teens go to the beach they like to be cool, so I will use lightweight fabrics. Beach wear is usually bright as you are outside so the shorts will be bright and colourful and will have a pocket so that the wearer can keep small things such as money safe. They will have a drawstring waist to hold them up.

I have 9 weeks to design and make my shorts. The final product must fit well and be wearable.

## Specification Examples:

Name/type of product	Skateboarding Specified Hoodie
Function: what does the product need to do?	The product needs to improve comfort when skateboarding. It also needs to symbolise skateboarding, it needs to be obvious that it is a skateboarding hoodie.
Situation/occasion when product will be used	The product will be used when the client wearing is skateboarding in colder and unpleasant weather. Also the product might be worn to protect their upper body if they are attempting something risky and they are concerned that their upper body might get injured.
Aesthetics (theme)	The aesthetics of the hoodie will be shown in the logo on the front of the hoodie. I am hoping to fabric paint 'The Evolution of The Skateboarder' logo on the front of my hoodie.
Sizes	The hoodie will be Medium/Large. I thought this would be a suitable size, because I am going to make the hoodie baggy, so if someone who is Extra Large is wearing the hoodie then it should fit them too, and if someone is small then the hoodie will be baggy on them, but still seem stylish.
Fabrics and components	I am going to attempt to make my product 100% cotton. This would be the best material, because it is eco-friendly and also it can be durable and warm. I am going to have different components on my hoodie, for example: a hood, a pocket on the front and strings to tighten the hood.
Target market and customer profile	My target market is teenagers around 16 years old who are passionate skateboarders. My customer profile is of a boy who is 16 and skateboards.
Minimum/maximum cost	The minimum cost will be £20 and the maximum cost will be £40. I have chosen these prices as the boundaries, because my customer said that he will buy clothing costing £20-£40.
Decorative techniques	For my decorative technique I am going to fabric paint a logo on the front of the hoodie, as mentioned previously in the 'Aesthetics' section.
Social, moral and ethical issues related to product	To avoid social issues I will have to make sure that the people who acquired the materials were paid fairly. I will not be making my product out of an animal, this means that there will be no moral issues. I will not use material that has been made with chemicals that will damage the planet this will avoid ethical issues.
Life expectancy	My product should last around two years. If the client starts to skateboard a lot more and falls off more frequently, then the product might not last as long as a year.
Other information	The hoodie will be black. I want it to be black, because I have found out in my research that most skateboard hoodies are dark colours. I also want to make my hoodie black, because I want the white logo that I am putting on the front of it to stand out.

The statements in your SPECIFICATION need to be justified so you will need evidence that they are required and meet the needs and wants of the user/client.

## Design Criteria/Specification

### Function:

The function of my garment primarily is to be a costume for a modern show of 'The Snow Queen' to be featured in the first half of the show. The dress must be floor-length and have a small train. It must also include a fitted corseted bodice with boning to give shape, fit and easy access in and out. The skirt should include layers of dark and sinister colours to show the fate of the character later on in the show. The garment could include beading to give the illusion of ice and snow glinting in the light. The garment must be durable so it can go through several shows and can be adapted for a different show.

### Aesthetics:

My final garment must have the colours and feel of ice/snow and unknown danger. It must have the heir of elegance as the character is a royal and high status. The bodice must be ridged and have harsh lines but must flow into a silky and watery skirt. The skirt should be layered with dark colours to show the fate that will befall the character. The dress should contain illusion on the bodice and sleeves and neck that is a translucent off white or bright white colour. The bodice could contain intricate bead work to give the feel of ice and snow glinting in the light.

### Size:

The garment must be bespoke to the actress wearing the garment.

### Target market:

My target market is the Apollo Victoria Theatre, London. They require high quality garments to fit their standards.

### Minimum and maximum cost:

After looking at a range of garments that represented the quality of the garment and found that they ranged from £100-£500. To deduce the cost of my garment I intend to try and find local resources for the fabric and make it not too complicated to reduce labour costs.

### Decorative techniques:

If I have time I intend to include decorative elements on the bodice. By doing this it will glitter in the stage lights and imitate the look of ice and snow.

### Social, Moral and Ethical issues relating to products:

My garment needs to be long lasting, made from locally sourced materials as to reduce the carbon footprint. By being well made it will also be able to be used for many productions reducing the need for costumers to remake the garment and lessening the need for the use of more fabric and resources.

### Life expectancy:

My garment will be used for my adaptation of the 'Snow Queen' primarily but after its been used for that show it will be reused and adapted to fit other shows. The garment will have a life span of about 5 years with added adaptations that have been from other productions.

Use the Coursework guidance to help you and always refer to the coursework mark scheme to make sure you are on track.

## DESIGN BRIEF

Write your brief as a short paragraph. It should include what you intend to make, the context you are working in and the benefits it will bring to the clients. Start it with the phrase below.

I am going to design and make a...

## SPECIFICATION

- Use bullet points under the headings below to state the criteria that your final design must meet.
- Justify each of your statements.
- 2 or 3 points should have numbers in so they are measurable.
- Make reference to your 3 research sections (Client/User Interview, Product Analysis and Environment Considerations) at appropriate points to reach the higher grades.

### Use

- Give several bullet points with as much detail as possible about each of the things it should be able to do, drawing on the information in your research. Start each with - The product should be able to .... because ...  
Eg. Where should it go? What should it store and how many? Should it be portable? Where will it be stored, What desirable features should it have? Etc.

### Aesthetics (appearance)

- How important is the style and colour of the project and why? Will it need to match or compliment any of its surroundings?
- Should it be made available in a range of colours or a generic colour?
- Can colour and style make it more appealing to your target population?

### Ergonomics

- What features need considering which will make your solution as easy to use and safe as possible. Eg. Easily accessed / filled / fitted / carried / cleaned / stable / stored / etc.
- Including no sharp edges or parts that may trap fingers etc.

### Anthropometrics

- Are there any parts of the project that need to be an appropriate size to fit people or parts of people, eg. size of hands for handles etc. State the size (or size range needed) and where appropriate use sketches to explain.

### Properties

- What properties do you need from the materials you make it from and why? The main properties are strength, durability, toughness, aesthetics and cost.
- The materials will need to be tough as the ..... is likely to be roughly handled.

### Cost

- What would be a reasonable price range for the solution bearing in mind the client / user interview question.

