The Trafalgar School at Downton

Knowledge Organiser

Year 10: Terms 1 and 2

Contents

Name…….House……..

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.

Look	Read the information 3 or more times 
Cover	Now cover what you have just read up
Write	Now try and write down the information you have just read 
Check	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”.

ENGLISH 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

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 motif is…'*** (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.*

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	• Reads with understanding • Identifies explicit information.
Q2/3	• Analyses the effects of writer's choices • Well-judged quotations • Sophisticated subject terminology
Q4	• Same as Q2/3 • Evaluates (judges the effectiveness of) the text in a detailed way

Assessment Objectives (AOs)

AO1
- **Identify and interpret** explicit and implicit information and ideas.
- **Select and synthesise evidence** from different texts.

AO2
- **Explain, comment on and analyse** how writers use **language and structure** to achieve **effects** and influence readers
- Use **relevant subject terminology** to support views.

AO4
- **Evaluate** texts critically and support this with **appropriate textual references**.

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 patters - 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/

Language features

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

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 <u>pace</u> and a <u>tone</u> 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.

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 **<u>not</u>** named? Why not this be? Why might these names by 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 **<u>types</u>** 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?

Q3: Structure

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

Q2: Language

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

REMEMBER YOU SHOULD ALWAYS DO Q5 FIRST

Generally – why not go for the narrative and have a bit of fun writing?
BUT 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!

DESCRIPTION
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 'how to cheat the description Q' (Mr Salles)

NARRATIVE
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*

**you can use characters and ideas from games or films – especially if you can play it into a great twist – but pick a very small section – up to 2mins max (these are great to practice on – turn a 1min scene into a piece of writing*

Planning:
Think up 3 ideas...discard the first 2: by the third idea you have moved away from what most people will do – use this! **Then plan using the 6 Camera Method - don't skimp on this stage!**

6 rules for writing stories

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

Mr Salles Method for planning stories [The 6 Camera Method]

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

Plan like this in the exam
[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

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	**Example 1:** **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)*

Example 2: Lighthouse Viewpoint 1	Abandoned – dark; light not on at start – *repeat opening with light on at end – circular narrative!*
Zoom in – inside	Fixing the light – dark frown
Zoom out - boat	Danger – moving towards dark
Zoom in – light on	Relief – bright smile lit up face
Zoom out - boat	Boat avoids danger
Lighthouse	Same as 1 but light on

The basics

- Capital letters
- Full stops
- Question marks
- Commas
- Apostrophes
- Consistent tense
- Paragraphs
- Homophone spellings
- Connectives
- Semi-colons
- Colons
- Hyphens
- Parenthesis (...)
- Topic sentences
- Vary sentence starts/lengths
- Vary paragraph lengths

- Verb – *Running quickly, she .....* (make sure you finish sentence)
- Adverb – *Darkly, the night sky....*
- Adjective – *Red light filled the ...*
- Preposition – *Down there, all...*
- Connective – *However, his life...*
- ISPACED...VARIETY!

The Exam

45 minutes - 1 task - 40 marks
(1 from a choice of 2 - usually 1 descriptive **or** 1 narrative...but could be 2x narrative or 2x descriptive)

Step one: read & highlight key words in question (including PURPOSE, AUDIENCE, LANGUAGE & FORM)

Step two: Study the stimulus (picture) then choose one of the two questions

Step three: Plan 6 -8 things you can include, then put them in order (Steps 1 to 3 = 10 mins)

Step four: Write it' (Step 4 = 30 mins)
- ❑ Should be lots of crossing out to show 'crafting'
- ❑ Should be 2 sides approx

Symbolism	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.
Motif	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 & dark – *think of the colours used in film to represent good or bad characters*
Contrast (technique)	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.
Imagery	Includes simile, metaphor & 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'.

AO5 Content and Organisation	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.
AO6 Technical Accuracy	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.)

The descriptive 'rules'

- No names for people
- At least 3 zoom-ins
- No person described for more than a paragraph
- Minimum 5 senses
- 1-3 sentences of direct speech
- Maximum 1 exclamation mark
- 3rd person
- No thoughts
- Present or past tense (not both)
- Move the camera – like a film

Historical and Social Context of 'An Inspector Calls' by J.B. Priestley: set one evening in 1912, written/published in 1945, first performed in the UK in 1946.

Capitalism and **Socialism**: two main economic and political systems used in developed countries. **Capitalism** dates back to 1400 AD Europe. **Socialism** evolved in France during French Revolution (1789) and in Britain as a reaction against Industrialization (1700s-1800s): factory owners became wealthy, while many workers were often mistreated by them, lived in increasing poverty, working for long hours under difficult and sometimes dangerous conditions.

Capitalism:

Traditionally a view of the conservative party (Churchill), Capitalism is a right-wring political belief in individual gain through hard work and a focus on profit. Capitalists accept that, for this to happen, there will always be people in society who are much better off than others.

Socialism:

Traditionally a view of the labour party (Clement Atlee, Priestley), Socialism is a left-wring political belief in greater equality and fairness for all, especially the poorest and most needy in society. Socialism creates equality by state/public ownership of money/capital and control of business, distributing wealth more evenly among the classes.

In 1912 (year play set):

- Society divided into three rigidly fixed classes dependent on family background, wealth and education: Upper class - aristocracy (wealthiest, greatest political power: led opulent and leisurely lives); Middle-class - business owners, educated professionals (lawyer, doctor); Lower class - worked for middle and upper classes (servant, factory, shop).
- General belief of middle and upper class you look after yourself and your family only, and lower class poverty was caused by laziness, drunkenness, and lack of morals.
- Few rights for workers, little support for unemployed, injury, illness, cost of medical treatment; millions of poor lived in city slums across UK; 2% London's poor were dying from cold; poor relied on help from charities, Government offering only the workhouse.
- Year for employee disputes after workers had appealed for social and economic reform unsuccessfully, for years: protests, riots, coal strikes, docks lying idle, garment workers walking out in their thousands. **National coal strike of 1912** was first national strike by miners in UK. Its main goal was securing a minimum wage. After 37 days, government intervened and ended strike establishing a minimum wage for first time.
- RMS Titanic was a British passenger liner that sank five days into maiden voyage (Southampton to NYC), after hitting an iceberg in North Atlantic Ocean, in April; approx. 1,500 people died (incl.130 first class, 166 second class and 536 third class passengers).
- Women treated as subservient to men; no social welfare system so many unemployed lower class women had no alternative but prostitution; upper class women also had few choices: most they could hope was to impress a rich man and marry him.

After WW1 (1914-19) and WW2 (1939-1945):

- Society recovering from two wars: they'd had to unite, rich with poor, old with young, man with woman; rationing further enforced equality, so people particularly open/desire to continue with social equality (treated equally) and social responsibility (looking out for each other).
- July 1945, Clement Atlee's Labour party won landslide victory in elections over Winston Churchill's Conservatives reflecting scale of enthusiasm for the social and moral reform and equality they offered.
- Women earned more valued place as had filled work roles of men: helped change perceptions about gender as men had to acknowledge women just as capable. Many women enjoyed newfound freedom working and earning allowed them.

Priestley deliberately set 'An Inspector Calls' in 1912 as the year represented an era very different from the time he was writing it: rigid class and gender boundaries were now almost disbanded. Priestley wanted to make the most of these changes, so through his play, he encourages people to seize the opportunity to build a better, more caring society, rather than return to past inequalities.

John Boynton Priestley (1894 - 1984):

- Grew up in northern industrial town of Bradford, Yorkshire; socialist views formed here as noticed while many lived in poverty, city's respectable men folk could be smug, even hypocritical: pompously religious on Sundays, but on Saturday nights ill-using young women.
- Fought WW1; nearly died when buried alive by a trench mortar explosion, and later gassed.
- By 1930s, strong social conscience, troubled by effects of social inequality in Britain, and became actively involved in politics.
- Much of his writing was revolutionary and controversial; it included new ideas about possible parallel universes, and contained strong political messages.
- In 1942 he was a co-founder of new political party, the Common Wealth Party, which argued for public ownership of land, greater democracy, and a new 'morality' in politics. The party merged with the Labour Party in 1945, their mandate to create a 'welfare state' and a national health service, eliminating poverty.
- He campaigned for the formation of the United Nations (1946), believing further world wars could be prevented through cooperation and mutual respect between countries, and for the National Health Service (1948).

'An Inspector Calls' by J.B Priestley

Act 1 Summary and Key Quotations

1. Set in 1912, the play begins during a celebratory engagement dinner at the Birling residence: '**a fairly large suburban house**'.
2. Arthur Birling toasts the future marriage of his daughter, Sheila, to Gerald Croft (son of aristocrats Lord and Lady Croft), mentioning his hopes the marriage will enable his and the Croft's (rival) businesses to work together to '**lower costs and higher prices**'.
3. Sheila teases Gerald about his detachment towards her last summer. Arthur pontificates about the marriage being at a good time: '**passed the worst**' of the strikes, **'there isn't a chance of war'**, time of great progression such as newly built Titanic, sailing next week, which is **'unsinkable, absolutely unsinkable'**.
4. After dinner, Arthur privately tells Gerald he's up for a knighthood, so Gerald can allay Lady Croft's fears he's marrying beneath him. He lectures Eric and Gerald on his belief one should '**look after himself and his own**' only - clearly rejecting ideas of socialism. The '***sharp ring of a doorbell***' interrupts his views.
5. It is Inspector Goole, who '***creates at once an impression of massiveness, solidity and purposefulness***' and '***speaks carefully, weightily***'.
6. The Inspector states a girl named Eva Smith has committed suicide by drinking disinfectant which '**Burnt her inside out**'. He shows Arthur alone a photograph of her. Arthur admits employing Eva two years ago, she was a '**good worker**', but he dismissed her for being a ring-leader in a strike so he '**can't accept any responsibility'** for her suicide.
7. The Inspector explains Eva **'like a lot of young women'** in the country, had no relatives to help, **'few friends, lonely, half-starved'.** Due to a winter influenza outbreak, she secured a job at Milwards. After a very happy couple of months there, a customer complained, so she was fired. Goole then shows Sheila the photograph. She is shocked, **'*gives a half-stifled sob, and then runs out*'.**
8. Sheila returns '***distressed***', confessing she had Eva sacked out of jealousy: a dress looked better up against Eva than on Sheila. She caught Eva smiling, thought she was mocking her, so told the manager she'd have her mother close their account if he didn't fire Eva. Sheila vows **'if I could help her now, I would'** and **'I'll never, never do it again to anybody'.**
9. The Inspector reveals Eva took a new name - Daisy Renton; Gerald is visibly '***startled***'. Sheila, alone with Gerald, questions him. At first he denies knowledge of the girl, but then admits it was where his attention was last summer! He thinks he can **'keep it from'** the Inspector. The '*door slowly opens and Inspector appears … Slow Curtain*'.

Act 2 Summary and Key Quotations

1. In Act 2, the same setting, the Inspector tells Gerald and Sheila a girl had died that night **'in misery and agony - hating life'**.
2. Sybil enters and fails to see why they should be trying to understand actions of **'Girls of that class'.** Sheila warns her not to act complacently or **'build up a kind of wall between us and that girl'**.
3. Sybil admits Eric, who's **'only a boy'**, drank too much at dinner. Sheila and Gerald shock her revealing **'he's been steadily drinking too much for the last two years'**. Birling enters.
4. The Inspector questions Gerald, who reluctantly concedes he knew Daisy; '***distressed***', suddenly realizing **'she's dead',** he recounts how he rescued her in the theatre bar from the lecherous Old Joe Meggarty '**one of the worst sots and rogues in Brumley**'. Mrs Birling is '***staggered***' by this description of an Alderman they know.
5. Gerald put Eva up in a friend's set of rooms; she became his mistress. He's embarrassed by his indiscretion, maintains his concern for Daisy was genuine, but eventually ended it, insisting on giving her money **'to see her through to the end of the year'**.
6. The Inspector tells him according to her diary, in September, she went to a '**seaside place**' for two months **'to make'** the memory of their affair **'last longer'**.
7. Sheila gives Gerald back the engagement ring, telling him they're '**not the same people who sat down to dinner**', they'd '**have to start all over again, getting to know each other**'. Gerald tells the Inspector he's going for a walk but will come back.
8. Sheila queries why the Inspector didn't show Gerald the photograph. He insists Sybil see it. She immediately lies, saying she doesn't know the girl. Sheila begs her mother to tell the truth.
9. It's revealed that in her role as a member of the Brumley Women's Charity Organization, two weeks ago, Sybil refused to give Eva money because she pretended to be called 'Mrs Birling' and she '**didn't like her manner**'; Sybil states she used her '**influence to have it refused'.** The Inspector reveals Eva needed money as she was pregnant. Sybil told Eva to make the father '**responsible**' but Eva claimed she couldn't take the father's money as it was stolen. Sybil asserts Eva was **'claiming elaborate fine feelings and scruples that were simply absurd in a girl in her position'.**
10. Pressured by the Inspector, Sybil, who'll '**accept no blame for it at all',** insists the father should shoulder all responsibility for Eva's death and be **'compelled to confess in public'.** Suddenly, the Birlings realize who's the father of Eva's baby! '*Eric enters … the curtain falls slowly*'!

Act 3 Summary and Key Quotations

1. Eric confesses: very drunk one night in November, he met Eva, followed her home, and forced himself on her as he '**was in that state when a chap easily turns nasty'.**
2. A fortnight later they began a relationship; she fell pregnant. He offered to marry her but she refused as he '**didn't love her**'. He stole money from his father's company to support her.
3. The Inspector reiterates the parts each of them played in the girl's death. Hearing his mother's role for the first time, Eric tells her '**you killed them both'.** The Inspector reminds Eric he used Eva as '**an animal, a thing, not a person**', and all of them that even though '**One Eva Smith has gone … there are millions and millions of Eva Smiths and John Smiths still left with us',** and **'We don't live alone. We are members of one body. We are responsible for each other'** but '**if men will not learn that lesson, then they well be taught it in fire and blood and anguish'.** He says '**Goodnight**' and leaves.
4. Arthur worries about public scandal, blaming everything on Eric. Eric and Sheila criticize their father for worrying about his knighthood and reputation when someone has died.
5. Replaying the Inspector's arrival, just after Arthur had declared they shouldn't take any notice of those **'cranks'** who tell us **'everybody has to look after everybody else, as if we were all mixed up together',** they suspect Goole's a fraud. Sheila and Eric point out their actions are still terrible, but their parents disagree!
6. Gerald, having bumped into a police officer on the street, returns and confirms their suspicions: there's no such person as Inspector Goole. Arthur verifies it by ringing the Chief Constable!
7. For Eric and Sheila **'the girl's dead and we all helped to kill her - and that's what matters'.** However, the Birling parents and Gerald try to acquit themselves from responsibility again, for Eva Smith's death, by arguing their actions may have been performed on four or five different girls, and Eva might not even be dead.
8. Gerald phones the hospital and confirms there's been no suicide. Arthur and Sybil are overjoyed. Eric and Sheila are appalled at them: **'You began to learn something. And now you've stopped. You're ready to go on in the same old way.'**
9. Just as Arthur jovially mocks his children for their over-seriousness, the phone rings: a girl has just died after swallowing disinfectant, and a police inspector is on his way to question them, **'they stare guiltily and dumbfounded, the curtain falls'.**

Characterisation: Character Profiles

Mr Arthur Birling is described as a ***'heavy-looking, rather portentous man'*** suggesting his affluent lifestyle. From the start of play, he comes across as arrogant, foolish and selfish:

- he makes political, social and economic predictions for the future that the audience know to be completely mistaken;
- he asserts a man should look out for himself, not wasting time with '**community and all that nonsense**';
- he brags he's a '**hard-headed business man ... who knows what he's about',** who was **'Lord Mayor two years ago ... still on the bench',** and up for a knighthood; he tries to use his status to influence others and evade the law, warning the Inspector Chief Constable Roberts is an old friend.

He doesn't learn any lessons: when it seems the Inspector might have been an imposter, he's overjoyed he'll retain his reputation, mocking others for being 'tricked' by the investigation. Priestley believed in socialism so he uses Arthur Birling to represent greedy businessmen, an example of the ills of capitalism, who only care for themselves, implying Eva Smiths of the world will continue to suffer if people like Birling remain in positions of power.

Mrs Sybil Birling, Arthur's wife, in initial stage directions is described as '***rather cold***' and '***her husband's social superior***'. From the outset we get the impression she's an unfeeling, haughty snob despite (we later find out) being a prominent member of the local women's charity:

- throughout dinner she tells Sheila and Eric off for slips in social etiquette, whilst blind to her son's drinking, ignorant of his long-standing drink problem and of the world around her: Alderman Meggarty; **'scruples...simply...absurd'** for '**Girls of that class**';
- she's unsympathetic of Eva's situation and refuses to take any responsibility for her suicide: '**I accept no blame for it at all**'.
- her cold, uncaring nature leads to her downfall as the Inspector forces her to unknowingly condemn her own son; her own children are disgusted by her lack of compassion for a pregnant, destitute lower-class girl.

By the play's end, Priestley shows she clearly learned nothing, and so is typical of an older generation who he believed couldn't accept responsibility, cared only for themselves, and were unwilling to change. Priestley uses Sybil as a contrast to the future welfare state: in 1912 rich people like her decided, with their own prejudices, who deserved welfare and who didn't.

Sheila is the Birlings' daughter, in her early twenties. At the start of the play, celebrating her engagement, she's described as ***'very pleased with life and rather excited'.*** At first we get the impression she's a giddy, naïve and childish, but when the Inspector arrives she changes:

- she's shocked by the news of Eva Smith's death;
- she's deeply affected by and repentant of her own involvement in Eva's death, accepting responsibility at once, promising to never behave in such a way again;
- she matures quickly, standing up to her parents, and showing she's insightful and intelligent: she grasps where the investigation is going, so tries to warn others.

By the end of the play she has grown up and realises your actions can have grave consequences. Sheila, like Eric, allows Priestley to show his opinions on youth: he felt there was hope for the future in the young people of post-war Britain, viewing them as the ones who would help solve the problems the country had with class, gender and social responsibility.

Eric is the Birlings' son, in his early twenties. He's described as ***'not quite at ease, half shy, half assertive'***. In other words, he lacks confidence, although at points he tries to stand up to his father but is talked down. He is drunk at the dinner table and later it's revealed that he's been drinking too much for quite some time:

- he forced himself on Eva one drunken night;
- he had an affair with her, she became pregnant, so he stole money from his father's business to help her;

- he offered to marry her, but she refused him;
- he attacks his parents' behaviour and values in the final act, showing he can be assertive.

Like Sheila, he's grown up considerably by the end of the play, and the evening's events can be seen as his path to adulthood and responsibility. Through Eric, Priestley shows that immoral behaviour, excessive drinking and casual relationships can have consequences.

Gerald Croft, about thirty, is the ***'easy well-bred young man-about-town'***. He's an aristocratic heir to a rival business, Crofts Ltd. At the beginning of the play he appears confident and charming; this changes after his secret affair is revealed:

- his outlook on life and business mirror Birling's: he agrees with Eva's dismissal and says the Crofts '**would have done the same thing**';
- he's acted immorally, given in to lust, having an affair (although at the beg. of the 20th Century it wasn't uncommon for upper class men to have a mistress), and when caught out initially tries to deny it to Sheila, and then a Police Inspector;
- he seems to have rescued Eva from the Palace Bar out of genuine concern, and provided her temporary accommodation, stating he didn't do this in order to have an affair, but she did become his mistress; he says he '**didn't feel about her as she felt about me**', so after some months, when it suited him, he ended it.

At one point it appears he's developing some remorse: **'I - well, I've suddenly realised - taken it in properly - that she's dead';** the Inspector later says he: '**at least had some affection for her and made her happy for a time**' but in the final act he's trying to get them all out of trouble, and says **'Everything's all right now, Sheila.** ***(holds up the ring)*** **What about this ring?'** suggesting he's learned nothing, eager to get back to how things were before the evening, inconsiderate of Sheila's feelings. It implies how ingrained attitudes to women and lower classes were in the upper class, and how difficult it was to change them. Priestley uses Gerald to attack the upper-classes, showing despite outward appearances and a privileged upbringing, they were capable of very questionable behaviour.

We never meet **Eva Smith** during the course of the play, her voice is never heard, but it's her death that dominates the plot. We learn about her through the Inspector, who's read a letter, and diary she kept, and infer through the incidences with the other characters:

- Birling's factory: good worker, brave, strong willed, intelligent;
- Sheila at Milwards: beautiful, a sense of humour;
- Gerald relationship (Daisy Renton): victim, emotionally sensitive, empathetic;
- Eric relationship: honest, principled/moral, mature;
- Sybil: desperate and resourceful.

Eva is always referred to in a positive light by the characters, suggesting she is a better person than any of them, but the Inspector never lets the audience or characters forget her gruesome death. His final speech reveals Priestley's lesson: there are millions of Eva Smiths being exploited and this must not continue. Eva/Daisy may not be a single person, but as Sheila realises, she is an 'Everywoman' - a symbol of all working class people exploited by the rich. Her name 'Eva' evokes Eve, the first woman, while 'Smith' is the most common surname in the UK. A Daisy is a common flower, associated with chains (series) and symbolising innocence and purity; 'Renton' reminds the audience of the rent that Gerald pays for her, and the suggestion that she resorts to prostitution (rent girl).

Genre and Structure

Greek tragedy: (originated Ancient Greece – one of oldest literary genres)

drama with moral lesson telling story of high ranking character destroyed due to hubris (selfish or arrogant actions).
Priestley constructs play using the three unities of Greek tragedy (set of structural rules that classical Greek dramas adhered to): Unity of time: play should take place in period of less than 24 hours; Unity of place: play should take place in single physical location; Unity of action: play should focus on one storyline with few/no subplots.
Perhaps he thought this structural simplicity would help audience to focus entirely on his moral lesson.

Morality play: (genre based on religious mystery plays of Middle Ages)

sought to teach audience lessons focused on seven deadly sins: lust, gluttony, greed, sloth, wrath, envy and pride. Characters who sinned were punished but if repented could redeem themselves.
Priestley uses this structure to teach 20th century audience lessons about social responsibility; audience invited to enjoy judging characters but also question own behaviour. He would have hoped audience left theatre as better people.

Well-made play: (popular dramatic genre from 19th-century)

plot based on events that happened before opening of play; each individual act repeats same pattern; contrived (engineered for max impact) entrances, exits and props (such as letters) to increase suspense; plot based on withheld secret revealed only, at climax, which reverses **misfortunes** of protagonist.
Priestley perhaps uses this structure to manipulate audience: they don't know what happened to Eva Smith so each revelation about her treatment by characters adds drama, each one more shocking than last, building to climax. He subverts genre by including his twist at the end, a reversal of fortune: another inspector on way! The curtain falls; the audience is left stunned.

Crime thriller or The 'Whodunnit' (genre based around a crime)

a murder/mystery needs solving; audience receives clues on who's committed crime and enjoy trying to guess outcome before end; a highly competent detective investigates and interrogates suspects.
Priestley subverts the genre as centres around suicide not murder investigation; initially seems no clear suspect but soon revealed all characters are guilty for different reasons, so audience would be considering who is 'more' to blame for the suicide. Priestley makes audience question if they too committed similar 'crimes' to the characters.

Priestley's Dramatisation: Dramatic Methods

antagonist	a character who actively opposes main character; an adversary (Birling v Goole)
cliff-hanger	suspense at end of episode inciting anticipation about what will happen next
coup de theatre	(the peripeteia) a sudden dramatic turn of events
cyclical structure	ends as it begins (Priestley interested in theories about time, including Ouspensky's and Dunne's theories: see themes)
dramatic irony	(commonly used in Greek tragedy), the full significance of a character's words/ actions is clear to audience/reader but unknown to the character
entrances/exits	in AIC used for dramatic irony, propel story, amplify Inspector's image
everyman	a character who represents all ordinary men/human beings (Eva: everywoman)
foil	character whose function is to serve as a contrast to another character
linear structure	chronological order with beginning, middle and end (in that order)
props	a portable object used on stage (photograph of Eva, telephone)
subvert	undermine or challenge the expected or conventional
set and lighting 	highlight **themes** Priestley wanted to explore e.g. set in dining room (in 1912 only well-off would have one) which is **'substantial and heavily comfortable, but not cosy and homelike'** suggesting Birlings wealthy, live comfortably, but all show, not truly happy family

Age: Priestley uses age to illustrate the differing attitudes in society at the time. Older characters, Arthur and Sybil, who believe in only looking after themselves and their family, represent an outdated way of thinking; younger characters, Sheila and Eric, come to represent modern attitudes towards caring about others in society.

Responsibility and Remorse: Priestley shows a family forced to reflect upon their actions and responsibility for a young girl's demise. Sheila and Eric at once admit responsibility and feel guilty; Arthur and Sybil refuse to accept responsibility or feel guilt; Gerald's acceptance and guilt doesn't last out to the end of the play!

Themes

Secrecy and Lies: Priestley exposes the hypocrisy and dishonesty, of upper and middle classes: Arthur ironically (magistrate) wants the scandal covered up, Sheila vengefully uses her family's status to get Eva sacked, Gerald cheated (like many men of his class), Sybil lied to the inspector about recognising the girl in the photograph, Eric hides his alcoholism, child, and embezzlement.

Class and Gender: Priestley reveals unfairness of class system using Birlings and Croft as caricatures of all the bad qualities he felt ruling classes had, and how the working class (Eva) were victims of it, not the drunk, lazy, immoral ones! He exposes gender stereotypes: women - protected, clothes obsession, vain; men serious business, can sleep around. He challenges this with his rebellious young female characters: Eva and Sheila.

Time: there are over 100 references to time in the play; Priestley was fascinated with the notion of time having read P.D. Ouspensky's reincarnation theory (we're reborn to exactly same life, over and over, unless we are spiritually enlightened in a life, which allows us to escape cycle, and enter new life in which we don't make same mistakes) and J.W. Dunne's theory: past, present and future all happen at the same time. Human consciousness experiences this simultaneously in linear form! **How does Priestley explore the theme of time in the play?**

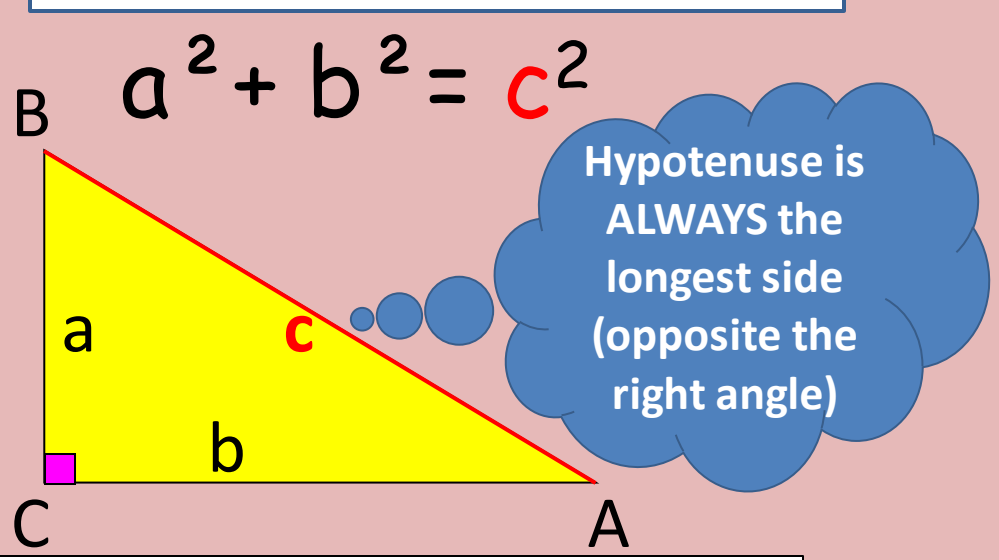
Inspector Goole's Role

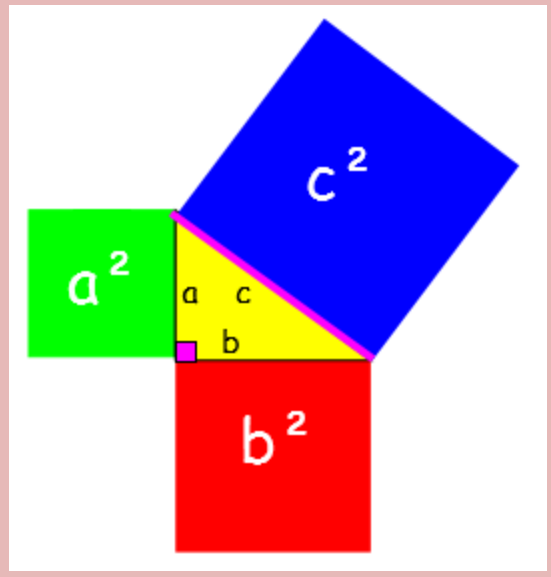
Priestley uses **Inspector Goole:**

- as his **mouthpiece**, representing Priestley's socialist views so Goole speaks up for working class (Eva), he makes selfish middle/upper class characters reflect and take responsibility for unfair treatment of them. In Goole's dialogue, Priestley uses the plural pronoun 'we', for Birlings, the singular 'I', creating clear contrast between Birlings' self-interest and Goole's/Priestley's humanitarianism: '**We are members of one body',** threatening if we don't take responsibility for each other, world doomed by '**fire and blood and anguish**'.
- to **heighten drama**: all his entrances, exits and dialogue used to create maximum tension: pausing, interrupting, repeating, shocking language: '**a burnt out inside on a slab**'.
- to **impose control**: on entering, immediately takes control from Birling; polices characters throughout, compelling them to confess; physically controlling aura as ***'need not be a big man'*** but must create an ***'impression of massiveness, solidity and purposefulness'***, even silences unstoppable Birling at one point; controls flow of information to audience: supplying dates, filling in background; controls structure of play: deals with '**one line of enquiry at a time**', each revelation driving play a further step forward, revealing the '**chain of events**' in order, but deliberately swapping Eric for Sybil from the chronological order to expose her double-standards.
- to **reveal all crimes**: he's omniscient, shedding light ('***pink and intimate***' to '**brighter and harder**' as soon as he arrives) on family's moral offences; plays role of God, urging characters to repent, knows extraordinary amount: history of Eva and Birlings' involvement in it (Sheila tells Gerald, '**Of course he knows**') even though Eva died only hours ago.
- to add a **haunting layer of mystery**: by end of play, revealed he's not an Inspector, but not clear who he is as know little about him; name 'Goole' pun on 'ghoul' suggests supernatural/other worldly; fishing village near home town of **Bradford** suggests he's fishing out the truth. For Priestley, Goole's dramatic power lies in the audience's speculations over his possible identity.

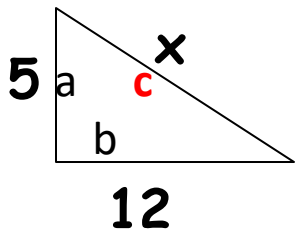
Pythagoras' Theorem

Pythagoras' Theorem states that for right angled triangles, the sum of the squares of the two shorter sides is equal to the square of the hypotenuse





Finding the hypotenuse



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

$x^2 = 5^2 + 12^2$

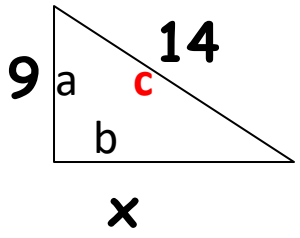
$x^2 = 25 + 144$

$x^2 = 169$

$x = \sqrt{169}$

$x = 13$

Finding a shorter side



Find x

All lengths in cm

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

Rearrange for shorter side

$b^2 = c^2 - a^2$

Remember to give degree of accuracy of rounding and **UNITS** of measure when needed.

$x^2 = 14^2 - 9^2$

$x^2 = 196 - 81$

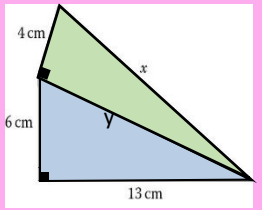
$x^2 = 115$

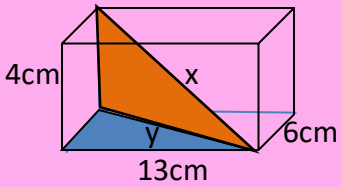
$x = \sqrt{115}$

$x = 10.72380....$

$x = 10.7$ cm (3 sf)

Problems Solving: Pythagoras in 3D





Find the interim hypotenuse:

$c^2 = a^2+b^2 \rightarrow$ $y^2 = 13^2+6^2$

$y^2 = 169+36 = \mathbf{205}$

No need to find value of y as it is y^2 that will be used in next calculation !

Find the wanted hypotenuse:

$c^2 = a^2+b^2 \rightarrow$ $x^2 = \mathbf{y^2}+4^2$

$x^2 = \mathbf{205}+16 = 221$

$x = \sqrt{221} = 14.866....$

$x = 14.9$ cm (3sig fig)

Summary 3D Formula: $d^2 = a^2+b^2+c^2$

Pythagorean Triples are 3 integers that follow the Pythagorean rule e.g.

3,4,5 **5,12,13** **7,24,25**

and any multiples of these triples e.g.

6,8,10 15,36,39, 14,120,125

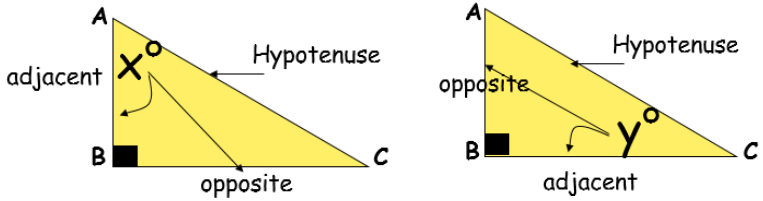
Basic Trigonometry (in right angled triangles)

Understanding Trigonometry

Trigonometry enables us to find **missing angles and sides in right angled triangles** because the ratios between different sides of a right angled triangle will be the same for all similar triangles (with the same angles).

Trigonometry Notation

For any right angled triangle ABC:
The **HYPOTENUSE** is ALWAYS the LONGEST SIDE
The **other sides are named according to where they are in relation to the angle**
The **OPPOSITE** side is OPPOSITE the ANGLE known/wanted
The **ADJACENT** side is NEXT TO the ANGLE known/wanted



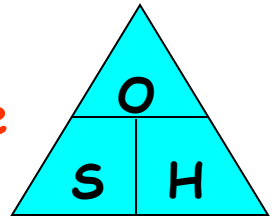
Pythagoras or Trigonometry?: Pythagoras only deals with sides; Trigonometry MUST INVOLVE AN ANGLE

A common way to remember the ratios is: "**SOH CAH TOA**".... but make up your own mnemonic to remember the order of letters e.g. from one former pupil: "**s**unny **o**n **h**oliday, **c**loudy **a**t **h**ome, **t**oday **o**nly **a**verage!"

Sine Ratio

$\sin \delta = \frac{\text{Opposite}}{\text{Hypotenuse}}$

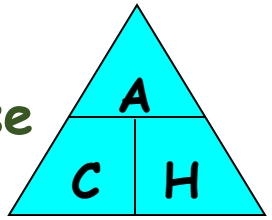
Finding angle ⇨ $\sin^{-1}\left(\frac{o}{h}\right)$



Cosine Ratio

$\cos \delta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

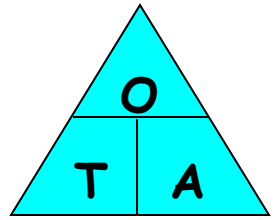
Finding angle ⇨ $\cos^{-1}\left(\frac{a}{h}\right)$



Tangent Ratio

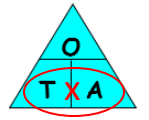
$\tan \delta = \frac{\text{Opposite}}{\text{Adjacent}}$

Finding angle ⇨ $\tan^{-1}\left(\frac{o}{a}\right)$



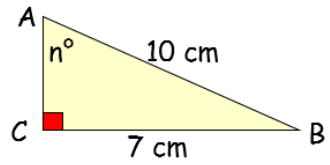
METHOD

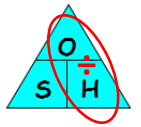
STEP 1: Label the sides you need or know (only 2 out of the 3!)
Remember to label according to the known/wanted angle
STEP 2: Identify the trig ratio needed from the sides involved
STEP 3: Draw out the required calculation triangle
Cross out the item you need to find
STEP 4: Write down the required calculation – times or divide?



CB = tan(56) x 2
= 2.965...
= 2.97cm s(3sf)

In triangle ABC find angle n

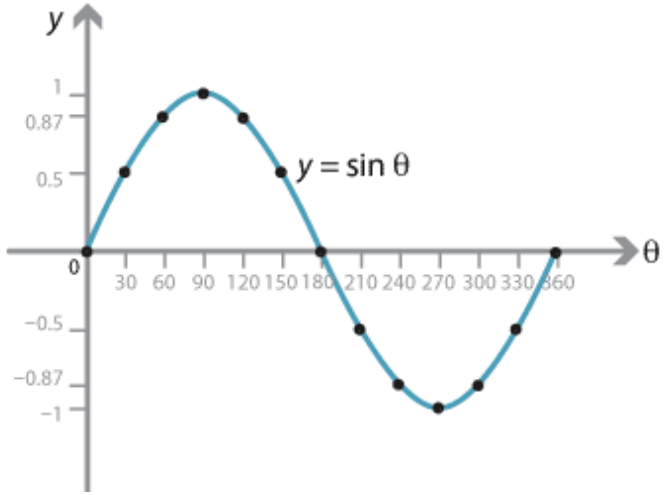




Angle n = $\sin^{-1}\left(\frac{7}{10}\right)$
= 44.427....
= 44° (nr°)

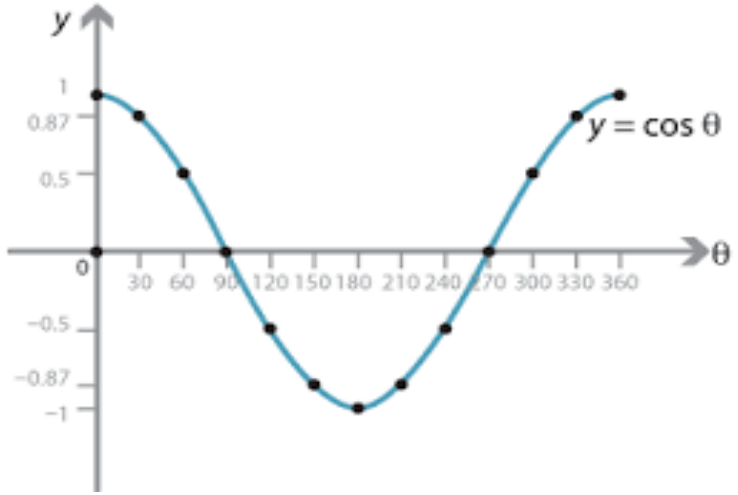
Trigonometric Graphs

Sine Graph



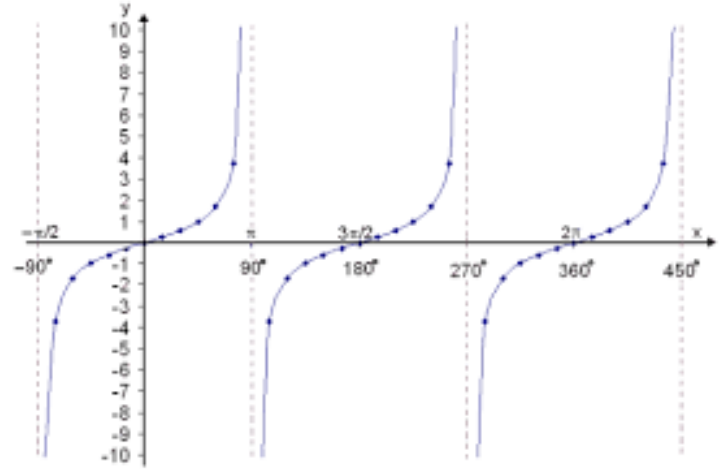
Minimum value -1 Maximum value +1
Lines of symmetry at 90° and 270°
Pattern repeats every 360° so within every 360° there are 2 angles with same sine ratio
e.g. $\sin^{-1}(½) = 30°$ AND $150°$

Cosine Graph



Minimum value -1 Maximum value +1
Lines of symmetry at 180°
Pattern repeats every 360° so within every 360° there are 2 angles with same cos ratio
e.g. $\cos^{-1}(-½) = 120°$ AND $150°$

Tangent Graph



Minimum value -∞ Maximum value +∞
Asymptotes at 90° and 270° - no tan value for these angles.
Pattern repeats every 180° so within every 360° there are 2 angles with same tan ratio
e.g. $\tan^{-1}(1) = 45°$ AND $(45+180=) 225°$

Exact Values:

Some trigonometric values need to be learnt BY HEART

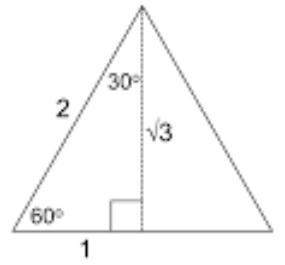
Exact Values of Trigonometric Functions

Angle (θ) Degrees	0°	30°	45°	60°	90°
$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined

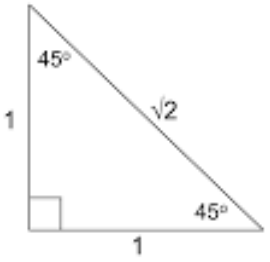
Exact trig values can be calculated using properties and known angles in a "unit" equilateral triangle (60° and 30°) and a right angled isosceles triangle (45°) - Pythagoras is applied to find the 3rd side….

two famous triangles

an equilateral triangle



an isosceles, right-angled triangle



Trigonometry in non-right angled triangles ("wonky trig")

Knowing this basic fact is key as correct use of formula requires knowing which sides and angles are involved

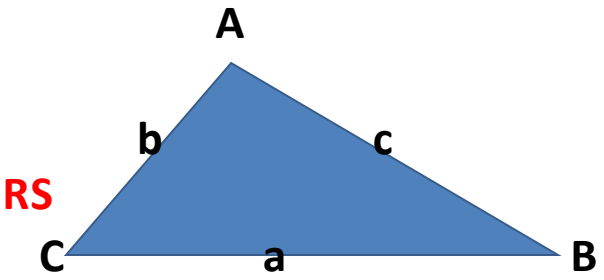
KEY LABELLING Notation

For any triangle ABC:

Angles are labelled with **CAPITAL LETTERS**

Sides are labelled with **LOWERCASE LETTERS**

Side a will be opposite **Angle A** etc.

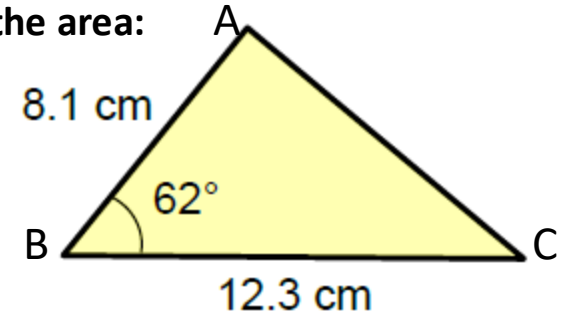


Sine Rule for AREA OF TRIANGLES

$$Area = \frac{1}{2}abSin(C)$$

Requires: 2 sides and INCLUDED angle

Find the area:



Area = ½ x 8.1 x 12.3 x Sin(62)

= 43.984….

= 44.0 cm^2 (3sig fig)

Remember to show answer to 3 or 4 decimal places before rounding. Always state degree of accuracy and **units**

Sine Rule for LENGTHS and ANGLES

Finding sides:

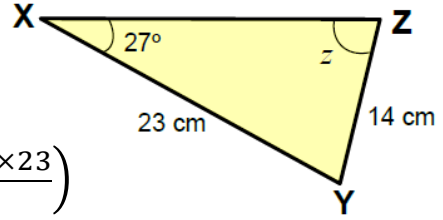
$$\frac{a}{Sin\,(A)} = \frac{b}{Sin\,(B)}\ \left(= \frac{c}{Sin(C)}\right)$$

Finding angles:

$$\frac{Sin\,(A)}{a} = \frac{Sin\,(B)}{b}\ \left(= \frac{Sin\,(C)}{c}\right)$$

Requires: a known SIDE & ANGLE pair the opposite side/Angle of the wanted Angle/side

Find the angle Z



$$\frac{Sin\,(Z)}{23} = \frac{Sin\,(27)}{14}$$

$$Z = sin^{-1}\left(\frac{Sin\,(27)\times 23}{14}\right)$$

= 48.234….

= 48^o (nr degree)

Cosine Rule for LENGTHS and ANGLES

Finding sides:

$$a^2 = b^2 + c^2 - 2bcCos(A)$$

Requires: 2 sides and INCLUDED angle being the angle opposite wanted side.

Finding angles:

$$Cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$$

Requires: all 3 sides

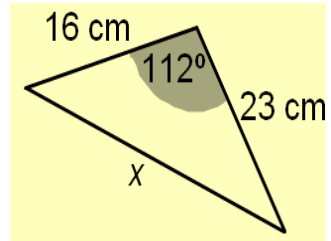
Find the side x

$x^2 = 16^2 + 23^2 - 2 \times 16 \times 23 \times Cos(112)$

$x^2 = 1060.710\ldots$

$x = 32.568\ldots$

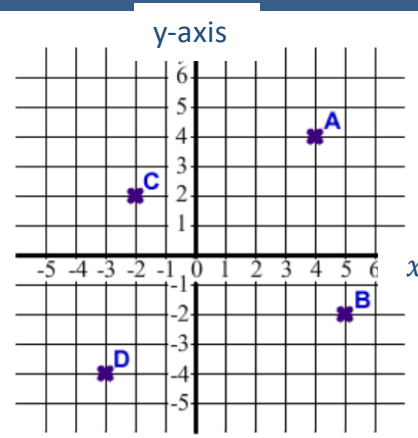
$x = 32.6$ cm (3 sf)



Straight Line Graphs

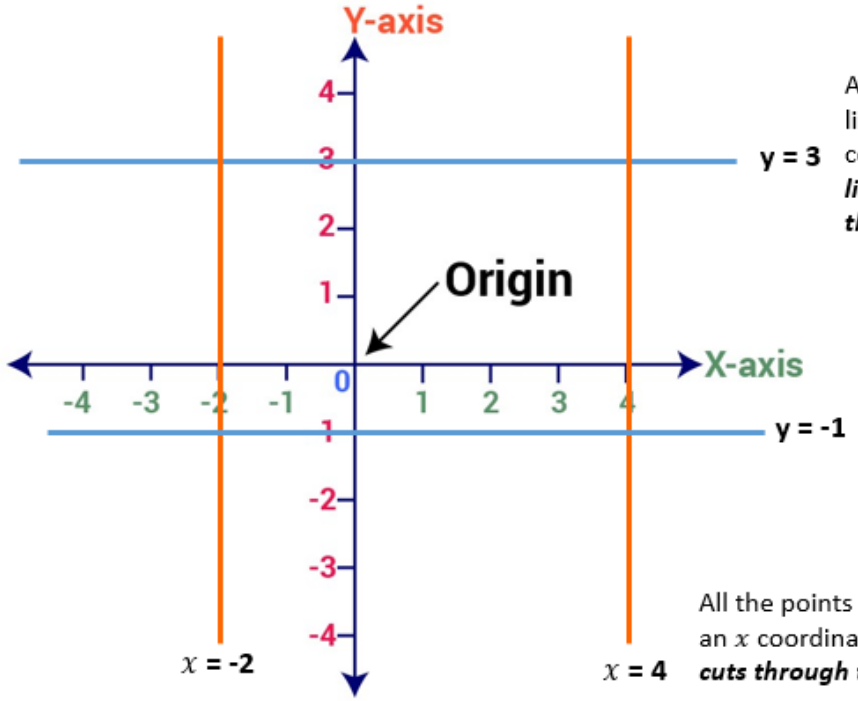
What do I need to be able to do?

- Plot and read Cartesian Co-ordinates
- Identify and plot lines parallel to the axes
- Recognise the line y = x
- Understand what a gradient and y-intercept is
- Recognise a positive and negative gradient
- Give an equation of a line that is parallel to a given line
- Plot lines in the form y=mx + c
- Find the equation of a line



A = (4, 4)
B = (5, -2)
C = (-2, 2)
D = (-3, -4)

Coordinates are used to show a position on a graph. They are written with the notation (x, y). The first coordinate is the horizontal position (x-axis), the second is the vertical position (y-axis).



All the points on this line have a y coordinate of 3. ***The line cuts through the y-axis at 3.***

All the points on this line have an x coordinate of 4. ***The line cuts through the x-axis at 4.***

Plotting a Straight Line Graph

Maths Term 1&2

Every straight line has an equation in the form of:

$$y = mx + c$$

the steepness of the line — The **GRADIENT**

where the line cuts the y axis — The **y-INTERCEPT**

Suppose we want to plot the graph $y = 2x + 1$

We complete a table of values by substituting (replacing) the x values from the table into the equation.

E.g. When $x = 0$

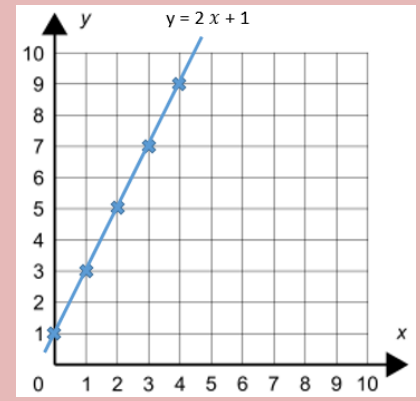
$y = 2 \times 0 + 1 = 1$

So the coordinate in the form (x, y) would be (0, 1)

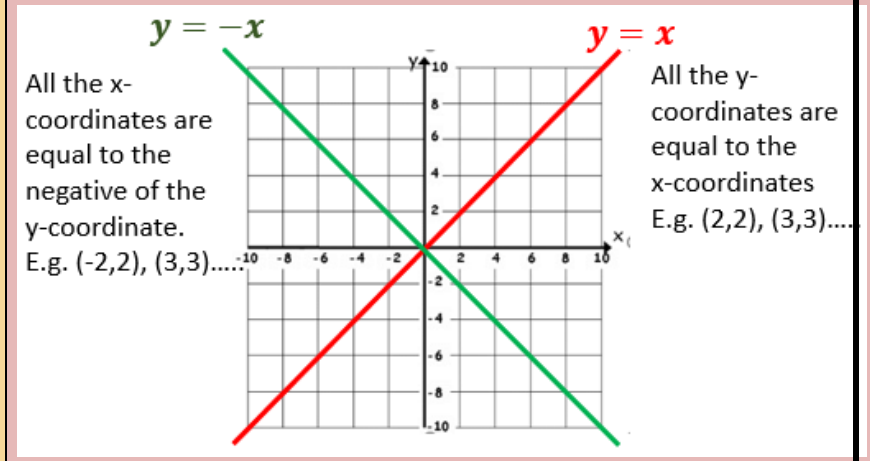
x	0	1	2	3	4	5	6
$y = x + 3$	1	3	5	7	9	11	13
	(0, 1)	(1, 3)	(2, 5)	(3, 7)	(4, 9)	(5, 11)	(6, 13)

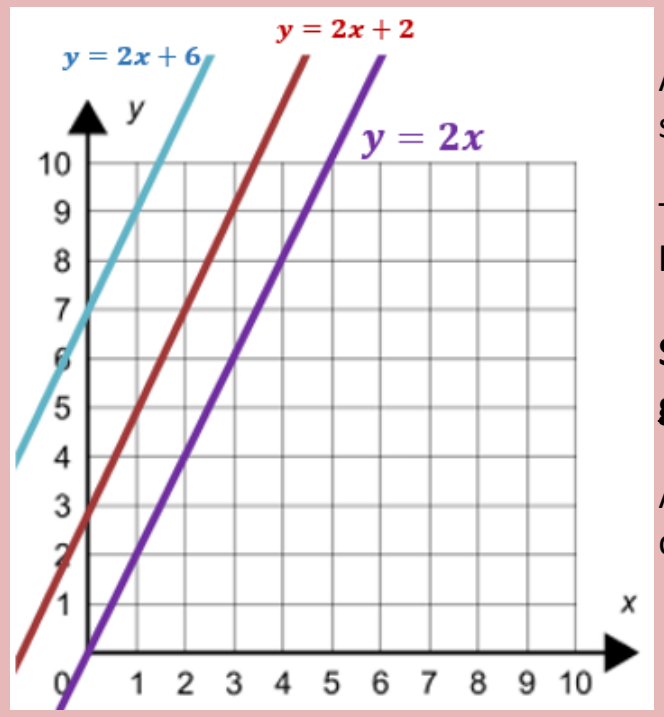
We then plot these coordinates on the graph, join them with a straight line using a ruler and label the line with the equation.

Notice the link between sequences: in this case you are finding the first 6 terms of the sequence 2n + 1



The gradient of the line y=$-x$ is -1. When the gradient is **negative**, the line slopes **down**.
The gradient of y=x is 1. When the gradient is **positive**, the line slopes **up**.
A line that goes straight across horizontally, has a gradient of 0.





All these straight lines have the same gradient of 2.

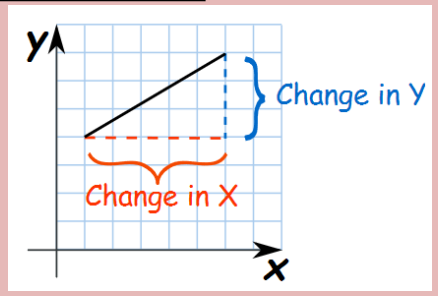
This means that for every unit the line goes across, it goes 2 units up.

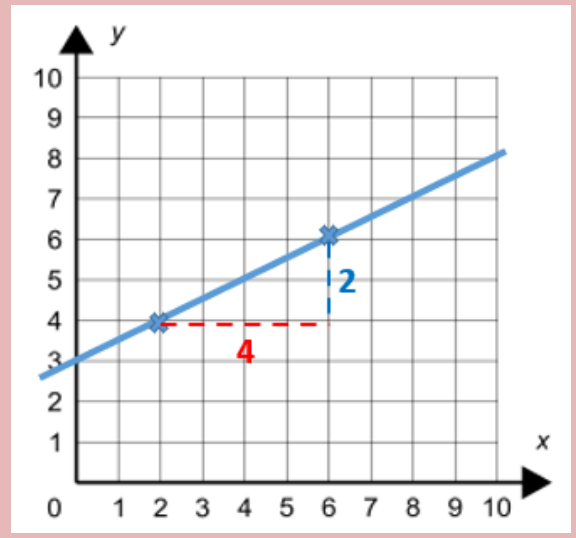
So if two lines have the same gradient, they are parallel.

A line parallel to the line y = -5x + 7 could be y = -5x + 2

Finding the equation of a line from a graph

Gradient = $\frac{\text{Change in Y}}{\text{Change in X}}$





To find the m (the gradient), pick 2 coordinates and draw a triangle. Divide the change in y by the change in x.

Gradient = $\frac{2}{4} = \frac{1}{2}$

This means that for every unit the line goes across, it goes $\frac{1}{2}$ a unit up.

The c, is where the line crosses the y-axis which is 3.

So the equation of this line is **y = $\frac{1}{2}x$ + 3**

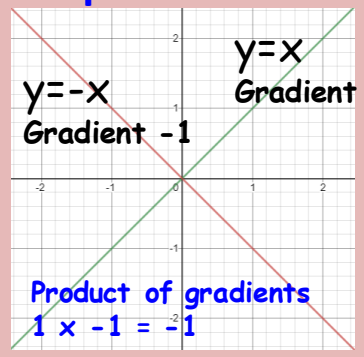
When plotting graphs remember to:
Always label your axes 'x' and 'y'
Make sure your scale is even on your axes
Use a pencil and a ruler
Label your straight line graph

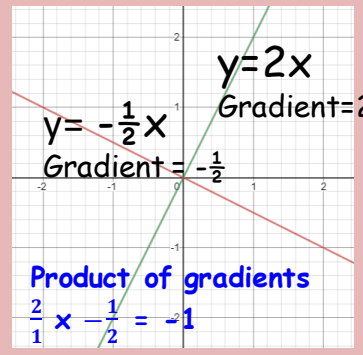
Key words
Axis/Axes (plural)
Origin – The point (0, 0)
Coordinates
Y-intercept
Gradient
Parallel
Plot

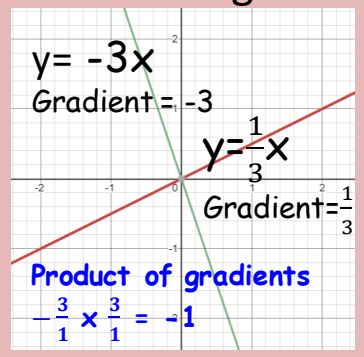
Parallel and Perpendicular Lines

Parallel lines will have the **SAME** gradient

Perpendicular lines have **NEGATIVELY RECIPROCAL** gradients







If 2 lines are perpendicular, the product of their gradients will be -1.

For any gradient ($^{m}/_{1}$), the perpendicular gradient will be ($-^{1}/_{m}$)

This means if you know a gradient, to find the gradient of its perpendicular, you need to (i) change the sign of the gradient and (ii) "flip the fraction"

Finding the equation of a line through a point

Find the equation of a line **parallel** to **y=2x-1** and passing through **(3,4)**

Building from general equation of a straight line y=mx+c

Parallel lines have the same gradient → **y = 2x + c**

From given coordinate (3,4)

substitute known values **x=3**,**y=4**

→ 4 = 2x3 + c

→ Solve: 4=6+c (-6)

→ -2=c

Answer: y = 2x - 2

Find the equation of a line **perpendicular** to **y = 2 - 4x** and passing through **(8,3)**

General equation → y=mx+c

Perpendicular lines have negatively reciprocal gradients

so if m = -4; new gradient $-^{1}/_{m} = +¼$

→ **y = $-\frac{1}{4}$x + c**

… substitute known values **x=8**,**y=3**

→ 3 = ¼ x 8 + c

→ Solve: 3 = 2 + c (-2)

→ 1 = c

Answer: y = $\frac{1}{4}$x + 1

Finding the equation of a line through two points

Find the equation of a line passing through **(3,4) and (10,-10)**

Building from general equation of a straight line y=mx+c

Gradient = rise / run = difference in y / difference in x

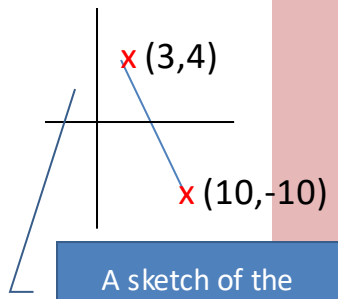
= (4 - -10) / (3 - 10)

= 14 / -7

= -2

Take care of SIGNS Always a subtraction problem… but if you minus a minus the effect is add

Keep the pattern of the coordinates the same in both calculations (3,4) and (10-10)



A sketch of the problem can help you visualise/check the of type gradient expected

Substitute in known coordinate: (3,4)

→ 4 = -2x3+c

Solve → 4 = -6 + c (+6)

→ 10 = c (+6)

Equation passing through points is y = -2x + 10

Find the equation of a line passing through (1.4) and **parallel** to the line between **(3,4) and (5,2)**

Gradient: rise / run = (4 - 2) / (3 - 5) = 2 / -2 = -1

Has same gradient → **y = -2x + c**

From given coordinate (1,4)

substitute known values **x=1**,**y=4**

→ 4 = -2x1 + c

→ Solve: 4 = -2 + c (-6)

→ -2 = c

Answer: y = -2x - 2

Find the equation of a line passing through (6,4) and **perpendicular** to the line between **(-2,-3) and (2,5)**

Gradient: rise / run = (-3 - 5) / (-2 - 2) = -8 / -4 = -2

Has negatively reciprocal gradient

so if m = -2; new gradient $-^{1}/_{m}$ = + ½

→ **y = ½x + c**

… substitute known values **x=6**,**y=4**

→ 4 = ½ x 6 + c

→ Solve: 4 = 3 + c (-3)

→ 1 = c

Answer: y = ½x +1

Representing Inequalities…

Split double inequality into two: x > -4 and x ≤ 4 … the "arrows" from the two join to show the full range

(i) …on a numberline

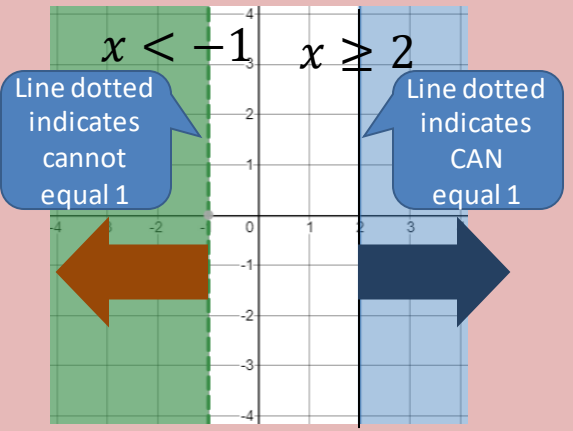
Represent the following equations on a numberline

a) $x < -3$ b) $x \geq 2$ c) $-4 < x \leq 4$

Solid dots indicate the unknown can be EQUAL to that value; an "open" dot shows that the unknown can be greater (or less than) that value but NOT equal to it.

(ii) …on a graph

Inequality graphs are plotted in the same way as equations
What is different is that the area "satisfying" the inequality is shaded … and the line joining points can be solid (greater/less than or equal to…) or dotted (greater than or less than but not equal to….)

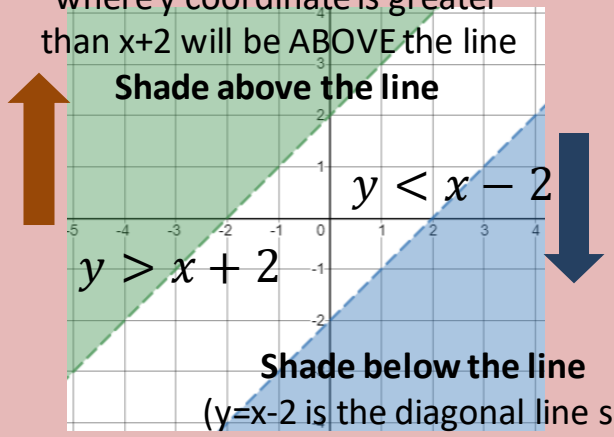


Area shaded where x coordinate is less than -1

Area shaded where x coordinate is greater than -1

(y=x+2 is the diagonal line so) where y coordinate is greater than x+2 will be ABOVE the line

Shade above the line



Shade below the line

(y=x-2 is the diagonal line so) where y coordinate is greater than x+2 will be BELOW the line

Problem Solving with Inequalities

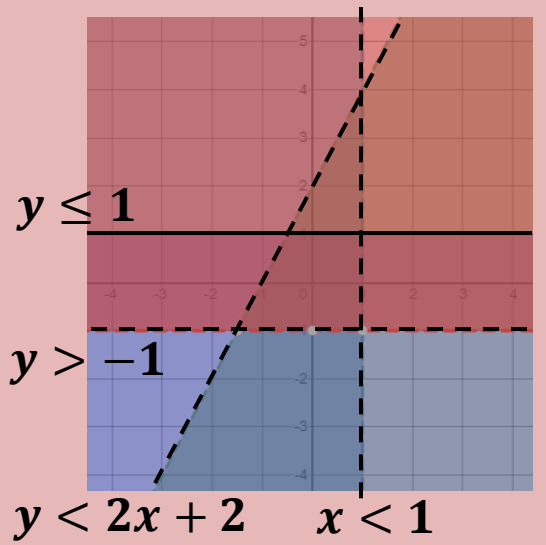
Maths Term 1&2

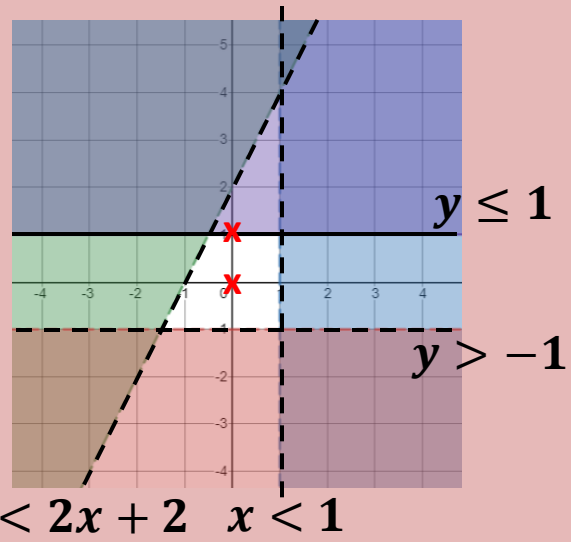
A common exam problem is to identify areas or coordinates which are true for a number of inequalities e.g.

"Find the region that satisfies these inequalities:

$y < 2x + 2$ $x < 1$ $-1 < y \leq 1$

Split double inequality into two: y > -1 and y ≤ 1





BOTH these graphs are representing the same inequalities… but it is much easier on the second to see the area that is true for ALL 4 inequalities… the clear unshaded trapezium in the middle. This is because if you SHADE THE AREAS NOT WANTED it leaves the wanted region clear!

Remember to pay attention to the notation of the lines with inequalities… if the question had been slightly different

"Find the **coordinates** that satisfy these inequalities:.."

It would be important to know whether coordinates lying on one of the lines would be "allowed" in the inequality or not. **(0,0) is a solution** being in the clear region, but all the all the inequalities are less than or more than **EXCEPT $y \leq 1$ …so the only point on a line which satisfies <u>all</u> criteria is (0,1)**

Solving Linear Equations

What do I need to be able to do?

- Identify an equation as linear
- Understand algebraic notation
- Represent an equation as a function
- Identify inverse operations
- Solve single sided linear equations
- Solve double sided linear equations
- Solve equations involving brackets
- Solve equations involving fractions
- Solving inequalities
- Solve linear simultaneous equations

Algebraic notation

Add and subtract? – depends on the sign IN FRONT of a term

Multiply? The × sign is not used in algebra (because it looks like x often used as an unknown number. If letters and numbers are written together remember there is a "hidden" times sign between them.

Divide? Algebra uses FRACTIONS to show divide rather than the ÷ sign

Recognising Linear Equations and Inequalities

Methods to solve equations depend on what type of equation it is … so recognising when an equation is linear is important

LINEAR equations only contain simple x terms

Examples:

2 step Linear	$2x + 5 = 11$
…with brackets	$5(x - 3) = 8$
Double sided Linear	$5x - 1 = 11x + 2$
…with fractions	$\frac{2x+5}{6} = \frac{x}{4} + 2$

If there is a term with x raised to any power the equation is not linear (a x^2 means the equation is QUADRATIC and x^3 means it is CUBIC

Inverse Operations

Every operation has an opposite which will undo its effect…

Add ⇔ Subtract	Multiply ⇔ Divide	Square ⇔ Square root
$+x \leftrightarrow -x$	$\times \leftrightarrow \div$	$x^2 \leftrightarrow \sqrt{x}$

Solving Linear Equations

An equation explains a relationship – it is a number sentence where one element is unknown but the relationships around it are. When you are asked to **"SOLVE" a LINEAR equation**, you are being asked to find the **one value of the unknown** that means the number sentence is correct. To do this we can "unpick" the relationships around the unknown until we are just left with….

$x = (the\ number)$

Always aiming to get to this whatever you start with!

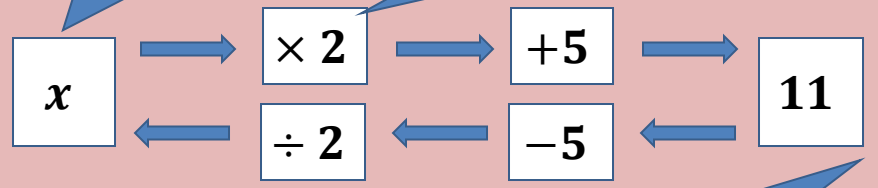
Understanding Linear Equations – Function Machines

If we need to "unpick" equations, to get to our final statement, we will need to understand how an expression is built up around x. A function machine is a good way to start….

Solve: $2x + 5 = 11$

REMEMBER: Algebra follows number rules… so think BIDMAS when working out which order the operations should appear

Always start with x



"Unpick" the problem by applying the inverse operation in the opposite order (working backwards from the previous "answer")

Workings: $x = (11 - 5) \div 2$

Solution $x = 3$

Solving Linear Equations

Maths Term 1&2

Solving Linear Equations – Balance Method

Functions machines are good at understanding equations but cannot deal with all linear equation. The BALANCE METHOD can.
The principle that you want to "unpick" an equation from around x remains… you just need to remember whatever needs to be done to unpick one side of an equation, must be done to the other side also

Solving simple 2 step equations:

Solve: $2x + 5 = 11$ (-5)
$2x = 6$ $(\div 2)$
$x = 3$

Show workings i.e. what you are going to do to get to the next line…

Notice that these are exactly the same operations and order as identified in the function machine!

Check by substituting:
2x3+5 =11 ☑

As equations get more complex the principle remains the same… what do you need to do to unpick to get to "x=… " or in other words …
what looks horrible?… what's needs to be done to get rid of it?!

Solving Double Sided equations:

Solve: $5x - 1 = 11x + 2$
$5x - 1 = 11x + 2$ $(-5x)$
$-1 = 6x + 2$ (-2)
$-3 = 6x$
Just switched $6x = -3$ $(\div 6)$
$x = \frac{-3}{6} = -\frac{1}{2}$

What looks horrible?
"x" on both sides of equation
Fix? Get rid of one of them!
RECOMMENDED: REMOVE THE SMALLER UNKNOWN by adding or subtracting it (because removing the smaller will always leave a POSITIVE x term

Remember: Any division problem can be written as a fraction!

Solving Linear Equations – Brackets

Sometimes brackets can be dealt with using the function machine methods but if in doubt – **get rid of them by expanding!**

Solve: $4(x - 3) = 8$
$4x - 12 = 8$ $(+12)$
$4x = 20$ $(\div 4)$
$x = 5$

Check by substituting:
4(5-3) = 4x2 = 8 ☑

$3(x + 8) = 4 - 2x$
$3x + 24 = 4 - 2x$ $(+2x)$
$5x + 24 = 4$ (-24)
$5x = -20$ $(\div 5)$
$x = -4$

Check by substituting:
3(-4+8) = 3 x 4 = 12
and
4 -2x(-4) = 4+8 = 12 ☑

SMALLER unknown is negative… so ADD to remove!

Solving Linear Equations – Fractions

Sometimes fractions can be dealt with using the function machine methods but if in doubt – **get rid of them by multiplying through by denominator!**

Solve: $\frac{2x+5}{6} = 2$ (x6)
$2x + 5 = 12$ (-5)
$2x = 7$ (÷2)
$x = 3.5$

Solve: $\frac{2}{x} = 5$ (xx)
$2 = 5x$ (÷5)
$x = \frac{2}{5}$

After multiplying by the denominator:
- original numerator STAYS THE SAME
- ALL OTHER TERMS ARE SCALED UP

$\frac{3x-5}{2} + 1 = x + 2$ (x2)
$3x - 5 + 2 = 2x + 4$
$3x - 3 = 2x + 4$ (-2x)
$x - 3 = 4$ (+3)
$x = 7$

Solving Linear Equations

Checklist for Solving Linear Equations

"What don't I like in the equation?" | **How can I get rid of it?"**

FRACTIONS

$$\frac{2x+5}{6} = \frac{3x}{4} + 2$$

Rewrite all terms with a common denominator

$$\frac{2(2x+5)}{12} = \frac{9x}{12} + \frac{24}{12} \quad (\times 12)$$

Multiply all terms by denominator – numerators stay the same

BRACKETS

$$2(2x+5) = 9x + 24$$

Expand and simplify

DOUBLE SIDED

$$4x + 10 = 9x + 24 \quad (-4x)$$

Remove the smaller unknown first

So you will always end up with a positive x-term

$$10 = 5x + 24 \quad (-24)$$

REVERSE BIDMAS

$$-14 = 5x \quad (\text{switch so "x" is on left})$$

Unpick using reverse operations in the reverse order

$$5x = -14 \quad (\times 12)$$

NEED SOLUTION "1x=…."

$$x = -\frac{14}{5}$$

Remember all fractions are division problems - write final answer as a fraction if needed

Solving Linear Inequalities

Maths Term 1&2

Linear **EQUATIONS** have an equal sign: $2x + 5 = 11$

There will be **1 solution** to the equation $x = 3$

Linear **INEQUALITIES** have an inequality sign

There will be a **RANGE of solutions** to the inequality depending on the sign:

e.g $x < 1$ …x can be anything as long as it is **less than** 1

$x \leq 1$ …x can be anything as long as it is **less than or equal to** 1

$x > 1$ …x can be anything as long as it is **greater than** 1

$x \geq 1$ …x can be anything as long as it is **greater than or equal to** 1

INEQUALITIES ARE SOLVED IN THE SAME WAY AS EQUATIONS

But you must remember

1) **Write the INEQUALITY** not an EQUAL sign
2) The inequality will be the **SAME as originally** UNLESS
3) You have **multiplied or divided** by a **negative number…. MUST SWAP it round**

Solve: $2x + 5 < 11 \quad (-5)$

$2x < 6 \quad (\div 2)$

$x < 3$

Solve: $3x + 24 \geq 4 - 2x \quad (+2x)$

$5x + 24 \geq 4 \quad (-24)$

$5x \geq -20 \quad (\div 5)$

$x \geq -4$

Inequality stays the same for all operations…

12 < 30

14 < 32 (+2)

13 < 31 (-1)

52 < 124 (x4)

26 < 62 (÷2)

EXCEPT

12 < 30 (x -2)

-24 > -60

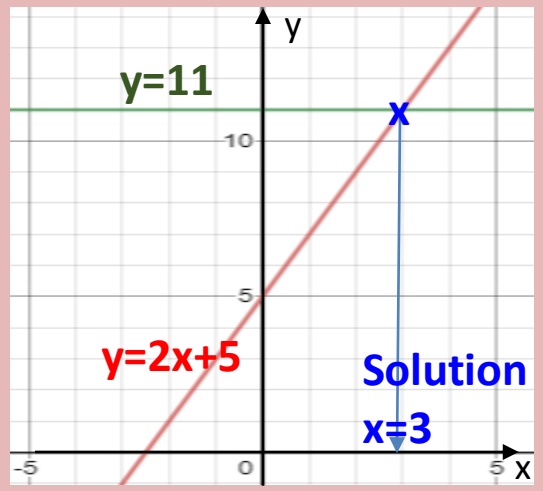
12 < 30 (÷ -2)

-6 > -15

Inequality needs to be reversed

Solving Linear Equations

Solving Linear Equations – using graphs



Graphs can be used to solve equations

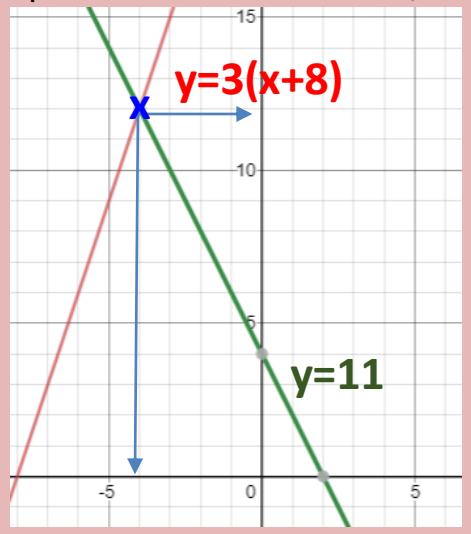
$$\underbrace{2x+5}_{y=2x+5} = \underbrace{11}_{y=11}$$

The intersection of the equation and where the y coordinate is 11 is the solution here

$$x = 3$$

Solving Simultaneous Equations using graphs

Using graphs is one way that **SIMULTANEOUS EQUATIONS** can be solved. "Simultaneous" just means "happening at the same time" and the solution to a simultaneous equation is the coordinate values which are the same for two equations… in other words, **the solution is where the two lines meet**.



Solve these simultaneous equations:

$$y = 3(x+8) \qquad y = 4-2x$$

Graphs cross at (-4, 12) so solution is

$$x = -4$$
$$y = 12$$

Note that this is the same solution for x as solving the linear equation:

$$\underbrace{3(x+8)}_{y=3(x+8)} = \underbrace{4-2x}_{y=4-2x}$$
$$x = -4$$

y-coordinate needed only if a SIMULTANEOUS EQUATION to solve

Solving Linear Simultaneous Equations

Maths Term 1&2

Simultaneous equations can be solved algebraically

Solve these simultaneous equations

$$3x + 2y = 11$$
$$x + y = 3$$

These equations cannot be solved individually as they have TWO unknowns but can be COMBINED and one unknown ELIMINATED … the other unknown can then be found and its value substituted back to find the other.

Simultaneous equations often given in **IMPLICIT** form (where x and y are on the same side) rather than **EXPLICIT** form i.e. y=mx+c. If they are given in different forms, one will need to be changed to match the other.

KEY PRINICIPLES:

1) Add or subtract the two equations to ELMINATE 1 unknown
2) Unknowns will only be eliminated if the have the SAME coefficient
3) If there is not a common coefficient scale one or both equations up so that the number in front of one unknown is the same in both equation.

PROCESS:

A) Get a common coefficient
2nd equation needs multiplying by 2 (or by 3) to get the same number in front of one of the unknowns

$$3x + 2y = 11$$
$$x + y = 3 \quad (\times 2)$$

Same - subtract

$$\Rightarrow 3x + 2y = 11$$
$$\Rightarrow 2x + 2y = 6$$

B) Add or subtract to eliminate unknown
Same Signs SUBTRACT ; Different signs ADD (2y-2y=0)
and solve any subsequent equation for the remaining unknown

$$x = 5$$

C) Substitute value back into ORIGINAL equation
to find an equation to solve for the second unknown

$x = 5$ **then** $5 + y = 3$
(-5) $y = -2$

D) Check solutions by substituting BOTH values into OTHER original equation

Solution: $x = 5,\ y = -2$

CHECK: if $x = 5$ **and** $y = -2$ **then for** $3x + 2y = 11$

$$3 \times 5 + 2 \times (-2) = 15 - 4 = 11 \ \checkmark$$

Maths Term 1&2 – Ratio & Proportion 1

Ratio

Harder Ratio problems – Hegarty clips 335, 336, 337

Ratio – is used to compare two or more amounts.

Jack has £160 and Gill has £240

These amounts can be written as a ratio,

J	:	G	or	G	:	J
160	:	240		240	:	160

Simplifying a Ratio – you can simplify a ratio by eventually dividing the numbers by the HCF

	J	:	G	or	G	:	J
÷10	160	:	240		240	:	160
÷ 80	16	:	24		24	:	16
÷ 8	2	:	3		3	:	2

80 80 80 80 80

Hegarty Clip 329 Corbett Maths Video 269

Sharing an Amount in a Ratio

Hegarty clip 332 Corbett video 270

Jack and Gill had £400 in total which they shared in the ratio 2:3

There are five parts (2+3 = 5)

To split this money evenly 400 ÷ 5 = 80

Jack receives 2 x 80 = £160

Gill receives 3 x 80 = £240

£160 + £240 = £400

Best Buys – using (the unit) ratio

Hegarty clip 763,764,340 Corbett video 270

Which is the best deal;

Five packets of sweets costing £2.45,

Six packets of sweets costing £3.00

or Seven packets of sweets costing £3.57?

Hint – Find the cost of one packet

Packets : Cost		
5	:	2.45
(÷ 5) 1	:	0.49

49p a box

Packets : Cost		
6	:	3.00
(÷ 5) 1	:	0.50

50p a box

Packets : Cost		
7	:	3.57
(÷ 5) 1	:	0.49

51p a box

The five packets option is the better deal at 49p per packet

Writing in the ratio 1 : n or n : 1

You need to divide both sides by the same number in order to get the correct side down to 1.

	J	:	G		G	:	J	
	2	:	3		3	:	2	
÷ 2	1	:	1.5		1	:	2/3	÷ 3

Gill gets £1.50 for every £1 that Jack gets

Jack gets ≈ 67p for every £1 that Gill gets

Hegarty Clip 331

Maths Term 1&2 – Ratio & Proportion 1

PROPORTION

Combining Ratios

Hegarty Clip 329

The ratio of apples:bananas is 3:5, the ratio of bananas:carrots is 3:4. What is the ratio of apples to carrots?

A	:	B	:	C
3	:	5		
		3	:	4
9	:	15	:	20

X 3

X5

Hint: Use common multiples

So A:B:C is 9:15:20 and **A : C = 9 : 20**

Proportion can compare the size of one part to the size of the whole.

Hegarty Clip 330

If a tutor group has 13 boys and 16 girls.

The proportion of boys is 13/29

The proportion of girls will 16/29

Multiplicative Reasoning is a way of comparing two things and applying this to a new situation.

15 mins → 30/15 = 2 → 30 pages

? mins → X 2 → 210 pages

Find a Multiplicative link and use it to find missing quantities.

How many pages can this person read in 1 hour?

The symbol ∝ means "is proportional to"

Direct Proportion

A and B are directly proportional when as one gets larger the other gets proportionally larger.

The ratio between these two quantities is a constant.

As a rule of thumb you could apply two tests:

- If one quantity is zero, the other will be zero
- If one quantity doubles the other will also double ect

If the graph of the two quantities is drawn it will always be a straight line passing through the origin.

Inverse proportion

A is inversely proportional to B when one quantity increases the other will decrease proportionally.

In Maths "inverse" means the opposite of an operation. The inverse operation of multiply is divide, and vice/versa

The inverse of A will be 1/A because x by A = ÷ 1/A

Another way of describing "A is inversely proportional to B" is to say "A is directly proportional to 1/B"

Direct Proportion

Relation between quantities whose ratio is constant

b directly proportional to a

When a = 4, b = 20 (b is 5 times a)

20 ÷ 4 = 5

So b = 5a (for any values a and b)

Hegarty Clip 343

Alternatively

$b \propto a$ "b is directly proportional to a"

$b = ka$ "k is a constant"

$20 = 4k$

$k = 5$

$b = 5a$

Find b when a = 0.5

b = 5a

b = 5 x 0.5

b = 2.5

Find a when b = 150

b = 5a

150 = 5a

150/5 = a

a = 30

Inverse Proportion

Relation between quantities such that as one increases in proportion the other decreases

a and b are inversely proportional

When a = 4, b = 5

4 x 5 = 20

So a = 20/b or b = 20/a

"a is inversely proportional to b"

$a \propto 1/b$

$a = k/b$

$4 = k/5$

$20 = k$

$a = 20/b$

Hegarty Clip 346

Find a when b = 0.1

a = 20/b

a = 20/0.1

a = 200

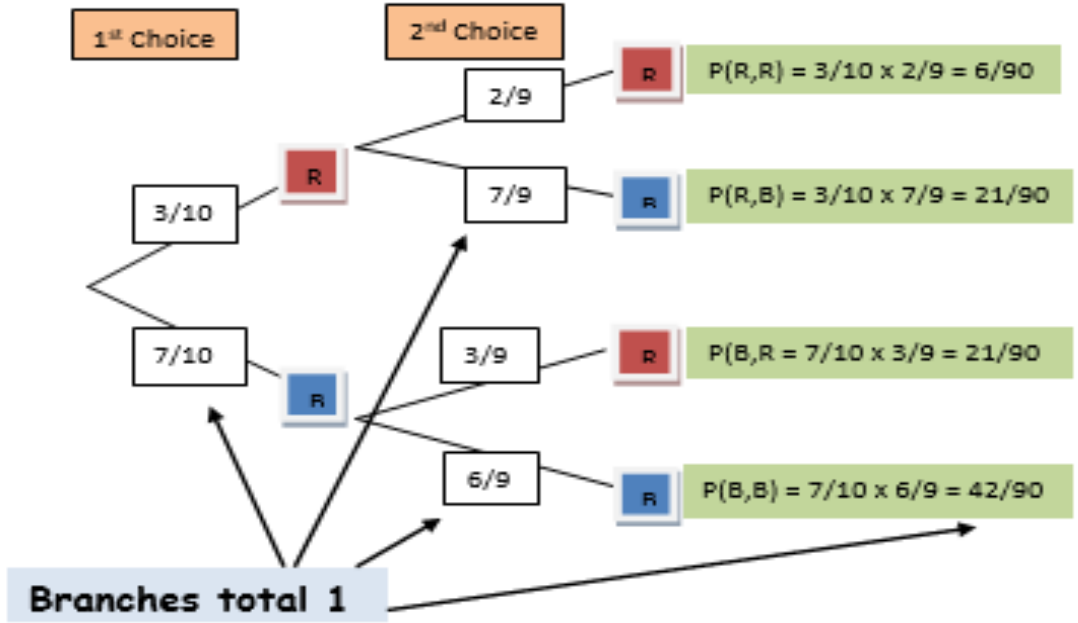
Year 10 Maths
Terms 1&2 – Probability 1

Combining Probabilities:

If you want to find the the probability of more than one thing happening you will need to multiply the probabilities.

Tree Diagrams

There are 3 Red Balls and 7 Blue Balls in a bag. Balls are taken from the bag and not replaced.



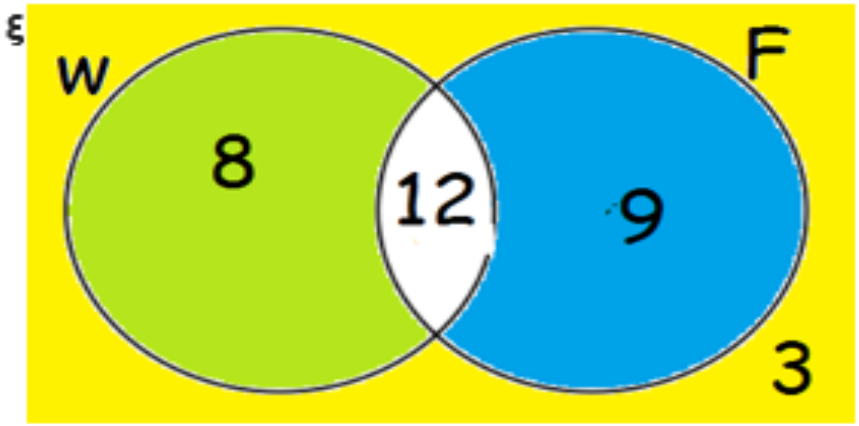
P(Choosing at least one red) = 6/90 + 21/90 + 21/90 = 48/90

Corbett Maths Video 252
Hegarty Clip 363

Venn Diagrams

Corbett Maths Video 380
Hegarty Clip 383

ξ : 32 pupils in a class
W: pupils who walk to school
F : pupils who like football



P(W ∩ F) = 12/32
P(W ∩ F') = 8/32
P(W' ∩ F') = 3/32
P(W ∪ F)' = 3/32

Two way Tables – Holidays

Hegarty Clip 423

	Spain	France	Other	Total
June	5	19	3	29
July	12	17	3	32
August	17	15	7	39
Total	34	51	15	100

What is the probability that a person selected at random

Went to France on holiday?	51/100
Did not visit either Spain or France?	15/100
Went on holiday in July?	32/100
Went to Spain in June?	5/100

Maths Terms 1&2 – Probability 3

More Vocabulary: Sample, Sample size, Probability notation, Expected outcomes, Mutually Exclusive Events, Exhaustive Events, Tree Diagrams

A **Sample** is a selection of items from a population.
Your sample could be a selection of 20 pupils from your year group.
The larger the sample size or the more times you repeated a trial, the closer your probability will be to the true probability.

Probability Notation

P(X) refers to the probability of X occurring
P(Red, two) refers to a red two picked from a pack of cards

A **Sample Space** is way of recording the outcomes of two events.

This sample space records all the possible outcomes of a game of rock, paper scissors

	ROCK	PAPER	SCISSORS
ROCK	RR	RP	RS
PAPER	PR	PP	PS
SCISSORS	SR	SP	SS

Events are **Mutually Exclusive** if they cannot happen at the same time
Getting Heads or Tails on a coin
Turning Left or Right

Events are **Exhaustive** if they cover the entire range of possible outcomes
When you flip a coin the outcomes Heads and Tails are exhaustive because they cover all the possible outcomes
The probabilities of an exhaustive set of outcomes total 1.
Therefore, if the P(success) = 0.9
The P(Failure) = 1 – 0.9 =0.1

Theoretical Probability is a number between 0 and 1 representing the probability of something happening.

$$\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

An **Independent Event** is when the probability of one event does not depend on the outcome of another event.
If I flip a coin the probability of getting a Head is 0.5. The probability will not change for any subsequent flipping of the coin.

Dependent Events. This is when the probability of one event depends on the outcome of another.
If I wake up late the probability of being late for school increases.

To find the **Expected outcomes** multiply the probability by the number of trials.
The probability of a team winning is 0.3. How many games can they expect to win in a season of 24 games?

0.3 X 24 = 8 8 games

Tree Diagrams can show all the possible outcomes of multiple events and can be used to calculate their probabilities.

Venn Diagrams can be used to show the relationship between multiple groups of things and how they overlap.

These diagrams can be used to calculate probabilities

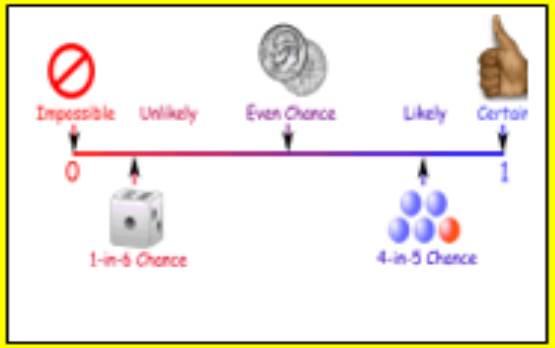
Maths Terms 1&2 – Probability 3

Probability uses numbers to calculate or predict the chance of something happening in the future.

Vocabulary: Probability, Probability Scale, Relative frequency, Theoretical Probability,, Dependent Events, Independent Events, Sample Space, Venn diagrams,

Skills you will need: Addition, Subtraction, Multiplication of Fractions

A **Probability Scale** is used to describe all probabilities, or how likely



If an event is **Certain** its probability is 1
Boxing Day will follow Christmas Day in December

If an event is **Impossible** its probability is 0
You will grow to be 5m tall

An event has a probability **Evens** if the two outcomes are equally likely
Flipping a coin and getting heads

Likely describes the probability of an event which is more than evens chance but not certain.
You roll a die and get a number greater than 2

Unlikely describes the probability of an event which is less than evens chance but not impossible.
I choose a letter from the word RAIN and pick the A

The probability of an event happening is always greater than or equal to 0 (Impossible) but less than or equal to 1 (Certain)

$0 \leq \text{probability} \leq 1$

Relative Frequency (Experimental Probability)

This is the estimated probability based on the results of an experiment.
I surveyed 50 birds landing on my bird table. 18 of them were bullfinches.
The experimental probability of the next bird landing on my bird table being a bullfinch is 18/50 or 36%

The more trials that are performed, the more reliable the results will be.

Addition and Subtraction:

1. Find the LCM of the denominators
2. Convert them to their equivalent fractions where the denominators are the same
3. Once the fractions have the same denominator you can add or subtract the numerators. The denominator stays the same.
4. Simplify if you can

Multiplication:

1. Cancel any of the numerators with any of the denominators by finding common factors.
2. Multiply the numerators together and the denominators together.

$\frac{2}{9} + \frac{1}{5}$

LCM of 9 & 5 is 45

$\frac{10}{45} + \frac{9}{45} = \frac{19}{45}$

$\frac{2}{9} - \frac{1}{5} = \frac{1}{45}$

Check why

$\frac{\cancel{2}^{1}}{3} \times \frac{6}{\cancel{8}_{4}}$

$\frac{\cancel{2}^{1}}{\cancel{3}} \times \frac{\cancel{2}^{1}}{\cancel{8}_{4}} = \frac{2}{4} = \frac{1}{2}$

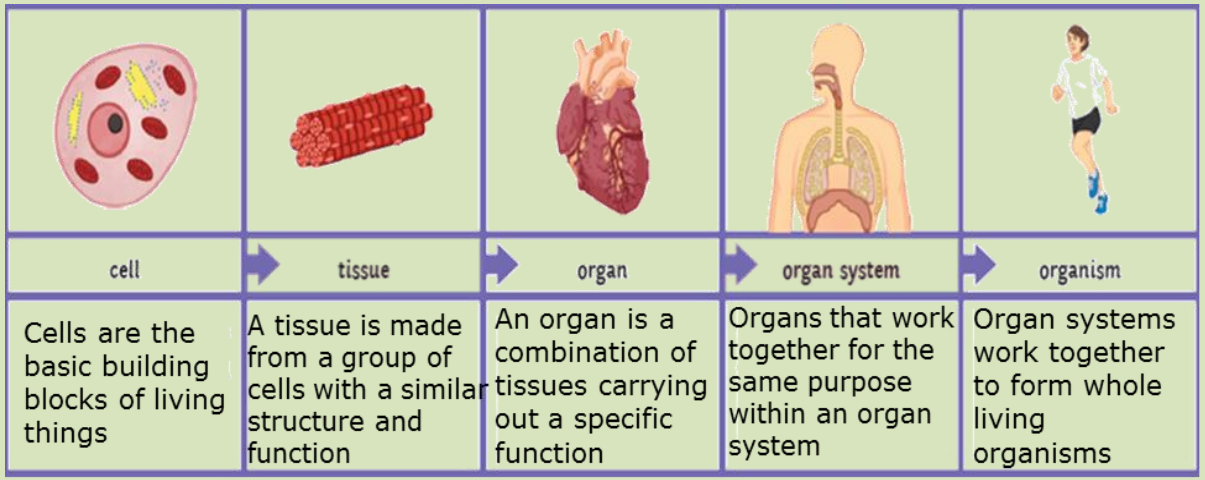
KS4 Biology: B3 Organisation & the digestive system

Please only use when directed by your teacher

Keyword	Definition
Enzyme	Protein with an active site of a specific shape which speeds up reactions
Villi	Finger like projections in the small intestine that increase surface area, helping with absorption
Catalyst	A molecule/chemical that speeds up the rate of reaction
Lock and key mechanism	Only one type of substrate can fit into the active site of an enzyme, like a key fits into a lock.
Active site	The part of the enzyme that helps break down the substrate
Substrate	The specific molecule that binds to an enzyme's active site
Rate of reaction	The speed at which a reactant is converted into a product
Denatured	When the active site of an enzyme changes shape and the substrate can no longer fit in. Can be caused by pH or temperature
pH	How acidic or alkaline a substance is. Enzymes are very sensitive to pH.
Bile	Alkaline substance produced in the liver and stored in the gall bladder. It neutralises stomach acid and breaks down fats into small droplets
Emulsification	Mixing two liquids such as oil and water that would not normally mix

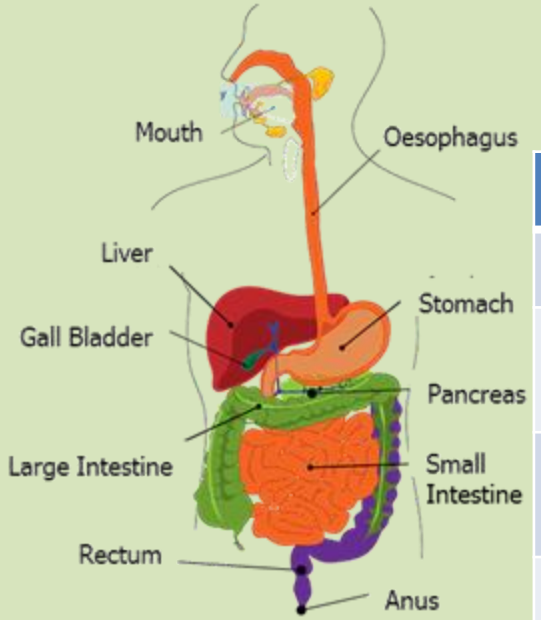
Organisation

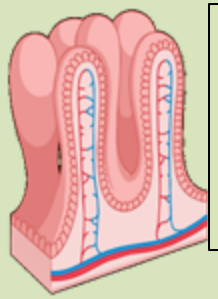
Organisms like you and I are organised from our smallest units (cells)



The digestive system

This system is made up of multiple organs that break down and absorb your food

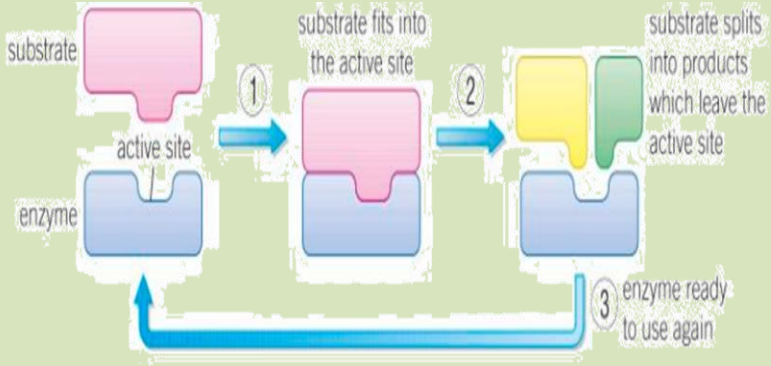




Your small intestine absorbs all of the required nutrients from your food. The villi help it do this by increasing the surface area

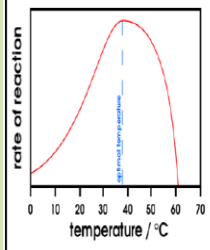
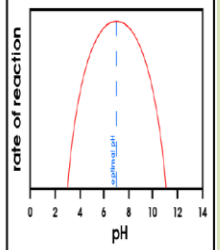
Organ	Function
Liver	Produces bile
Stomach	Breaks down large insoluble molecules into smaller soluble ones
Small intestine	Further breaking down of larger molecules and absorption into the blood
Large intestine	Absorbing water from undigested food

Enzymes are proteins and function in many reactions in the body as a biological catalyst- this means they do not change the reaction but they do <u>speed it up</u>



Most enzymes are specific, meaning that only one type of substrate will only bind to the enzymes active site- like a key fitting a lock

The activity of enzymes is affected by changes in temperature and pH

Enzymes activity has an optimum temperature	*Enzyme activity has an optimum pH*
	

Enzymes have 3 main functions
- To make larger molecules from smaller ones
- Breaking down larger molecules into smaller ones
- Converting molecules- e.g converting one amino acid to another

If the temperature is too high or the pH is not optimum then the active site will be denatured

Further reading

https://www.bbc.co.uk/bitesize/guides/zcttv9q/revision/1

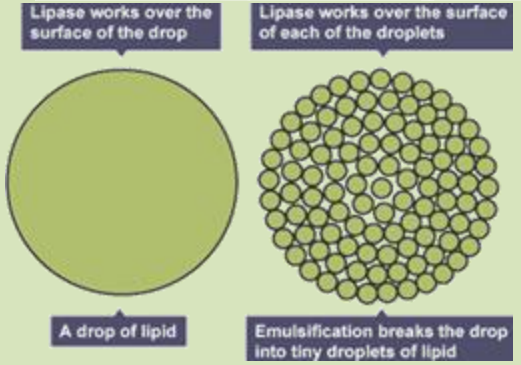
https://www.youtube.com/watch?v=Og5xAdC8EUI&t=3s

Carbohydrates, lipids and proteins make up the cell's structure-and are needed in a balanced diet- we can test food for these using the following tests

Molecule	What is it made from	Chemical test	Positive result looks like
Sugar	Carbohydrates with one or two sugar units	Benedict's reagent and heat	Small amount= green Large amount = yellow/red
Starch	Is a complex carbohydrate made from long chains of simple sugars bonded together	Iodine	Turns blue/black
Protein	Made from long chains of amino acids	Biuret reagent	Turns purple
Lipid/fat	3 fatty acids bonded to a glycerol molecule	Ethanol	Dissolve in ethanol and then turn <u>white/cloudy</u> when water is added

The digestive system uses several enzymes which work on different organs of the system- the three main sites are the mouth, stomach and small intestine

Digestive enzyme	Where is it produced	Site of action	substrate	product
Carbohydrase (e.g amylase)	Salivary glands, pancreas and small intestine wall	Mouth and small intestine	Complex carbohydrates - e.g. starch	Simple sugars - e.g. glucose
Protease (e.g pepsin)	Stomach, pancreas, small intestine wall	stomach	Proteins	Amino acids
Lipase	Pancreas, small intestine wall	Small intestine	Lipids	Glycerol and fatty acids



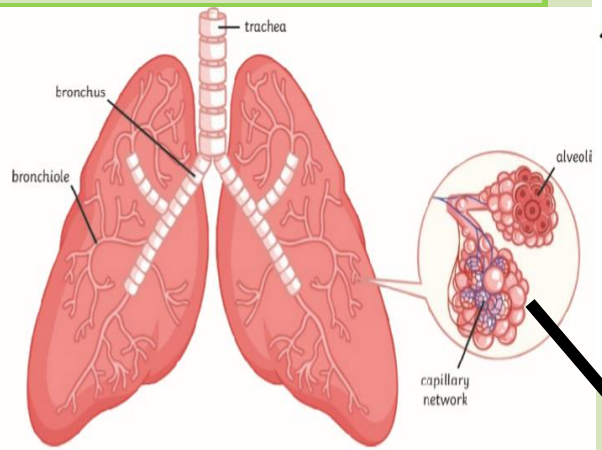
<u>Bile</u> (not an enzyme)

- Produced by the liver this is transported to the small intestine to neutralise stomach acid.
- It also emulsifies fat, increasing its surface area for lipase to work on

Please only use when directed by your teacher

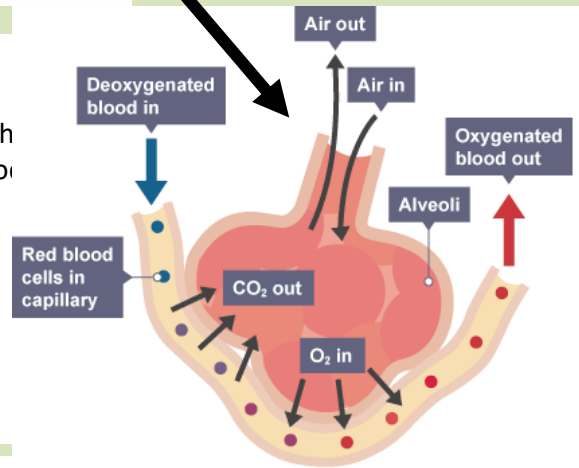
KS4 Biology: B4 Organising animals and plants

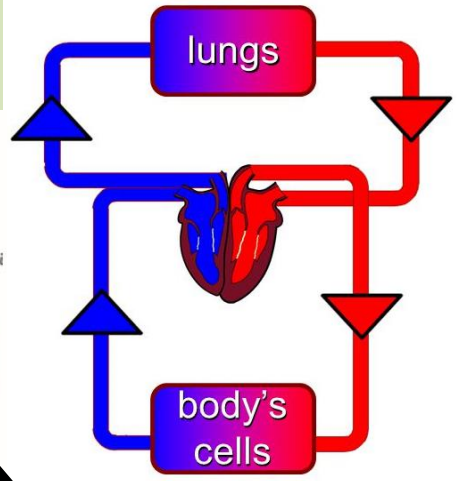
Arteries	Veins	Capillaries
From heart to rest of body	From rest of body to heart	Connects arteries and veins
Carries mostly oxygenated blood	Carries mostly deoxygenated blood	Carries both [de]oxygenated blood
High pressure with thicker walls	Low pressure with thinner walls	Walls only one-cell thick for diffusion
No valves	Has valves	No valves



The lungs are adapted for efficient gas exchange

The alveoli have a large surface area, capillaries around th alveoli lead to a goo blood supply, concentration gradient to allow a short diffusion pathway.





Aorta	The artery leaving the left ventricle.
Artery	Blood vessel that carries blood away from the heart.
Atria	Smaller top chambers of the heart.
Blood vessel	How blood is transported around the body.
Capillary	Blood vessel that connects arteries and veins.
Coronary blood vessel	The heart muscle needs its own blood supply. This comes from branches from the aorta as soon as it leaves the heart called **coronary** arteries.
Pulmonary artery	The blood vessel leaving the right ventricle, carrying blood to the lungs.
Pulmonary vein	Vein leading from the lungs back to the heart (to the left atrium).
Valves	Prevent back flow of blood. Allows blood to only flow the correct way.
Vein	Blood vessel that carries blood towards the heart.
Vena cava	The major vein transporting blood from the whole body back to the heart (to the right atrium)
Ventricle	The larger bottom chambers in the heart.

Red Blood Cells

Disc shaped and biconcave. This increases the surface area so can absorb and more oxygen. Don't have a nucleus so more room for haemoglobin.

White Blood Cells

Part of the immune system to fight communicable disease. They all have large nuclei, and can also change shape so they can **engulf** microorganisms

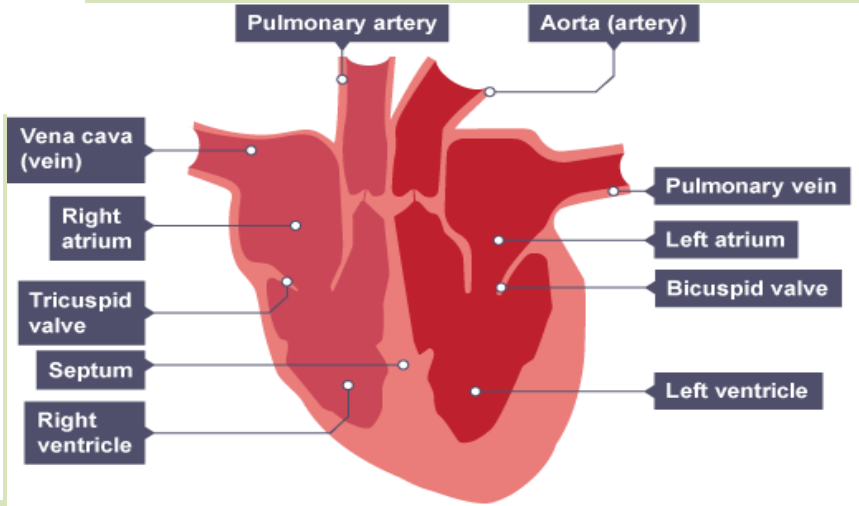
Plasma

This makes up 55% of the blood. It is mostly made of water, but with substances like glucose, proteins, ions and carbon dioxide dissolved in it. The other blood components are suspended in the plasma.

Platelets

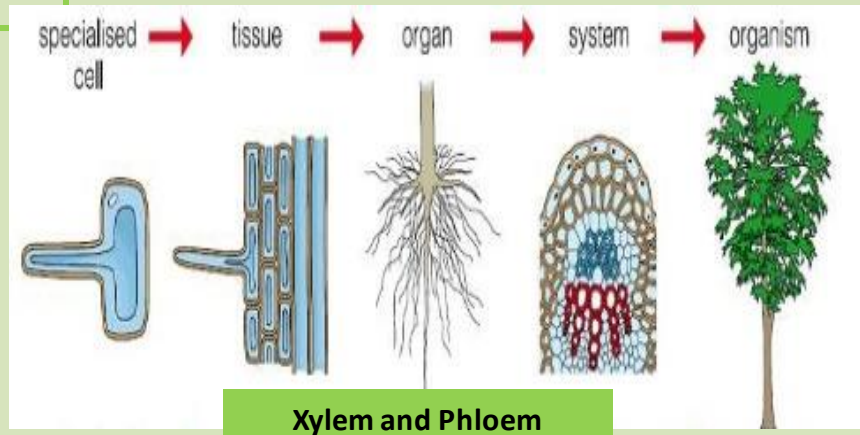
Fragments of cells. They start the process of **clotting** at a wound which blocks the injury until proper healing happens, preventing blood loss.

When the heart 'beats' the muscles contract to pump the blood.
Heart rate is controlled by a group of cells in the right atrium that act as a **pacemaker.** These cells set off the impulses that make the heart muscle contract.
Artificial pacemakers are electrical devices used to correct any irregularities in the heart rate.

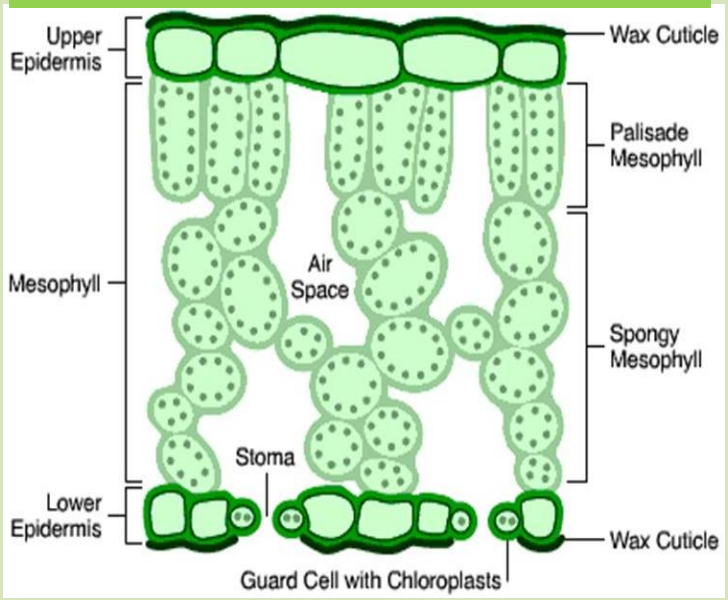


KS4 Biology: B4 Organising animals and plants

Plants, like humans, are made of cells, tissues, organs and organ systems.



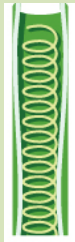
The Leaf



Epidermis	Transparent to allow sunlight to pass through
Palisade layer	Packed with chloroplasts to allow photosynthesis
Mesophyll layer	Air spaces to allow the diffusion of gases
Stoma	Gaps on the underside of the leaf to allow gases in and out of the leaf
Guard cells	Allow stomata to open and close

Water vapour is lost through the stomata on underside of the leaf by evaporation but the stomata need to be open to allow carbon dioxide to diffuse into leaf and oxygen to diffuse out

Xylem and Phloem

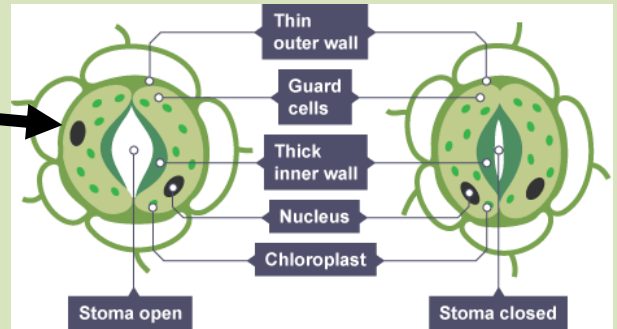


Xylem is made from hollow tubes made from cell walls of dead cells and strengthened by lignin.

Phloem is made of living cells elongated and stacked to form tubes.

Translocation

Phloem transports dissolved sugars from the leaves to other parts of the plant in a process called translocation.
Cell sap, containing the dissolved sugars, is able to flow from one phloem cell to the next through pores at the end of each wall.



https://www.bbc.co.uk/bitesize/guides/zps82hv/revision/1

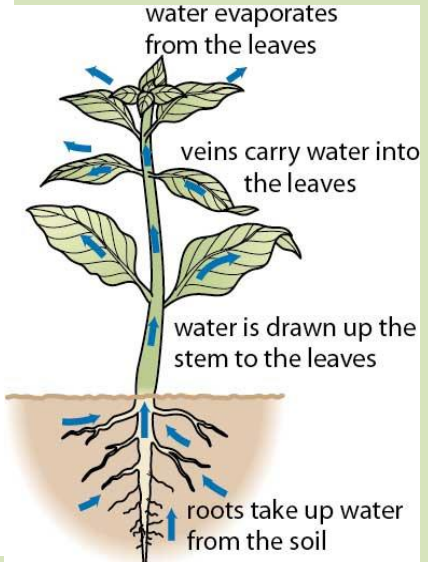
Active transport	Movement of particles against a concentration gradient
Diffusion	Movement of particles from high concentration to low concentration
Organ	A group of different tissues working together to perform a specific function
Organ system	Group of organs working together to carry out specific functions and to form organisms
Phloem	Living tissue which transports dissolved sugars around plant
Tissue	Group of specialised cells with similar structure and function working together
Translocation	Movement of dissolved sugars from leaves to rest of plant through phloem
Transpiration	Movement of water through a plant
Vascular bundle	Strand containing the xylem and phloem
Xylem	Non-living tissue which transports water and minerals from the roots to the leaves and shoots

Transpiration

Plants absorb water through the roots. It is transported against gravity from roots to leaves. Plants are constantly losing water as vapour through the leaves.

Transpiration can be increased by:
- Brighter light
- Increased temperature
- Increased air movement (wind)
- Decreased humidity (steeper concentration gradient)

Rate of transpiration measured using a potometer



KS4 Biology: B5 Communicable diseases

Please only use when directed by your teacher

Key term	Definition
Communicable disease	Disease caused **pathogens** that can be passed from **one organism to another**.
Pathogen	Microorganisms that cause disease may be **viruses, bacteria, fungi or protists.**
Bacteria	Prokaryotes that reproduce rapidly inside the body and may produce poisons (**toxins**) that damage tissues and make us feel ill, treated with **antibiotics.**
Virus	Live and reproduce **inside cells,** causing cell damage.
Protist	Eg malaria
Vaccine	Dead or inactive pathogenic material used in vaccination to develop immunity to a disease in a healthy person.
White blood cells	**Macrophages ingest** pathogens **(phagocytosis), lymphocytes** produce **antibodies**, other white blood cells produce **antitoxins.**
Antibody	Special proteins that target particular bacteria or viruses and destroy them. You need a **unique antibody for each type of pathogen.** When your white blood cells have produced antibodies once against a pathogen, they can be made **very quickly** if that pathogen enters your body again.
Antitoxin	Made by white blood cells, these counteract (cancel out) toxins made by pathogens.
Antigen	Proteins on the surface of cells that act like markers – your immune system can detect antigens that are not your own.
Cilia	Tiny hair-like projections on cells lining the trachea which beat out dirt/pathogens to the throat to be swallowed.

How pathogens are spread:

- By **air (including droplet infection).** When you are ill, your you expel tiny droplets full of pathogens when you cough, sneeze or talk.
- By **direct contact:**
  - Eg when one plant touches another hence you have to **remove and burn/destroy** infected plants.
  - Eg in humans; sex, cuts, scratches, and needle punctures (drug users).
  - Animals can act as vectors transferring pathogens.
- By **water:**
  - Eg fungal spores carried by water to plants.
  - Eg Humans eating raw, undercooked or contaminated food or drinking water containing sewage. Pathogens enter via the digestive system.

Preventing infection:

- **Wash hands** for 60s in warm water with soap.
- Use **disinfectants** on kitchen work surfaces, toilets etc.
- Keep raw meat away from food that is eaten uncooked.
- Cough/sneeze into a tissue – bin it – wash hands.
- **Vaccines (see B6 topic).**
- Maintain hygiene of agricultural equipment.
- **Isolate** someone who has the disease.
- **Destroy or control the vector** eg use mosquito spray/nets.

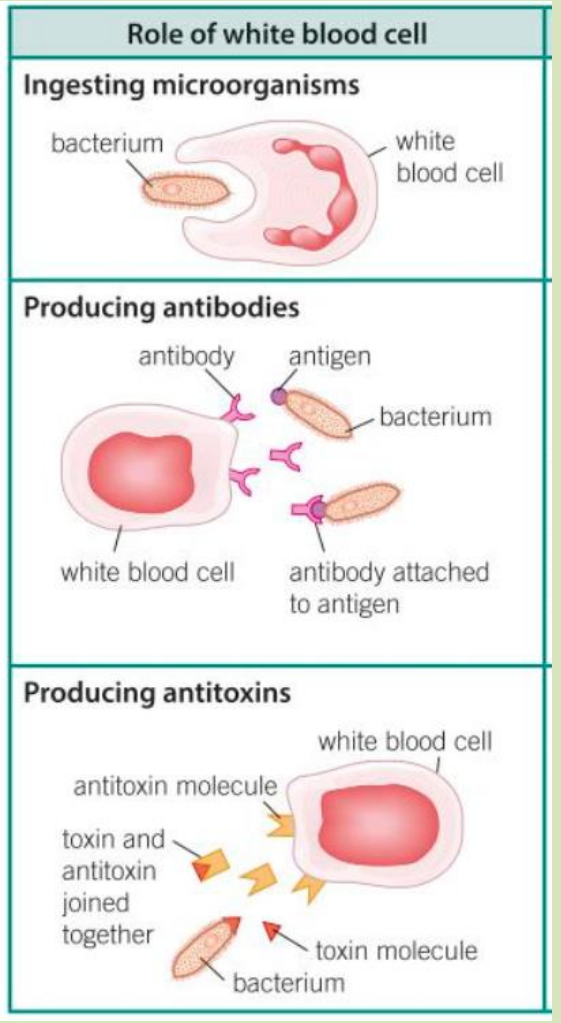
Human defence responses (stop the pathogens getting in!):

- Skin acts as a barrier and produces antimicrobial secretions and is covered in microorganisms that are not pathogenic.
- Respiratory system defences:
  - **Nose** full of **hairs** and produces **mucus** which trap pathogens to be blown out.
  - **Trachea and bronchi** secrete **mucus** and have **cilia** which **trap dirt** and **beat it** up to the throat to be **swallowed.**
  - **Stomach** produces **acid** which destroys the microorganisms in the **mucus** and in any **food/drink**.

KS4 Biology: B5 Communicable diseases

Disease	Type of pathogen	How is it passed on?	Symptoms	Treatment	Prevention
Measles	Virus	Inhalation of droplets, coughs/sneezes	Red rash – can cause blindness, brain damage, death	None	Vaccination
HIV/AIDS	Virus	Sex, share needles.	Mild flu at start, then none, then damages immune system so much that you die from infection or cancer.	Antiretroviral drugs to control the disease	Condoms
Tobacco mosaic virus	Virus	Contact between plants, a vector – insects.	Mosaic pattern on leaves - less photosynthesis – less yield from crop.	None	Grow disease resistant crops.
Salmonella food poisoning	Bacteria	Undercooked food eg chicken/eggs.	Vomiting, diarrhoea	Doesn't last for long so they don't use antibiotics.	Cook food properly.
Gonorrhoea	Bacteria	Sex	Yellow/green discharge from penis or vagina but may be symptomless – can lead to infertility.	Antibiotics	Condoms
Rose black spot	Fungal	Spores in the air, rain droplets splashing between leaves.	Black spots, yellow leaves – less photosynthesis, doesn't flower well.	Cut off infected parts, burn them.	Disease resistant crops, wash gardening tools.
Malaria	Protist	Mosquito bites	Damaged liver and red blood cell leading to weakness and death.	If diagnosed quickly drugs can be used.	Nets, anti malarial drugs, insect repellent.
Plant Galls	Bacteria	Transfer of plasmid into the plant.	Growths of genetically modified cells.	None stated.	None stated.

The immune system – internal defences



https://www.youtube.com/watch?reload=9&v=wUm71FPuVCQ&safe=active

https://www.youtube.com/watch?v=QYWNXp36O48&safe=active

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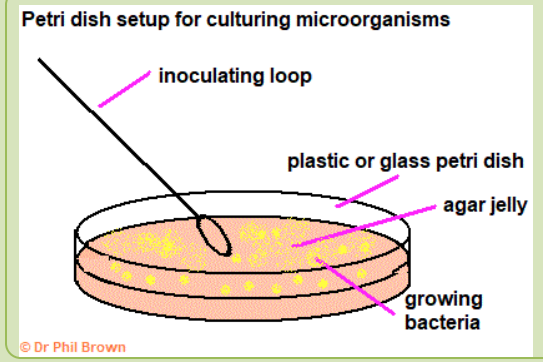
Culturing microorganisms

Bacteria multiply by simple cell division **(binary fission)** as often as every **20min** if they have the correct **nutrients and temperature.**
Bacteria can be grown in **nutrient broth solution** or as **colonies** on an **agar gel plate.**
WHY? Uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics.



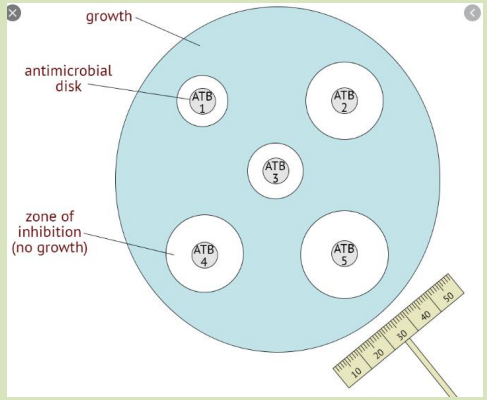
ASEPTIC TECHNIQUE

- **Sterilise Petri dishes and culture media** to prevent contamination.
- **Pass inoculating loops through a flame** to sterilise.
- **Secure lid of the Petri dish with tape** (to prevent transfer of pathogens) and store upside down to prevent condensation build up.
- In **school laboratories**, cultures should be **incubated at 25°C** to prevent growth of human pathogens which survive best at body temperature.

REQUIRED PRACTICAL: Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.
IV: this could one of a variety eg type of disinfectant, concentration of antibiotic, type of antibiotic. I have chosen one for this example.
Eg IV: type of disinfectant
DV: zone of inhibition (area of bacteria killed around the disc of disinfectant) – **measure the radius (or half the diameter).**
CV: concentration of disinfectant, size of disc.

Method:

1. Set up a culture plate using aseptic technique (mention the steps in the box above).
2. Place a drop of bacteria on the growth media and spread it with a sterile lawn spreader.
3. Add discs of filter paper soaked in the different disinfectants.
4. Leave for 24h.
5. Measure the diameter of the circles of clear area around the discs.
6. Divide the diameter by 2 to find the radius.
7. Calculate the area of the clear circles using πr^2.
8. The larger the area the more effective the disinfectant.



[HT only]
Plant diseases can be detected by:

- Stunted growth
- Spots on leaves
- Areas of decay (rot)
- Growths
- Malformed stems of leaves
- Discolouration
- The presence of pests

Identification can be made by:

- Reference to a **gardening manual or website**
- Taking infected plants to a **laboratory** to identify the pathogen
- Using testing kits that contain **monoclonal antibodies** (see B6 topic)

You just need to know the plant diseases listed on the previous table + **aphids are insects that insert a feeding tube into the phloem of plants to feed on the glucose produced by photosynthesis.**

Plants can be damaged by a range of **ion deficiency conditions**:
Stunted growth caused by **nitrate deficiency** (nitrate needed to make protein)
Chlorosis (yellow leaves) caused by **magnesium deficiency** (magnesium needed to make chlorophyll to allow photosynthesis).

Physical defence responses to resist invasion of microorganisms:
Cellulose cell walls
Tough waxy cuticle on leaves
Layers of dead cells around stems (bark) which falls off.
Chemical plant defence responses:
Antibacterial chemicals
Poisons to deter herbivores
Mechanical adaptations:
Thorns, hairs to deter animals. Leaves which droop/curl when touched.
Mimicry to trick animals.

https://www.youtube.com/watch?v=BkbLI2mAMP8&safe=active

KS4 Chemistry:
C3 Structure and Bonding

States of matter

The three states of matter are represented by simple models, where particles are shown as solid spheres and no forces are shown between these particles (limitations of this model). The amount of energy required to change state depends on the strength of the force between the particles of the substance.

State	Solid	Liquid	Gas
Closeness of particles	Very close	Close	Far apart
Arrangement of particles	Regular pattern	Randomly arranged	Randomly arranged
Movement of particles	Vibrate around a fixed position	Move around each other	Move quickly in all directions
Energy of particles	Low energy	Greater energy	Highest energy
2D diagram			

Ions

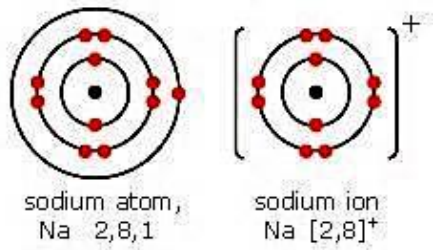
All atoms are more stable with a full outer shell of electrons. Some atoms will lose electrons to get a full outer shell: these are metals. Some atoms will gain electrons to get a full outer shell: these **are non metals**.

An ion is an atom with a positive or negative charge, these are formed by an atom gaining or losing electrons.

For example, sodium has one electron in it's outer shell, it therefore loses one electron to form a Na^{+1} ion.

We represent ions with square brackets around the ion and the charge in the top right corner.

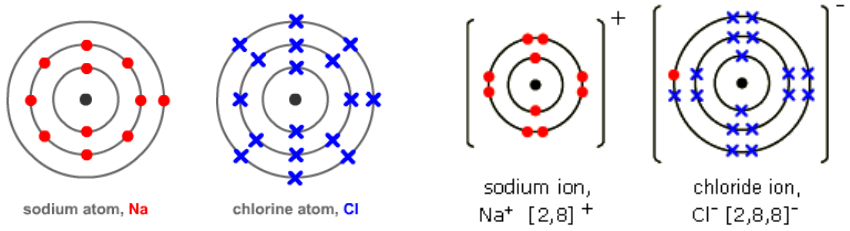
The group number indicates how loose or gain to form an ion. e.g. electrons, forming $^{2+}$ ions



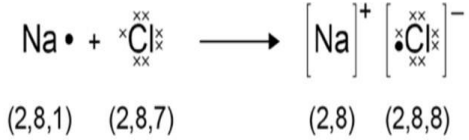
Keyword	Definition
Alloy	a mixture of two or more elements, at least one of which is a metal
covalent bond	the bond between two atoms that share one or more pairs of electrons
covalent bonding	the attraction between two atoms that share one or more pairs of electrons
delocalised electron	bonding electron that is no longer associated with any one particular atom
dot and cross diagram	a drawing to show only the arrangement of outer shell electrons of the atoms or ions in a substance
fullerene	form of the element carbon that can exist as large cage-like structures, based on hexagonal rings of carbon atoms
giant covalent structure	a huge 3D network of covalently bonded atoms, such as the bonding in silicone dioxide
giant lattice	a huge 3D network of atoms or ions
intermolecular forces	the relatively weak attraction between the individual molecules in a covalently bonded substance
ionic bond	the electrostatic force of attraction between positively and negatively charged ions
metallic bonding	The bonding that occurs in metals, due to the electrostatic force between positive metal ions and negative electrons
nanoscience	the study of very tiny particles or structures between 1 and 100 nanometres in size, where 1 nanometre = 10^{-9} metres
polymer	a substance made from very large molecules made up of many repeating units

Ionic Bonding

When a metal atom reacts with a non-metal atom electrons in the outer shell of the **metal atom are transferred to the non metal atom**. This means the metal has a positive charge and the non metal has a negative charge. This means there is an **electrostatic attraction** between the two ions, this is what forms an ionic bond. Both atoms will have **a full outer shell** (this is the same as the structure of a noble gas) see example below of sodium chloride.



Ion formation: When a metal atom reacts with a non-metal atom electrons in the outer shell of the metal atom are transferred. Metal atoms lose electrons to become positively charged ions. Non-metal atoms gain electrons to become negatively charged ions.



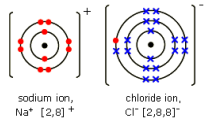
Formula of Ionic Compounds

In sodium chloride, 1 sodium atom gives an electron to a chlorine atom, therefore the empirical formula is NaCl. However there are some examples where the ratio of atoms is not 1:1. For example when sodium bonds with oxygen, sodium only wants to lose one electron but oxygen needs to gain two. So you need two sodium atoms for every oxygen so the **empirical formula is Na_2O.**

Ionic Bonding- Models

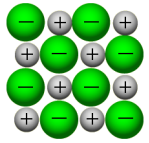
There are a number of ways we can represent ionic bonding all; of these have **advantages and limitations.** For example all the diagrams below show ways we can represent **sodium chloride**

1. Dot and cross diagrams- These show clearly how the electrons are transferred. It does not, however, show the 3D lattice structure of an ionic compound or that this is a giant compound.



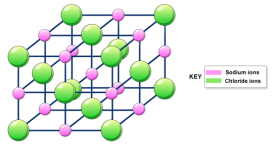
2. 2D ball and stick model of ionic bonding

This has the advantage of showing that electrostatic forces happen between oppositely charged ions in an ionic compound. However, does not show the 3D structure of an ionic compound.



3. 3D Ball and Stick model of ionic bonding

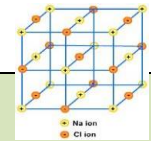
This clearly shows the 3D structure of the **ionic lattice** and how different ions interact with other ions **in all directions** to create an ionic lattice.



Properties of Ionic compounds

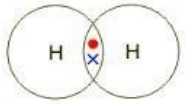
Ionic compounds have **high melting points, due to strong electrostatic forces between the oppositely charged ions.** This means a lot of energy is required to break these bonds. For example the melting point of sodium chloride is 801 °C. Ionic compounds **do not conduct electricity** as a solid. They **do conduct electricity** if they are dissolved in water (aqueous) or in the liquid state. This is because the ions are free to move, carrying the electric charge.

Ionic Lattice ionic compounds have **regular structures (giant ionic lattices)** in which there are strong **electrostatic forces** of attraction in all directions between oppositely charged ions.



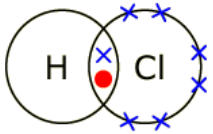
Covalent Bonding

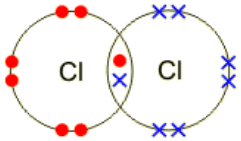
Covalent bonding occurs between non metals. Electrons are shared between the atoms, so that they have a full outer shell. Covalent bonds are strong and require a lot of energy to break. The simplest example is hydrogen: both hydrogen atoms have one electron in their outer shell. Therefore both hydrogen atoms share one electron each, to give them both a full outer shell, we can show this bond on a dot and cross diagram.

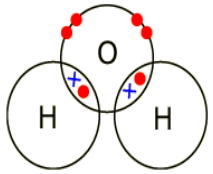


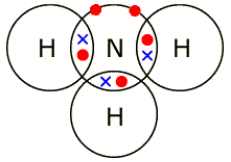
When drawing covalent molecules we use "dot cross diagrams" as we do with ionic compounds. It is important to represent the electrons on one atom with a dot and on the other atom with an X.

The first five examples, **hydrogen, chlorine, water, hydrogen chloride and ammonia (NH_3)** all share one electron per atom in a to make a full outer shell of electrons on each atom.



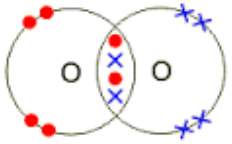


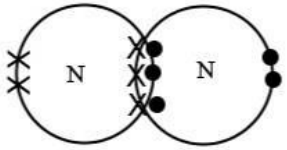




Some atoms need more than one electron to give them a full outer shell, for example oxygen needs 2 electrons to complete its outer shell. Oxygen therefore shares two electrons per atom to make a double bond. Nitrogen needs three electrons to complete its outer shell, this forms a triple bond between the two nitrogen atoms, to make a nitrogen molecule.

Covalent bonds are strong because there is a attraction between the electrons in the covalent bond and the positively charged nucleus. This means a lot of energy is required to break a covalent bond.



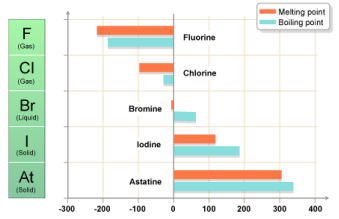


Properties of Simple Covalent Compounds

Simple covalent compounds have low melting points and are often gases at room temperature, for **example oxygen and carbon dioxide.** Although the covalent bonds between the atoms are strong, the **intermolecular forces between the molecules are weak. It is very important to remember that covalent bonds are strong but the intermolecular forces are weak .** This means that only a small amount of energy is required to overcome these weak forces.

The size of the intermolecular force between molecules increases as the molecules get larger. This is because a force called the van der Waals force increases (you do not need to know that for GCSE).

For example as you go down group 7, the boiling points increase because **the molecules get larger**.



As well as having low melting **not conduct electricity. T**his is electrons or ions and therefore there is nothing to carry the electric charge**.** Remember pure water does not conduct electricity, only when it has ions dissolved in it will it conduct.

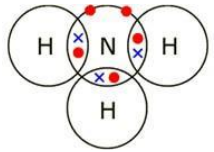
Additional information

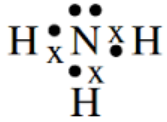
https://www.bbc.co.uk/bitesize/topics/zq6h2nb
https://www.youtube.com/watch?v=YpEQ-NWxKBc
https://www.youtube.com/watch?v=o_jDaUe9p5o
https://www.youtube.com/watch?v=9bbCFUyIuWg

Representing Covalent Compounds

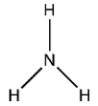
Like ionic compounds, there are variety of ways that scientists use to represent covalent compounds.

1. Dot cross diagram





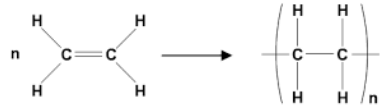
2. Ball and stick model



Polymers

Polymers are large covalent compounds which can be many thousands of atoms in length. They are made from small molecules known as **monomers.**

Rather than drawing out all the atoms in a polymer we draw a **repeating unit** which is the structure of the monomer in square brackets, with a n representing a very large number of atoms. Polymers have higher melting points than smaller covalent compounds like carbon dioxide as the intermolecular bonds are stronger. However the bonds are not as strong as they are in ionic or giant covalent compounds so the melting points are lower than those compounds.



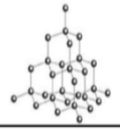
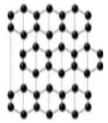
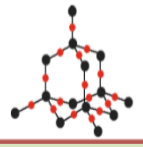
n = a big number of monomers

Giant Covalent Compounds

In a giant covalent structure all atoms are bonded to each other by strong covalent bonds.

Giant covalent compounds have a **high melting point** because many strong covalent bonds need to be broken and this requires a lot of energy.

There are three examples you need to know, diamond, graphite and silicone dioxide - often called silica (see table)

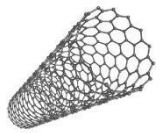
Substance	Diagram	Description	Properties
Diamond		Each carbon is covalently bonded to four other carbons	Very hard, very high melting point, due to strong covalent bonds. Does not conduct electricity – no free electrons/ions.
Graphite		Each carbon is covalently bonded to 3 other carbons, there are weak (non covalent) bonds between the layers.	High melting point, conductor of electricity due to **delocalised electrons which can carry a charge.** Slippery as layers can slide over each other
Silica		Every silicon atom is bonded to 2 oxygen atoms and vice versa	High melting point

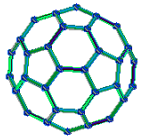
Graphene and Fullerenes

There are other forms of carbon which have been discovered recently: **graphene is a single layer of graphite** so it is 1 atom thick.

Fullerenes are molecules of carbon with hollow shapes. The most famous example is Buckminsterfullerene (C60).

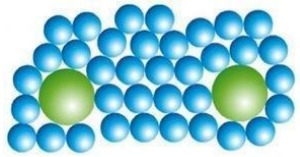
Fullerenes have use in drug delivery and as catalysts. Carbon nanotubes are cylinder shaped fullerenes, these are strong and are excellent conductors of both **heat and electricity.**





Alloys

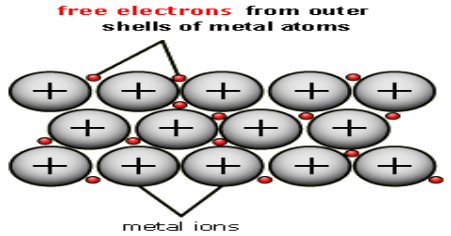
Alloys are mixtures of **2 or more elements, one of which is a metal.** Examples of alloys include brass and steel. Metals are alloyed so that the regular structure of metals is changed and the layers of ions can no longer slide over one another; therefore making it much stronger.



Metallic Bonding

Metals form giant structures. The metal atoms form a regular pattern and the donate their outer electron to the **"sea of delocalised electrons".** These electrons are free to move. The 2D structure of metallic bonding looks like this:

This would be the structure of a group 1 metal like sodium, if it were a group 2 metal like magnesium then the charge on the ions would be Mg^{2+}.



Nanoparticles

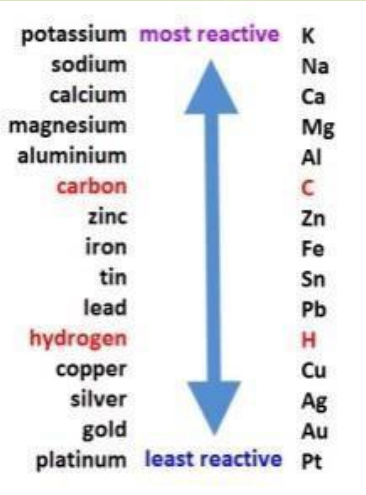
Nanoparticles have a diameter **between 1 nm and 100 nm**, this means they are only a few hundred atoms in size. Nanoparticles have an **extremely large surface area to volume ratio**, this gives them a variety of useful properties.

- The targeted delivery of drugs- they are more easily absorbed into the body and therefore could be use to deliver drugs to specific tissues.
- Making synthetic skin
- Silver nanoparticles have antibacterial properties. These can be used in things like clothing, deodorants and surgical masks.
- Some nanoparticles are electrical conductors, these can be used to make components in very small circuit boards.
- cosmetics, to make them less oily
- sun creams, they provide better protection from UV than conventional sun creams. They also provide better skin coverage.

Properties of Metals

Metals are **good conductors of electricity**, due to the delocalised electrons, which can carry the electric charge. Metals are also **good conductors of heat** as the free electrons can transfer the heat energy through the metal.
Metals are also **malleable** (bendy) as the layers of ions can easily slide over one another. This means that many pure metals are too soft for uses such as building.

Reactivity of metals When a metal reacts it **forms a positive ion.** The easier it is for a metal to form a positive ion, the more reactive it is. This is shown in the reactivity series; you should memorise the position of different elements:

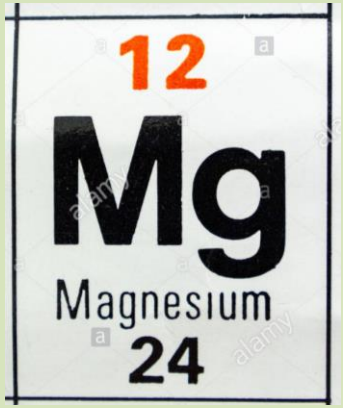


Dangers on Nanomaterials

The long term affects of nanomaterials on the body have not been well researched. For example when using sun cream, nanoparticles are absorbed through the skin. The affects of long term exposure to these has not been well researched. Some people believe anything containing nanoparticles should be clearly labelled.

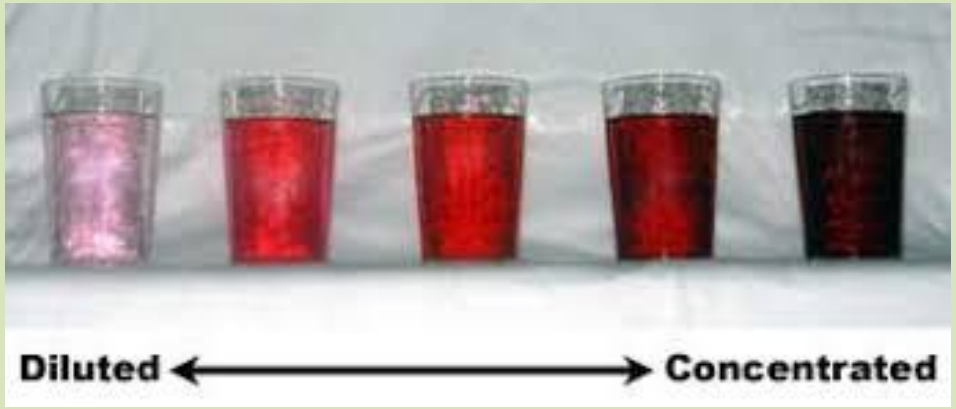
KS4 Chemistry C4 Chemical Calculations (Combined Foundation)

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_2 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

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

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

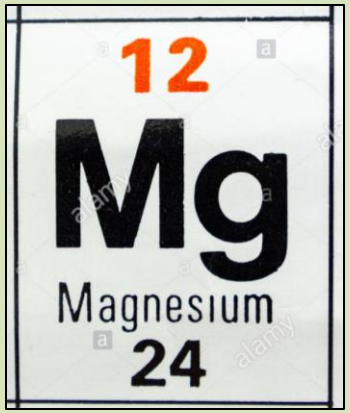
Mass = concentration x volume

Concentration is measured in g/dm^3

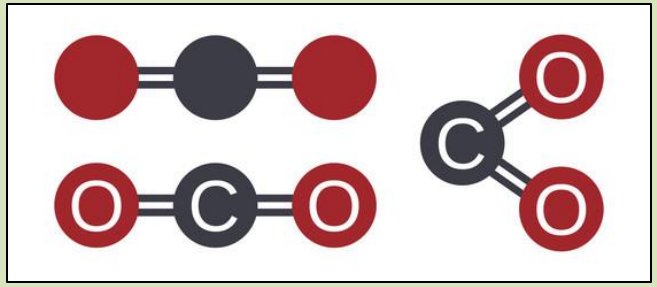
KS4 Chemistry C4 Chemical Calculations (Combined Higher)

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, Ar. This is the large number on the Periodic Table.



Relative formula mass, Mr is all the atomic masses in a compound added up.
E.g. CO_2 is 12+16+16 = 44



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.

Avogadro's constant is 6.02×10^{23}
The is the number of atoms in 1 mole (or the number of molecules in 1 mole).

Number of moles = mass / molecular mass

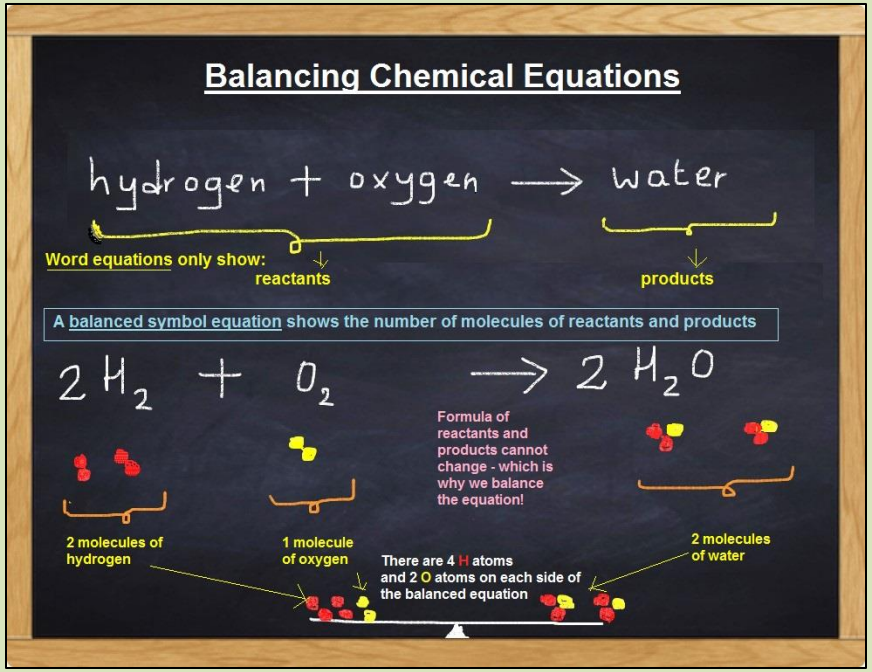
Molecular mass is the Ar for an element and Mr for a molecule.

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 H_2SO_4 in 1 mole of molecules.
41g of H_2SO_4 has (41/98) 0.4 moles of H_2SO_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.

one hydrogen molecule		one chlorine molecule		two hydrogen chloride molecules
H_2	+	Cl_2	→	2HCl
1 mole of hydrogen molecules		1 mole of chlorine molecules		2 moles of hydrogen chloride molecules

H_2	+ Cl_2	→ 2HCl	If we divide all by 2 …
1g	35.5g	36.5g	If we multiplied all by 8 …
8g	284g	292g	

H_2	+ Cl_2	→ 2HCl
2x1=2	2x35.5=71	2x (1+35.5) = 73
2g	71g	73g

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

sodium nitrate → sodium nitrite + oxygen

8.5 g = 6.9 g + x g

(8.5 – 6.9) g = x g

1.6 g = mass of oxygen

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

moles of $NaNO_3$ $= \frac{8.5}{85} = 0.1$ mol

moles of $NaNO_2$ $= \frac{6.9}{69} = 0.1$ mol

moles of O_2 $= \frac{1.6}{32} = 0.05$ mol

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

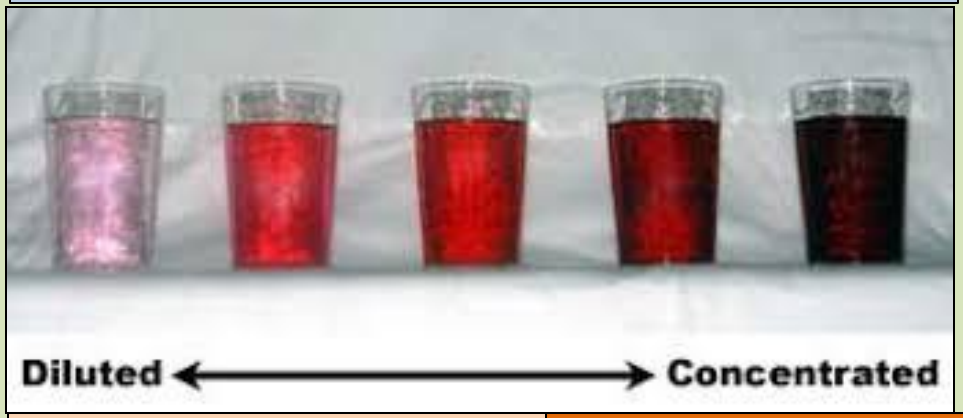
sodium nitrate → sodium nitrite + oxygen

8.5 g = 6.9 g + x g

(8.5 – 6.9) g = x g

1.6 g = mass of oxygen

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



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.

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

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

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

Mass = concentration x volume

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

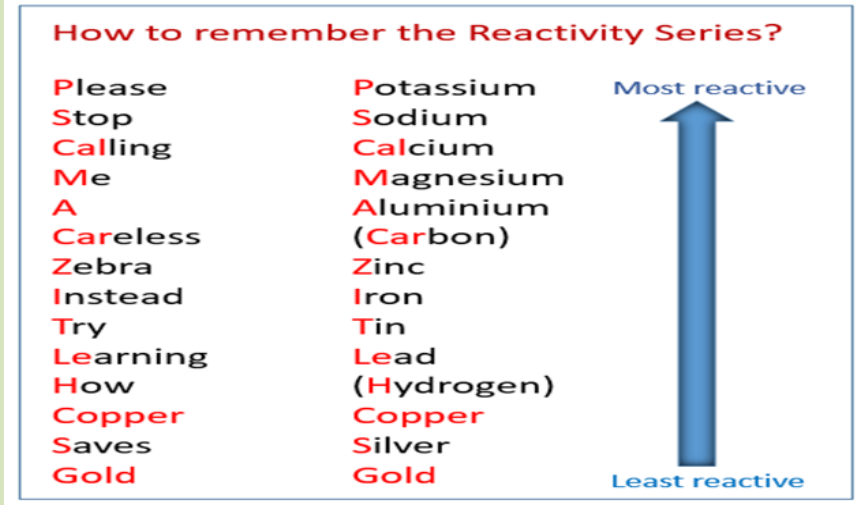
Concentration is measured in g/dm^3

KS4 Chemistry – C5 Chemical Changes

Reactivity Series

A *list* of metals in order of how reactive they are:
Some metals are *very reactive* (at the top) and react easily in chemical reactions. E.g. Sodium
Some metals are u*nreactive* (at the bottom) and do not react easily or at all in reaction e.g. gold

Further reading:
https://www.youtube.com/watch?v=KTmXEIiU_Go&safe=active
https://www.bbc.co.uk/bitesize/topics/zcdj97h



Displacement Reactions

Displacement reactions involve a metal and a compound of a different metal; the more reactive metal *displaces* (pushes out) the less reactive metal from its compound:

Magnesium + Copper Sulfate → Magnesium sulfate + copper
$Mg\ (s) + CuSO_4\ (aq) \rightarrow MgSO_4\ (aq) + Cu\ (s)$

Ionic Equations (H tier only)

$Mg\ (s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu\ (s)$

Half Equations (H tier only)

At the anode: $Mg\ (s) - 2e^- \longrightarrow Mg^{2+}(aq)$
At the cathode: $Cu^{2+}(aq) + 2e^- \longrightarrow Cu\ (s)$

Keyword	Definition
Acid	An acid has a pH value of less than 7
Alkali	Its solution has a pH value more than 7
Base	A soluble alkali that forms a salt when it reacts with an acid
Displacement reaction	When a more reactive metal replaces a less reactive metal in a compound
Electrolysis	The breakdown of a substance containing ions by electricity
Indicator	A substance that changes colour when added to acids or alkalis
Insoluble	Does not dissolve in water
Neutralisation	The reaction of an acid with a base producing salt and water
Ore	Rock which contains enough metal to make it economically worth extracting
Oxidation	The reaction when oxygen is added to a substance or electrons are lost
pH Scale	A number which hshows how strongly acid or alkaline and solution is
Reduction	A reaction in which oxygen is removed or electrons are gained
Salts	A compound formed when some of the H in an acid is replaced by a metal
Soluble	Dissolves in water
Reactivity Series	A list of metals showing how reactive they are
Half Equation	An equation that describes the gain or loss of electrons
Ionic Equation	An equations that shows only those ions or atoms that change in a chemical reaction
Strong Acid	An acid that completely dissociated into ions in solution e.g. nitric acid
Weak Acid	An acid that is only partly ionized e.g. ethanoic acid

KS4 Chemistry – C5 Chemical Changes

OILRIG is a useful way of remembering:
Oxidation Is Losing
Reduction Is Gaining (electrons)

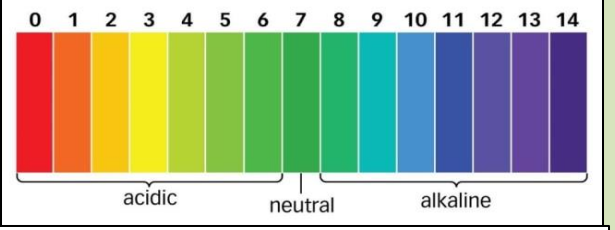
Reduction of metals by carbon and hydrogen

The oxides of metals below carbon in the series can be reduced by carbon

Metal oxide + carbon → metal + carbon dioxide

e.g. lead oxide + carbon → lead + carbon dioxide

$2PbO\ (s) + C\ (s) \rightarrow 2Pb\ (l) + CO_2\ (g)$



Making Salts

There are various ways salts can be made. You need to know the products.

Acid + metal	→	salt + Hydrogen
Acid + Base	→	salt + Water
Acid + Alkali	→	salt + Water
Acid + metal carbonate	→	salt + water + Carbon dioxide

pH Scale

Universal Indicator changes colour depending on the pH of a solution.
Acids can be dilute (lots of water) or concentrated (less water)
Weak Acids e.g. citric acid are not harmful even when in concentrated solutions
Strong acids e.g. hydrochloric acid can be harmful even when diluted

Names of Salts

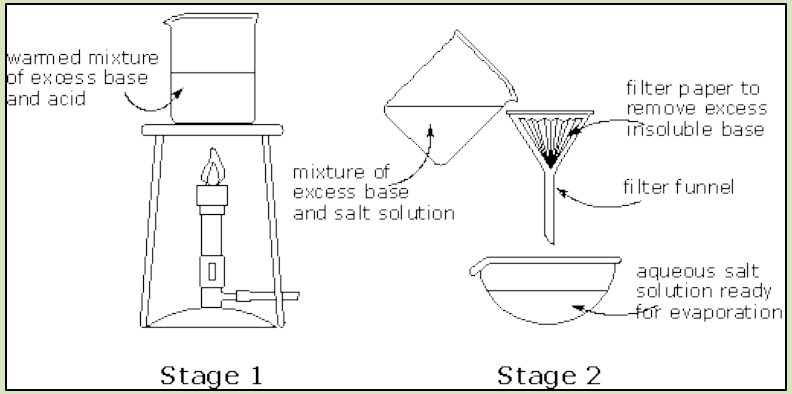
The acid used provides the negative ions present in all salts.
Hydrochloric acids make salts called ***chlorides*** containing Cl^- ions
Sulphuric acid H_2SO_4 makes ***sulphates*** containing SO_4^{2-} ions
Nitric acid HNO_3 makes ***nitrates*** called NO_3^- ions

Making a copper salt – this is a required practical

Sulphuric acid + copper oxide → copper sulphate + water

$H_2SO_4\ (l) + CuO\ (s) \rightarrow CuSO_4\ (aq) + H_2O\ (l)$

Method:
Add EXCESS insoluble copper oxide to sulphuric acid and stir
Warm gently on a tripod – the solution will turn blue
Filter off excess copper oxide
Evaporate the water so that crystals of copper sulphate start to form
Stop heating when you have evaporated about half the water and allow the rest of the water to evaporate off naturally



Making a salt from a metal carbonate is also a required practical

KS4 Physics: P1 Energy transfer

Types of energy store

- **Kinetic energy store** – Energy stored by moving objects
- **Sound energy store**
- **Light energy store**
- **Elastic potential energy store** – Energy stored in compressed springs or stretched elastic bands
- **Thermal energy store**
- **Gravitational potential energy store** – Energy stored by lifting something against the force of gravity
- **Electrical energy store**
- **Chemical energy store** – Energy stored in chemical bonds examples include batteries, coal, gas, and food. Released by chemical reactions.
- **Nuclear energy store**
- **Magnetic energy store**

Energy is measured in Joules (J)

Energy can be transferred:
Mechanically when work is done by a force
Electrically when a moving charge does work
By **Heating** when energy is transferred from a hot object to a cooler one

Energy transformations

Energy transformations describe how the transforms from one form to another.

Chemical energy store → kinetic energy store + sound energy store + thermal energy store

Chemical energy store → Electrical energy store → Light energy store + thermal energy store

The arrow means transforms into

Key words	
Power	The amount of energy transferred per second measured in Watts (W).
Work (work done)	The energy transferred by a force. **Work done** means **Energy transferred**
Conservation of energy	Energy can not be created or destroyed, only transformed from one form to another.
Energy dissipation	Energy transferred to the surroundings, usually as thermal energy or sound.
Friction	A force the opposes the motion of an object.
Efficiency	The proportion energy transferred in a useful way. Given as a percentage, decimal of fraction.
A system	An object or group of objects – In a closed system the energy before and after energy transformations always remain the same.

Friction: When you apply the brakes in a car, the brake pads do work on the brake disks causing the wheel's kinetic energy store to transfer to the thermal energy store of the break disks, resulting in the car slowing down.

input energy: Electrical energy store **200J** → useful output energy: Thermal energy store **160J** + wasted energy: light energy store **40J**

Orders of Magnitude:

1W	1W	Watt	1
1KW	**1,000**W	**Kilo** Watt	$1x10^3$
1MW	**1,000,000**W	**Mega** Watt	$1x10^6$
1GW	**1,000,000,000** W	**Giga** Watt	$1x10^9$

Equations for this topic:

Example Calculation: Calculate the work done if a person lifts a 10N weight 1.5m off the ground?

Work done = Force x distance

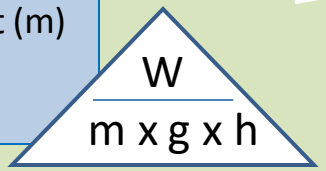
W = F x d

W = 10 x 1.5

W = 15J

Always write out the equation you will use, substitute in the numbers, calculate the answer and give the unit

…nal (N/Kg) x height (m)
…ength



Energy stored = ½ x Spring constant (N/m) x extension ^{2} (m) in a spring(J)

$E_e = ½ kx^2$

Kinetic energy (J) = ½ x mass (Kg) x velocity ^{2} (m/s)

$E_k = ½ mv^2$

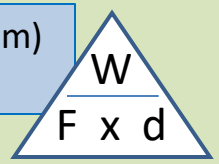
E Energy	**F Force**
P Power	**d distance**
g gravitational field strength	**t time**
E_k Kinetic energy	**v velocity**
E_p Gravitational potential energy	**x extension**
E_e Elastic potential energy	**h height**

Efficiency = $\left(\frac{\text{Useful power output}}{\text{Total power input}}\right)$ x 100

Efficiency = $\left(\frac{\text{Useful energy output}}{\text{Total energy input}}\right)$ x 100

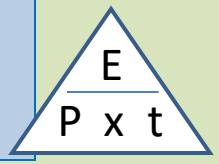
Work done (J) = Force (N) x distance (m)

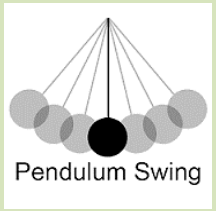
W = F x d



Power (W) = $\frac{\text{Energy (J)}}{\text{Time (s)}}$

$P = \frac{E}{t}$

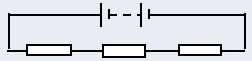


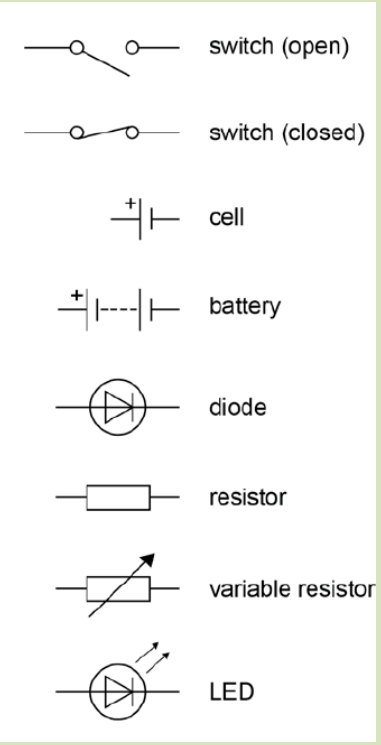


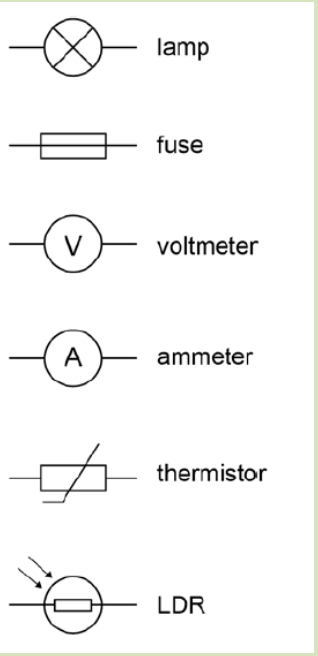
Energy dissipation: A pendulum eventually comes to rest as **energy is transferred to the surrounding**. Energy is **dissipated** as heat caused by friction and air resistance.

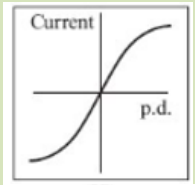
Energy dissipation: When a ball falls, its gravitational potential energy store decreases and its kinetic energy store increases. When it bounces some energy is transferred to the thermal energy store of the ball and ground. Eventually the original energy is transferred to the thermal energy store of the surroundings

KS4 Physics: Electrical circuits

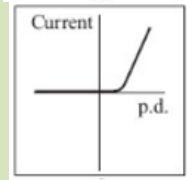
Key words	
Current	The flow of charge. Negatively charged electrons flow in the wire. The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. The greater the resistance of the component the smaller the current for a given potential difference (pd) across the component.
Charge	Charge is a property of a body which experiences a force in an electric field. Charge is measured in coulombs (C).
Potential difference (Voltage)	A measure of the difference in electrical energy between two parts of a circuit. Measured in Volts. It tells us how many joules of energy is transferred by each coulomb of charge. *You will only ever be asked about **potential difference** in exam questions however most equations refer to voltage. So for your GCSEs remember **voltage** is the same as **potential difference***
Resistance	The wires and the other components in a circuit reduces the flow of charge through them. This is called resistance. Resistance is measured in Ohms.
Parallel circuits 	In parallel circuits, electrical components are connected alongside one another, forming extra loops. When two components are connected in parallel, an individual charge will flow through one of the components only, not both.
Series circuits 	When components are connected in series a charge will flow through all the components in the circuit



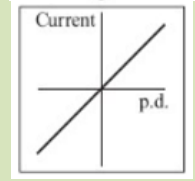




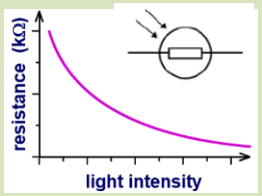
Filament bulb: As you pass a voltage across a filament lamp, the filament wire gets hotter. This causes the ions in the wire to vibrate faster making it harder for electrons to flow, increasing the resistance. As you increase the voltage the current increases but at a decreasing rate.



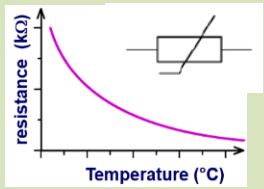
Diode: Diodes only allow current to flow in one direction. In the other direction they have an extremely high resistance



Resistor: For a resistor at a constant temperature current is directly proportional to voltage. The resistance remains constant.

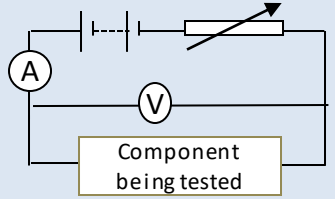


Light dependent resistor (LDR): As the light intensity increases the resistance of an LDR deceases. They are often used as light sensors.

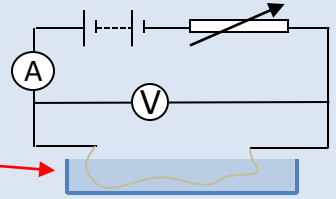


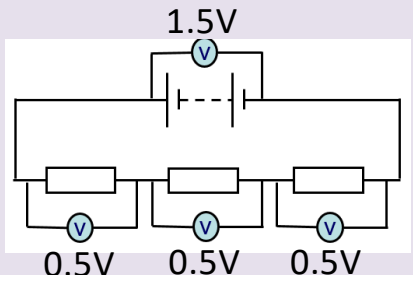
Thermistor: As the temperature of a thermistor increases the resistance deceases. They are often used in thermostats and temperature sensors.

Required practical 4 – investigate the how potential difference affects current for a diode, filament lamp and resistor at constant temperature.

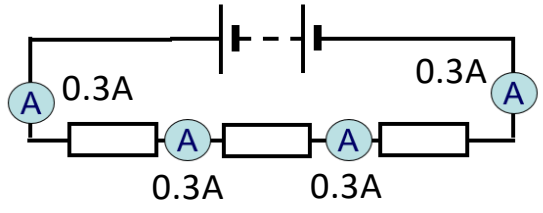


Through of water with wire submerged to maintain a constant temperature





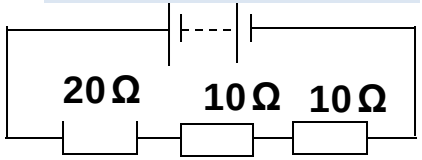
In Series
Potential difference is shared across each component depending on the resistance of each component



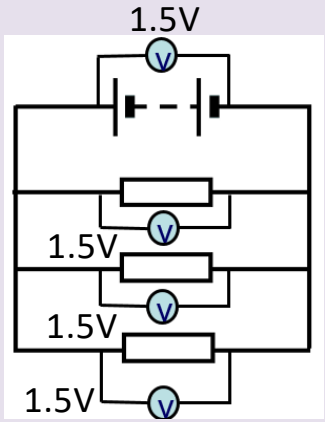
Current is the same every where in the circuit

When **resistors** are connected in **series** the total resistance of the circuit is the sum of their resistances.

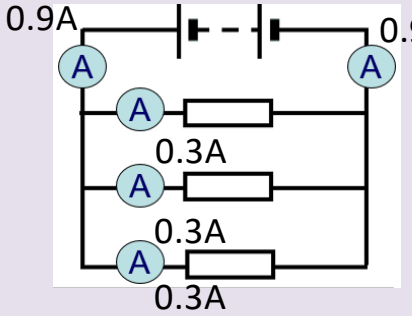
$R_T = R_1 + R_2 + R_3$



total resistance = 20 + 10 + 10 = **40 Ω**



In Parallel
Potential difference the same across each branch of the circuit



Current is shared across each branch of the circuit depending on the resistance of each component

When **resistors** are connected in **parallel**, then the total resistance of the circuit decreases. Even though you have added another resistor, you have given more pathways for current to flow, thus reducing the overall resistance.

KS4 Physics: Electrical circuits

$$Q = I\ t$$

Charge = current x time

Q / I x t

$I = \frac{Q}{t}$

This equation helps us understand current, current is the amount of charge passing a point in a given time (1 Amp = 1 coulomb per second)

$$V = I\ R$$

Voltage = current x Resistance

Potential difference (V, Volts) (A, Amps) (Ω, Ohms)

V / I x R

$$V = \frac{E}{Q}$$

Potential difference Voltage (V, Volts) = Energy (J, Joules) / Charge (C, Coulombs)

E / V x Q

This equation helps us understand voltage, it tells us that voltage is the amount of energy per coulomb of charge

Required practical 3

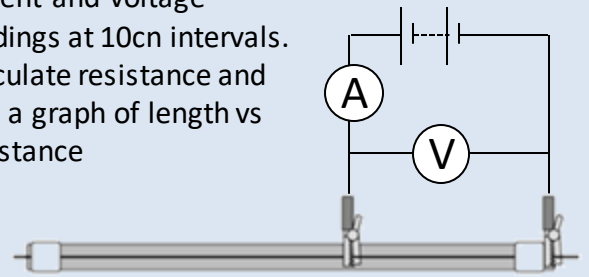
How does length of a wire affect its resistance

IV – length of wire

DV – current and voltage (to calculate resistance)

CVs – cross sectional area of wire, temperature of wire, input voltage

Attach a piece of resistance wire to a meter rule. Take current and Voltage readings at 10cn intervals. Calculate resistance and plot a graph of length vs resistance



Symbols to remember:

V Voltage or Potential difference
I Current
P Power
R Resistance
t Time
E Energy

Power, Current, Voltage

$$P = I \times V$$

Power (W, Watts) = current (A, Amps) x Voltage (V, Volts) Potential difference

P / I x V

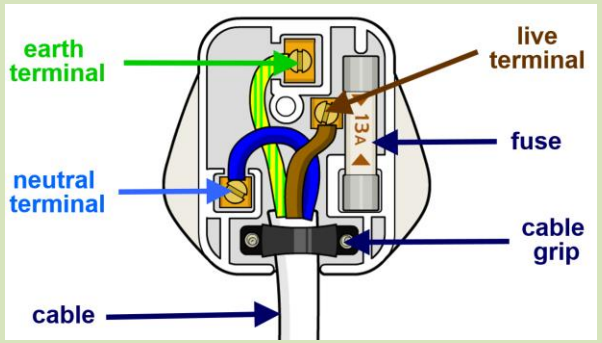
Power, Current, Resistance

$$P = I^2 R$$

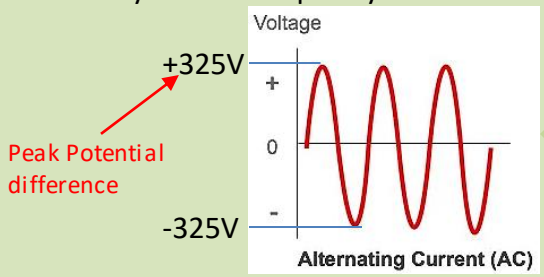
Power (W, Watts) = current (A, Amps) x Resistance (Ω, Ohms)

P / I^2 x R

KS4 Physics: Electricity in the home

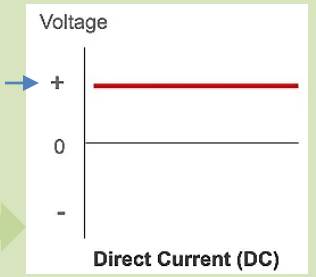


Mains electricity is an **Alternating Current** (AC). The current switches repeatedly from + to –
The electrons flow back and forth in the wire. It does this 50 times a second. We say it has a frequency of 50Hz.

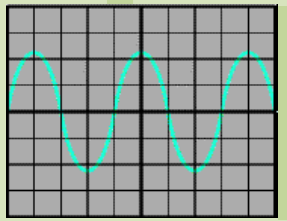


Frequency = $\frac{1}{\text{time taken for 1 cycle}}$

Cells and batteries supply **Direct current**. The electrons in the circuit only travel in **one direction** around the circuit.



These are called oscilloscope traces



Each square on the y axis represents the potential difference (voltage) measured. Each square on the x axis represents a time

If each square on the x-axis represented 0.02s the period of the Alternating current would be 0.08s. The frequency would be 12.5Hz (F = 1/T)

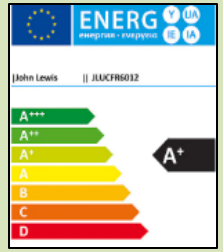
Live wire	**brown**	The live wire carries the alternating potential difference from the supply. The potential difference between the live wire and earth (0 V) is about 230 V (It alternates between +325V and -325 volts)
Neutral wire	**blue**	The neutral wire completes the circuit. The neutral wire is at, or close to, earth potential (0 V).
Earth wire	**green and yellow stripes**	The earth wire is a safety wire to stop the appliance becoming live. The earth wire is at 0 V. If a fault occurs connecting the live wire to the case of the appliance, the current will travel down the earth wire instead of a person! (avoiding an electric shock). If the case of your device has a plastic outer case then it would not need an earth wire as the case could not become live
Fuses		Fuses protect the appliance if the current gets to high. A fuse contains a piece of wire that melts if the current increases above a particular value. Fuses commonly come in 3A, 5A and 13A. If your appliance runs at 3.8A you would use a 5A fuse
Cable		Most electrical appliances are connected to the mains using three core cable. The insulation covering each wire is colour coded for easy identification.

Efficiency = $\frac{\text{Useful energy output}}{\text{Total energy input}} \times 100$

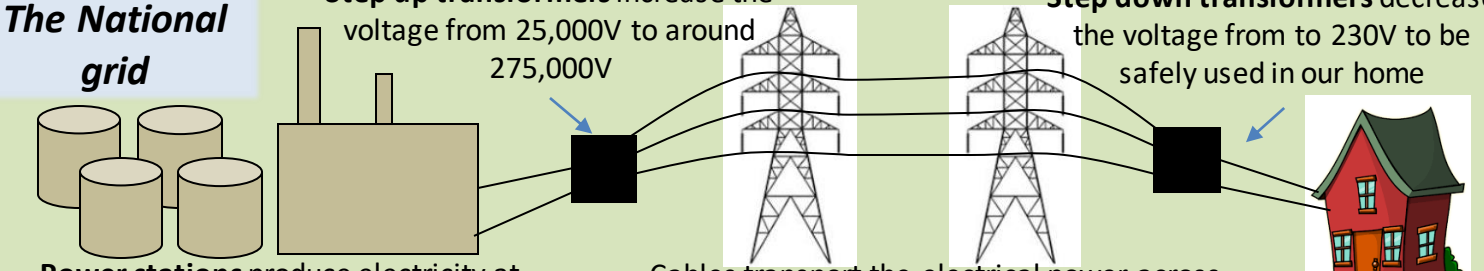
Efficiency = $\frac{\text{Useful power output}}{\text{Total power input}} \times 100$

The efficiency of electrical appliances is very important. An efficient appliance will transfer a high proportion of the electrical energy in a useful way.

Consumers can identify the efficiency of appliances using a rating system



The National grid



Power stations produce electricity at about **25,000V**

Step up transformers increase the voltage from 25,000V to around 275,000V

Cables transport the electrical power across the country at **275,000V**

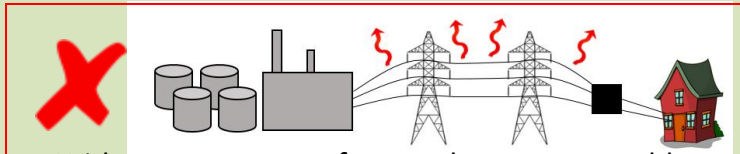
Step down transformers decrease the voltage from to 230V to be safely used in our home

Step up transformers:
Increase voltage
Decrease current
Step down transformers:
Increase voltage
Decrease current

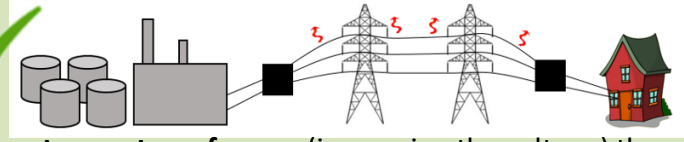
Reducing electrical energy losses

When electrical current passes through a wire it becomes hot. This means electrical power is being transferred to heat, resulting in less power being delivered to our homes.

The higher the current the greater the heating in the wires. Therefore electrical energy needs to be transferred through the cables at a low current. Step up transformers increase the voltage, which decreases the current, so electrical energy is transferred at very high voltages



With no step up transformer, the current would remain high and electrical power would be lost as it transfers to heat energy in the wires, and then to the surroundings

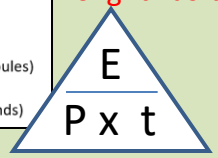


With a **step up transformer** (increasing the voltage) the current would reduce resulting in much less heating in the wires, resulting in more electrical power being supplied to the home.

Power, Energy, Time

$$P = \frac{E}{t}$$

Power = Energy (J, Joules) / time (s, seconds)
(W, Watts)

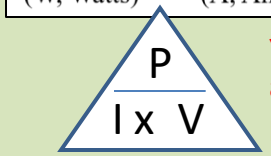


Power is the amount of energy used every second. You can work out how much energy you have used with an appliance if you know the power rating of the appliance and how long it has been on for.

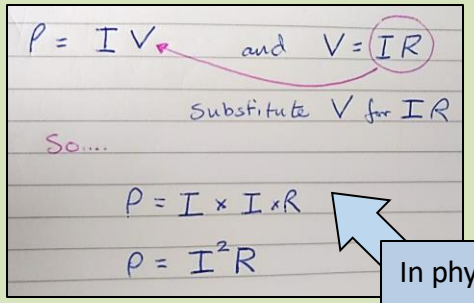
Power, Current, Potential difference

$$P = I \times V$$

Power = current x Voltage (Potential difference)
(W, Watts) (A, Amps) (V, Volts)



You can also work out the power of an appliance if you know the potential difference and the current.



How it works..

2000W of power could be transported at 100A and 20V
(P = IxV , 20x100 = 2000W)
However if you increased the voltage to 1000V using a step up transformer, the current would reduce to 2A reducing power losses due to heating
(P = IxV, so 2 x 1000 = 2000W

In physics you can combine equations. This can be useful if it appears you don't have the right data in the question.

You may also face questions where you need to use one equation first, followed by a second equation

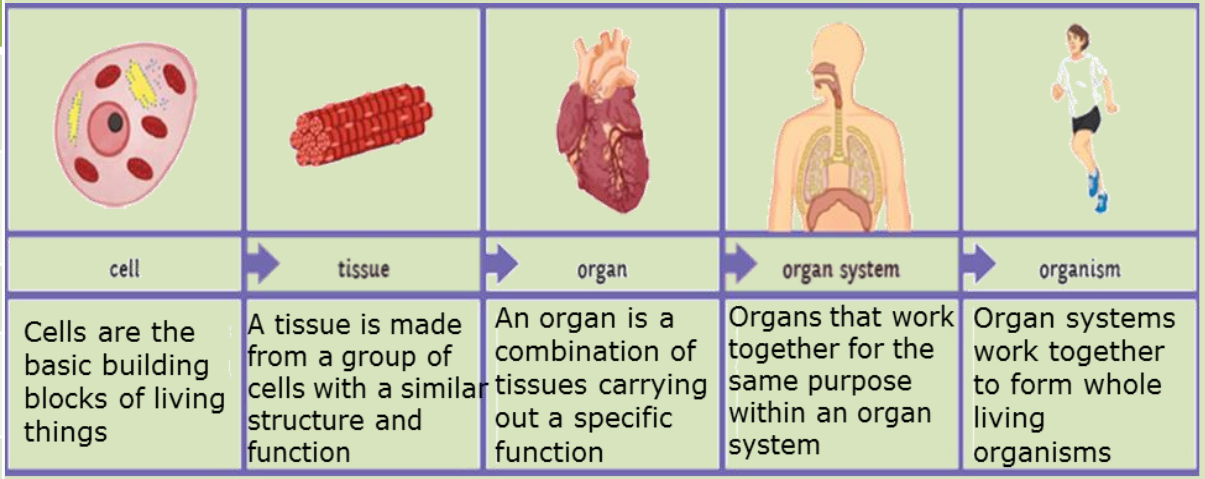
KS4 Biology: B3 Organisation & the digestive system

Please only use when directed by your teacher

Keyword	Definition
Enzyme	Protein with an active site of a specific shape which speeds up reactions
Villi	Finger like projections in the small intestine that increase surface area, helping with absorption
Catalyst	A molecule/chemical that speeds up the rate of reaction
Lock and key mechanism	Only one type of substrate can fit into the active site of an enzyme, like a key fits into a lock.
Active site	The part of the enzyme that helps break down the substrate
Substrate	The specific molecule that binds to an enzyme's active site
Rate of reaction	The speed at which a reactant is converted into a product
Denatured	When the active site of an enzyme changes shape and the substrate can no longer fit in. Can be caused by pH or temperature
pH	How acidic or alkaline a substance is. Enzymes are very sensitive to pH.
Bile	Alkaline substance produced in the liver and stored in the gall bladder. It neutralises stomach acid and breaks down fats into small droplets
Emulsification	Mixing two liquids such as oil and water that would not normally mix

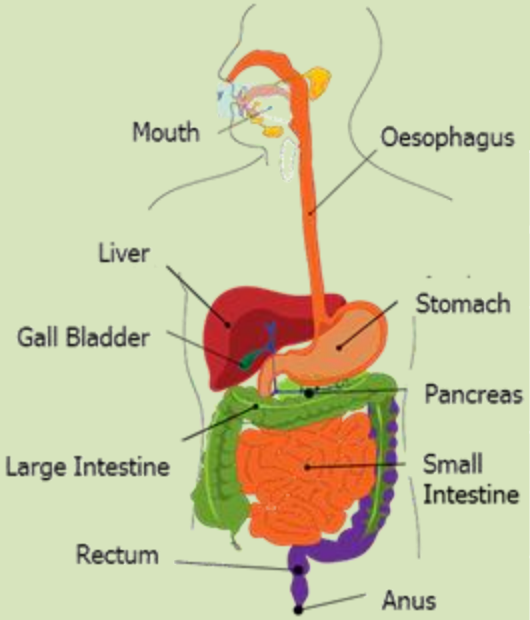
Organisation

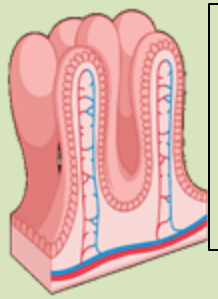
Organisms like you and I are organised from our smallest units (cells)



The digestive system

This system is made up of multiple organs that break down and absorb your food

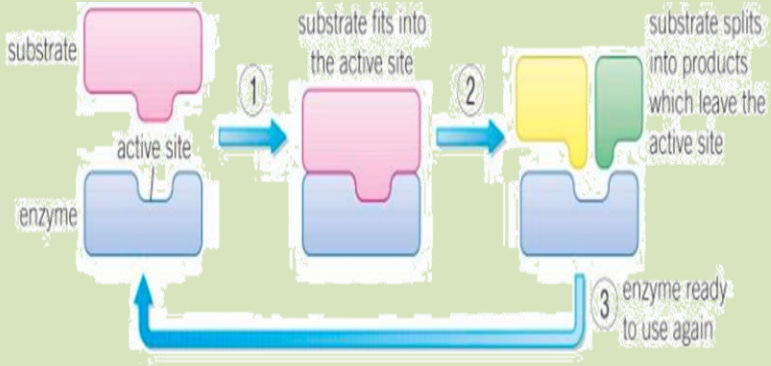




Your small intestine absorbs all of the required nutrients from your food. The villi help it do this by increasing the surface area

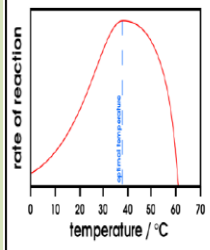
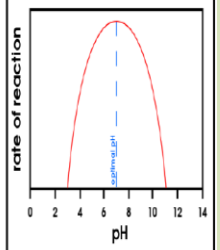
Organ	Function
Liver	Produces bile
Stomach	Breaks down large insoluble molecules into smaller soluble ones
Small intestine	Further breaking down of larger molecules and absorption into the blood
Large intestine	Absorbing water from undigested food

Enzymes are proteins and function in many reactions in the body as a biological catalyst- this means they do not change the reaction but they do <u>speed it up</u>



Most enzymes are specific, meaning that only one type of substrate will only bind to the enzymes active site- like a key fitting a lock

The activity of enzymes is affected by changes in temperature and pH

Enzymes activity has an optimum temperature	*Enzyme activity has an optimum pH*
	

Enzymes have 3 main functions
- To make larger molecules from smaller ones
- Breaking down larger molecules into smaller ones
- Converting molecules- e.g converting one amino acid to another

If the temperature is too high or the pH is not optimum then the active site will be denatured

Further reading

https://www.bbc.co.uk/bitesize/guides/zcttv9q/revision/1

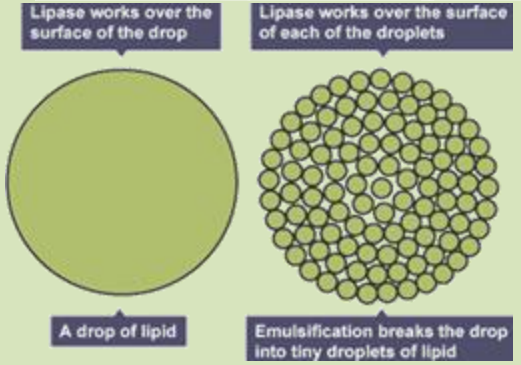
https://www.youtube.com/watch?v=Og5xAdC8EUI&t=3s

Carbohydrates, lipids and proteins make up the cell's structure-and are needed in a balanced diet- we can test food for these using the following tests

Molecule	What is it made from	Chemical test	Positive result looks like
Sugar	Carbohydrates with one or two sugar units	Benedict's reagent and heat	Small amount= green Large amount = yellow/red
Starch	Is a complex carbohydrate made from long chains of simple sugars bonded together	Iodine	Turns blue/black
Protein	Made from long chains of amino acids	Biuret reagent	Turns purple
Lipid/fat	3 fatty acids bonded to a glycerol molecule	Ethanol	Dissolve in ethanol and then turn <u>white/cloudy</u> when water is added

The digestive system uses several enzymes which work on different organs of the system- the three main sites are the mouth, stomach and small intestine

Digestive enzyme	Where is it produced	Site of action	substrate	product
Carbohydrase (e.g amylase)	Salivary glands, pancreas and small intestine wall	Mouth and small intestine	Complex carbohydrates - e.g. starch	Simple sugars - e.g. glucose
Protease (e.g pepsin)	Stomach, pancreas, small intestine wall	stomach	Proteins	Amino acids
Lipase	Pancreas, small intestine wall	Small intestine	Lipids	Glycerol and fatty acids



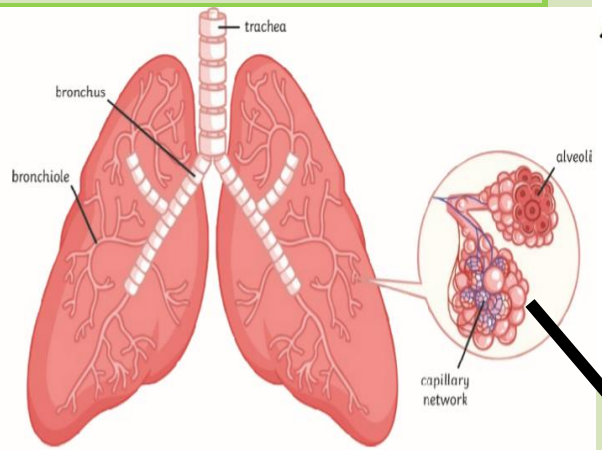
<u>Bile</u> (not an enzyme)

- Produced by the liver this is transported to the small intestine to neutralise stomach acid.
- It also emulsifies fat, increasing its surface area for lipase to work on

Please only use when directed by your teacher

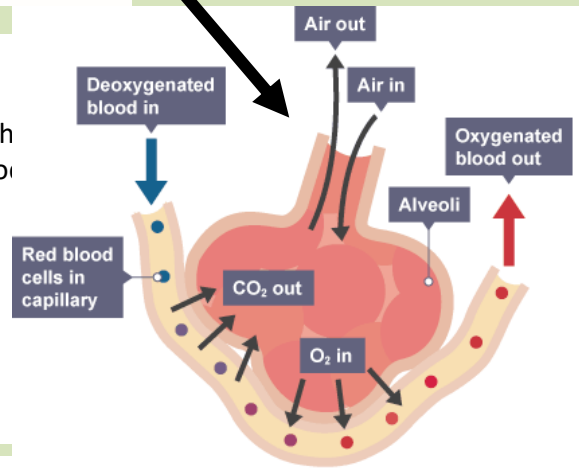
KS4 Biology: B4 Organising animals and plants

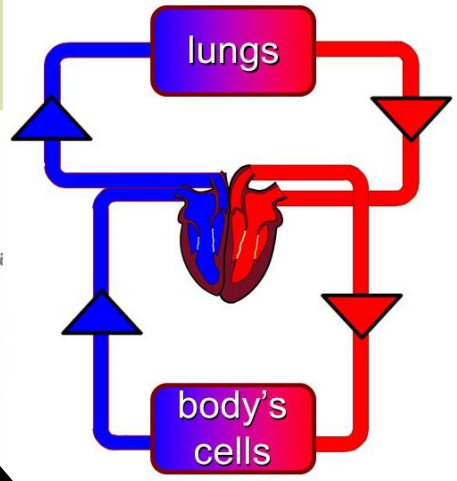
Arteries	Veins	Capillaries
From heart to rest of body	From rest of body to heart	Connects arteries and veins
Carries mostly oxygenated blood	Carries mostly deoxygenated blood	Carries both [de]oxygenated blood
High pressure with thicker walls	Low pressure with thinner walls	Walls only one-cell thick for diffusion
No valves	Has valves	No valves



The lungs are adapted for efficient gas exchange

The alveoli have a large surface area, capillaries around th alveoli lead to a goo blood supply, concentration gradient to allow a short diffusion pathway.





Aorta	The artery leaving the left ventricle.
Artery	Blood vessel that carries blood away from the heart.
Atria	Smaller top chambers of the heart.
Blood vessel	How blood is transported around the body.
Capillary	Blood vessel that connects arteries and veins.
Coronary blood vessel	The heart muscle needs its own blood supply. This comes from branches from the aorta as soon as it leaves the heart called **coronary** arteries.
Pulmonary artery	The blood vessel leaving the right ventricle, carrying blood to the lungs.
Pulmonary vein	Vein leading from the lungs back to the heart (to the left atrium).
Valves	Prevent back flow of blood. Allows blood to only flow the correct way.
Vein	Blood vessel that carries blood towards the heart.
Vena cava	The major vein transporting blood from the whole body back to the heart (to the right atrium)
Ventricle	The larger bottom chambers in the heart.

Red Blood Cells

Disc shaped and biconcave. This increases the surface area so can absorb and more oxygen. Don't have a nucleus so more room for haemoglobin.

White Blood Cells

Part of the immune system to fight communicable disease. They all have large nuclei, and can also change shape so they can **engulf** microorganisms

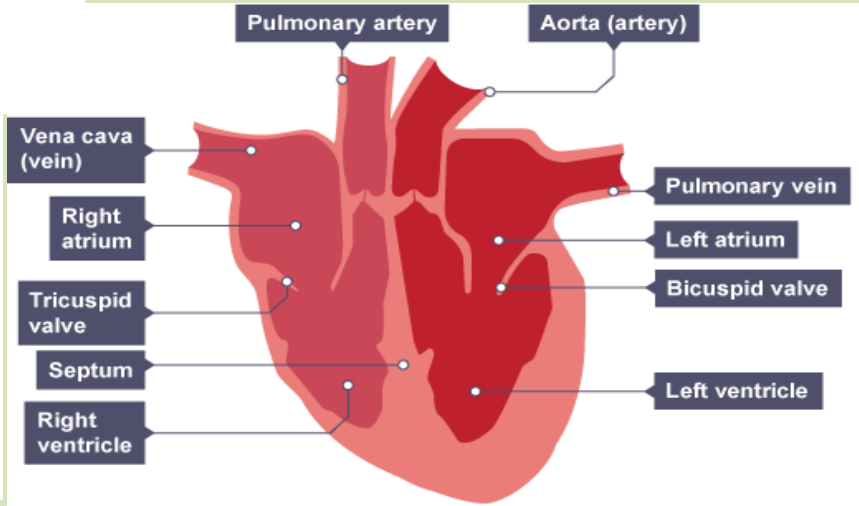
Plasma

This makes up 55% of the blood. It is mostly made of water, but with substances like glucose, proteins, ions and carbon dioxide dissolved in it. The other blood components are suspended in the plasma.

Platelets

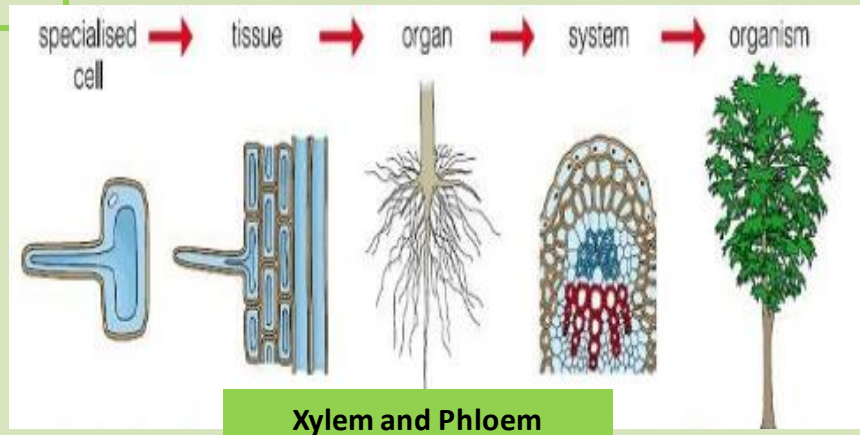
Fragments of cells. They start the process of **clotting** at a wound which blocks the injury until proper healing happens, preventing blood loss.

When the heart 'beats' the muscles contract to pump the blood.
Heart rate is controlled by a group of cells in the right atrium that act as a **pacemaker.** These cells set off the impulses that make the heart muscle contract.
Artificial pacemakers are electrical devices used to correct any irregularities in the heart rate.

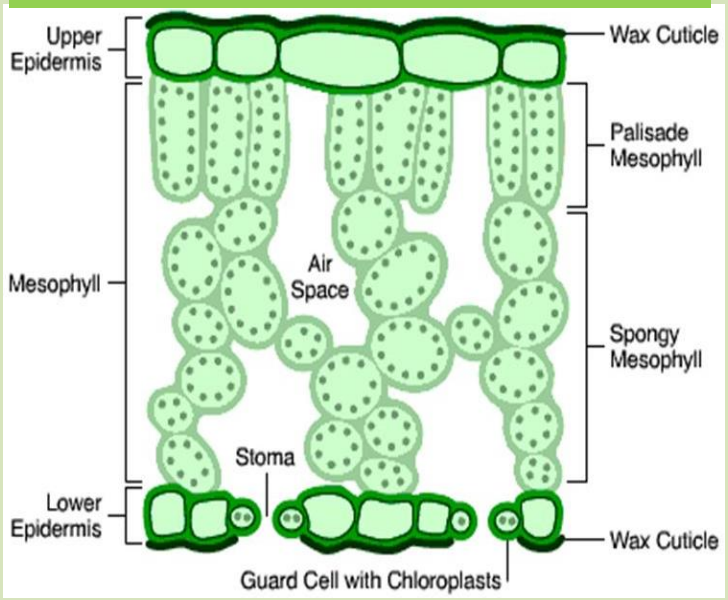


KS4 Biology: B4 Organising animals and plants

Plants, like humans, are made of cells, tissues, organs and organ systems.



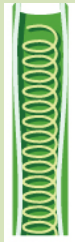
The Leaf



Epidermis	Transparent to allow sunlight to pass through
Palisade layer	Packed with chloroplasts to allow photosynthesis
Mesophyll layer	Air spaces to allow the diffusion of gases
Stoma	Gaps on the underside of the leaf to allow gases in and out of the leaf
Guard cells	Allow stomata to open and close

Water vapour is lost through the stomata on underside of the leaf by evaporation but the stomata need to be open to allow carbon dioxide to diffuse into leaf and oxygen to diffuse out

Xylem and Phloem

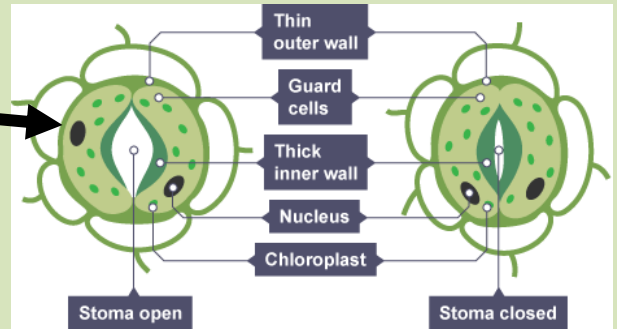


Xylem is made from hollow tubes made from cell walls of dead cells and strengthened by lignin.

Phloem is made of living cells elongated and stacked to form tubes.

Translocation

Phloem transports dissolved sugars from the leaves to other parts of the plant in a process called translocation.
Cell sap, containing the dissolved sugars, is able to flow from one phloem cell to the next through pores at the end of each wall.



https://www.bbc.co.uk/bitesize/guides/zps82hv/revision/1

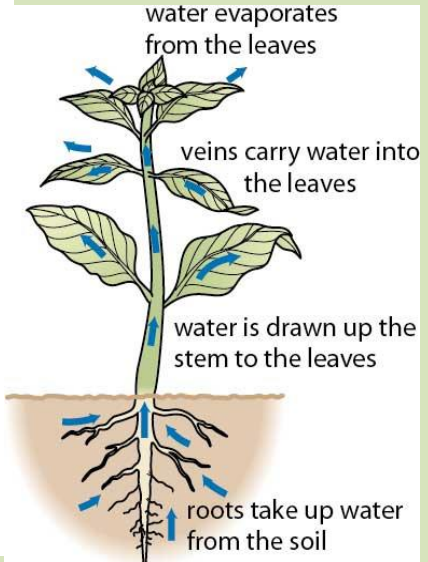
Active transport	Movement of particles against a concentration gradient
Diffusion	Movement of particles from high concentration to low concentration
Organ	A group of different tissues working together to perform a specific function
Organ system	Group of organs working together to carry out specific functions and to form organisms
Phloem	Living tissue which transports dissolved sugars around plant
Tissue	Group of specialised cells with similar structure and function working together
Translocation	Movement of dissolved sugars from leaves to rest of plant through phloem
Transpiration	Movement of water through a plant
Vascular bundle	Strand containing the xylem and phloem
Xylem	Non-living tissue which transports water and minerals from the roots to the leaves and shoots

Transpiration

Plants absorb water through the roots. It is transported against gravity from roots to leaves. Plants are constantly losing water as vapour through the leaves.

Transpiration can be increased by:
- Brighter light
- Increased temperature
- Increased air movement (wind)
- Decreased humidity (steeper concentration gradient)

Rate of transpiration measured using a potometer



KS4 Biology: B5 Communicable diseases

Please only use when directed by your teacher

Key term	Definition
Communicable disease	Disease caused **pathogens** that can be passed from **one organism to another**.
Pathogen	Microorganisms that cause disease may be **viruses, bacteria, fungi or protists.**
Bacteria	Prokaryotes that reproduce rapidly inside the body and may produce poisons (**toxins**) that damage tissues and make us feel ill, treated with **antibiotics.**
Virus	Live and reproduce **inside cells,** causing cell damage.
Protist	Eg malaria
Vaccine	Dead or inactive pathogenic material used in vaccination to develop immunity to a disease in a healthy person.
White blood cells	**Macrophages ingest** pathogens **(phagocytosis), lymphocytes** produce **antibodies**, other white blood cells produce **antitoxins.**
Antibody	Special proteins that target particular bacteria or viruses and destroy them. You need a **unique antibody for each type of pathogen.** When your white blood cells have produced antibodies once against a pathogen, they can be made **very quickly** if that pathogen enters your body again.
Antitoxin	Made by white blood cells, these counteract (cancel out) toxins made by pathogens.
Antigen	Proteins on the surface of cells that act like markers – your immune system can detect antigens that are not your own.
Cilia	Tiny hair-like projections on cells lining the trachea which beat out dirt/pathogens to the throat to be swallowed.

How pathogens are spread:

- By **air (including droplet infection).** When you are ill, your you expel tiny droplets full of pathogens when you cough, sneeze or talk.
- By **direct contact:**
  - Eg when one plant touches another hence you have to **remove and burn/destroy** infected plants.
  - Eg in humans; sex, cuts, scratches, and needle punctures (drug users).
  - Animals can act as vectors transferring pathogens.
- By **water:**
  - Eg fungal spores carried by water to plants.
  - Eg Humans eating raw, undercooked or contaminated food or drinking water containing sewage. Pathogens enter via the digestive system.

Preventing infection:

- **Wash hands** for 60s in warm water with soap.
- Use **disinfectants** on kitchen work surfaces, toilets etc.
- Keep raw meat away from food that is eaten uncooked.
- Cough/sneeze into a tissue – bin it – wash hands.
- **Vaccines (see B6 topic).**
- Maintain hygiene of agricultural equipment.
- **Isolate** someone who has the disease.
- **Destroy or control the vector** eg use mosquito spray/nets.

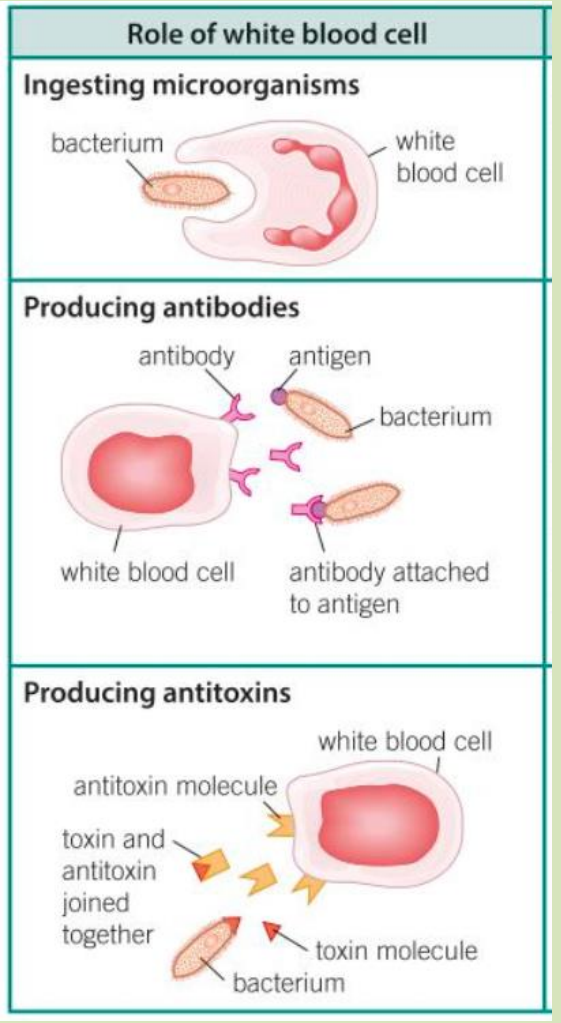
Human defence responses (stop the pathogens getting in!):

- Skin acts as a barrier and produces antimicrobial secretions and is covered in microorganisms that are not pathogenic.
- Respiratory system defences:
  - **Nose** full of **hairs** and produces **mucus** which trap pathogens to be blown out.
  - **Trachea and bronchi** secrete **mucus** and have **cilia** which **trap dirt** and **beat it** up to the throat to be **swallowed.**
  - **Stomach** produces **acid** which destroys the microorganisms in the **mucus** and in any **food/drink**.

KS4 Biology: B5 Communicable diseases

Disease	Type of pathogen	How is it passed on?	Symptoms	Treatment	Prevention
Measles	Virus	Inhalation of droplets, coughs/sneezes	Red rash – can cause blindness, brain damage, death	None	Vaccination
HIV/AIDS	Virus	Sex, share needles.	Mild flu at start, then none, then damages immune system so much that you die from infection or cancer.	Antiretroviral drugs to control the disease	Condoms
Tobacco mosaic virus	Virus	Contact between plants, a vector – insects.	Mosaic pattern on leaves - less photosynthesis – less yield from crop.	None	Grow disease resistant crops.
Salmonella food poisoning	Bacteria	Undercooked food eg chicken/eggs.	Vomiting, diarrhoea	Doesn't last for long so they don't use antibiotics.	Cook food properly.
Gonorrhoea	Bacteria	Sex	Yellow/green discharge from penis or vagina but may be symptomless – can lead to infertility.	Antibiotics	Condoms
Rose black spot	Fungal	Spores in the air, rain droplets splashing between leaves.	Black spots, yellow leaves – less photosynthesis, doesn't flower well.	Cut off infected parts, burn them.	Disease resistant crops, wash gardening tools.
Malaria	Protist	Mosquito bites	Damaged liver and red blood cell leading to weakness and death.	If diagnosed quickly drugs can be used.	Nets, anti malarial drugs, insect repellent.
Plant Galls	Bacteria	Transfer of plasmid into the plant.	Growths of genetically modified cells.	None stated.	None stated.

The immune system – internal defences



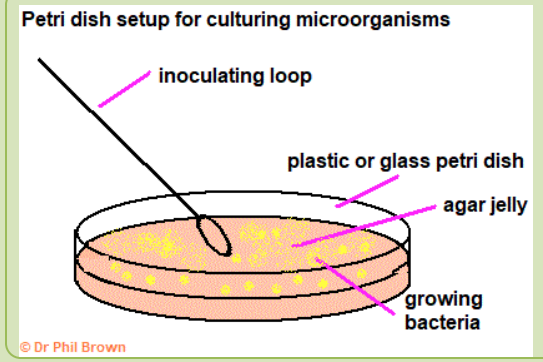
https://www.youtube.com/watch?reload=9&v=wUm71FPuVCQ&safe=active

https://www.youtube.com/watch?v=QYWNXp36O48&safe=active

https://www.youtube.com/watch?v=LXJy3T1McpM&safe=active

Culturing microorganisms

Bacteria multiply by simple cell division **(binary fission)** as often as every **20min** if they have the correct **nutrients and temperature.**
Bacteria can be grown in **nutrient broth solution** or as **colonies** on an **agar gel plate.**
WHY? Uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics.



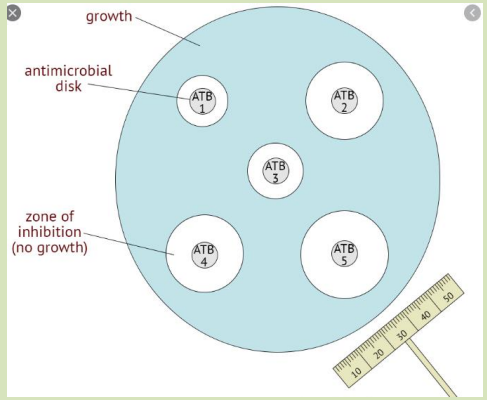
ASEPTIC TECHNIQUE

- **Sterilise Petri dishes and culture media** to prevent contamination.
- **Pass inoculating loops through a flame** to sterilise.
- **Secure lid of the Petri dish with tape** (to prevent transfer of pathogens) and store upside down to prevent condensation build up.
- In **school laboratories**, cultures should be **incubated at 25°C** to prevent growth of human pathogens which survive best at body temperature.

REQUIRED PRACTICAL: Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.
IV: this could one of a variety eg type of disinfectant, concentration of antibiotic, type of antibiotic. I have chosen one for this example.
Eg IV: type of disinfectant
DV: zone of inhibition (area of bacteria killed around the disc of disinfectant) – **measure the radius (or half the diameter).**
CV: concentration of disinfectant, size of disc.

Method:

1. Set up a culture plate using aseptic technique (mention the steps in the box above).
2. Place a drop of bacteria on the growth media and spread it with a sterile lawn spreader.
3. Add discs of filter paper soaked in the different disinfectants.
4. Leave for 24h.
5. Measure the diameter of the circles of clear area around the discs.
6. Divide the diameter by 2 to find the radius.
7. Calculate the area of the clear circles using πr^2.
8. The larger the area the more effective the disinfectant.



[HT only]
Plant diseases can be detected by:

- Stunted growth
- Spots on leaves
- Areas of decay (rot)
- Growths
- Malformed stems of leaves
- Discolouration
- The presence of pests

Identification can be made by:

- Reference to a **gardening manual or website**
- Taking infected plants to a **laboratory** to identify the pathogen
- Using testing kits that contain **monoclonal antibodies** (see B6 topic)

You just need to know the plant diseases listed on the previous table + **aphids are insects that insert a feeding tube into the phloem of plants to feed on the glucose produced by photosynthesis.**

Plants can be damaged by a range of **ion deficiency conditions**:
Stunted growth caused by **nitrate deficiency** (nitrate needed to make protein)
Chlorosis (yellow leaves) caused by **magnesium deficiency** (magnesium needed to make chlorophyll to allow photosynthesis).

Physical defence responses to resist invasion of microorganisms:
Cellulose cell walls
Tough waxy cuticle on leaves
Layers of dead cells around stems (bark) which falls off.
Chemical plant defence responses:
Antibacterial chemicals
Poisons to deter herbivores
Mechanical adaptations:
Thorns, hairs to deter animals. Leaves which droop/curl when touched.
Mimicry to trick animals.

https://www.youtube.com/watch?v=BkbLI2mAMP8&safe=active

KS4 Chemistry:
C3 Structure and Bonding

States of matter

The three states of matter are represented by simple models, where particles are shown as solid spheres and no forces are shown between these particles (limitations of this model). The amount of energy required to change state depends on the strength of the force between the particles of the substance.

State	Solid	Liquid	Gas
Closeness of particles	Very close	Close	Far apart
Arrangement of particles	Regular pattern	Randomly arranged	Randomly arranged
Movement of particles	Vibrate around a fixed position	Move around each other	Move quickly in all directions
Energy of particles	Low energy	Greater energy	Highest energy
2D diagram			

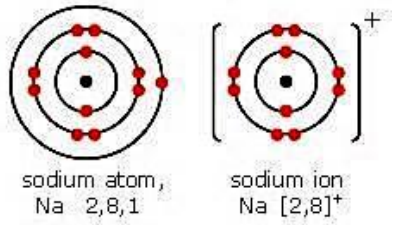
Ions

All atoms are more stable with a full outer shell of electrons. Some atoms will lose electrons to get a full outer shell: these are metals. Some atoms will gain electrons to get a full outer shell: these **are non metals**.

An ion is an atom with a positive or negative charge, these are formed by an atom gaining or losing electrons.

For example, sodium has one electron in it's outer shell, it therefore loses one electron to form a Na^{+1} ion.

We represent ions with square brackets around the ion and the charge in the top right corner.

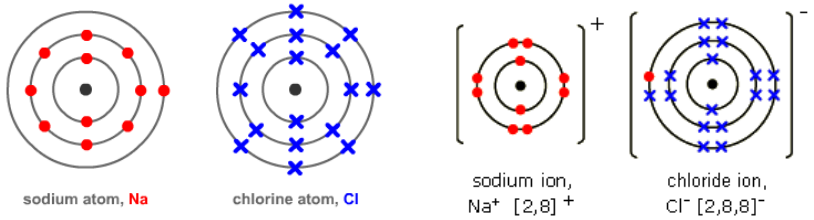


The group number indicates how many electrons an atom would loose or gain to form an ion. e.g. group two elements loose two electrons, forming $^{2+}$ ions

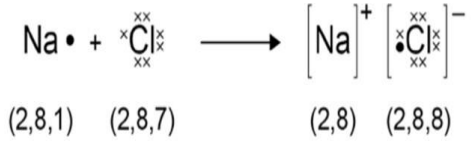
Keyword	Definition
Alloy	a mixture of two or more elements, at least one of which is a metal
covalent bond	the bond between two atoms that share one or more pairs of electrons
covalent bonding	the attraction between two atoms that share one or more pairs of electrons
delocalised electron	bonding electron that is no longer associated with any one particular atom
dot and cross diagram	a drawing to show only the arrangement of outer shell electrons of the atoms or ions in a substance
fullerene	form of the element carbon that can exist as large cage-like structures, based on hexagonal rings of carbon atoms
giant covalent structure	a huge 3D network of covalently bonded atoms, such as the bonding in silicone dioxide
giant lattice	a huge 3D network of atoms or ions
intermolecular forces	the relatively weak attraction between the individual molecules in a covalently bonded substance
ionic bond	the electrostatic force of attraction between positively and negatively charged ions
metallic bonding	The bonding that occurs in metals, due to the electrostatic force between positive metal ions and negative electrons
nanoscience	the study of very tiny particles or structures between 1 and 100 nanometres in size, where 1 nanometre = 10^{-9} metres
polymer	a substance made from very large molecules made up of many repeating units

Ionic Bonding

When a metal atom reacts with a non-metal atom electrons in the outer shell of the **metal atom are transferred to the non metal atom**. This means the metal has a positive charge and the non metal has a negative charge. This means there is an **electrostatic attraction** between the two ions, this is what forms an ionic bond. Both atoms will have **a full outer shell** (this is the same as the structure of a noble gas) see example below of sodium chloride.



Ion formation: When a metal atom reacts with a non-metal atom electrons in the outer shell of the metal atom are transferred. Metal atoms lose electrons to become positively charged ions. Non-metal atoms gain electrons to become negatively charged ions.



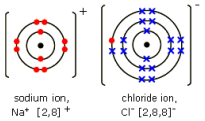
Formula of Ionic Compounds

In sodium chloride, 1 sodium atom gives an electron to a chlorine atom, therefore the empirical formula is NaCl. However there are some examples where the ratio of atoms is not 1:1. For example when sodium bonds with oxygen, sodium only wants to lose one electron but oxygen needs to gain two. So you need two sodium atoms for every oxygen so the **empirical formula is Na_2O.**

Ionic Bonding- Models

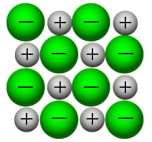
There are a number of ways we can represent ionic bonding all; of these have **advantages and limitations.** For example all the diagrams below show ways we can represent **sodium chloride**

1. Dot and cross diagrams- These show clearly how the electrons are transferred. It does not, however, show the 3D lattice structure of an ionic compound or that this is a giant compound.



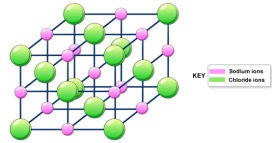
2. 2D ball and stick model of ionic bonding

This has the advantage of showing that electrostatic forces happen between oppositely charged ions in an ionic compound. However, does not show the 3D structure of an ionic compound.



3. 3D Ball and Stick model of ionic bonding

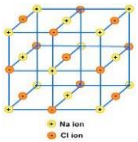
This clearly shows the 3D structure of the **ionic lattice** and how different ions interact with other ions **in all directions** to create an ionic lattice.



Properties of Ionic compounds

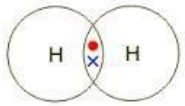
Ionic compounds have **high melting points, due to strong electrostatic forces between the oppositely charged ions.** This means a lot of energy is required to break these bonds. For example the melting point of sodium chloride is 801 °C. Ionic compounds **do not conduct electricity** as a solid. They **do conduct electricity** if they are dissolved in water (aqueous) or in the liquid state. This is because the ions are free to move, carrying the electric charge.

Ionic Lattice ionic compounds have **regular structures (giant ionic lattices)** in which there are strong **electrostatic forces** of attraction in all directions between oppositely charged ions.



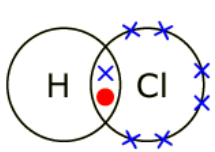
Covalent Bonding

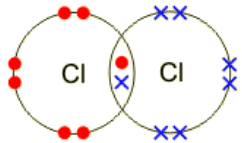
Covalent bonding occurs between non metals. Electrons are shared between the atoms, so that they have a full outer shell. Covalent bonds are strong and require a lot of energy to break. The simplest example is hydrogen: both hydrogen atoms have one electron in their outer shell. Therefore both hydrogen atoms share one electron each, to give them both a full outer shell, we can show this bond on a dot and cross diagram.

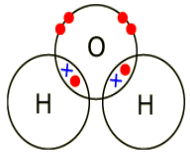


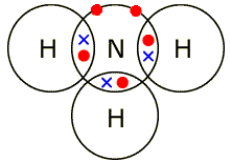
When drawing covalent molecules we use "dot cross diagrams" as we do with ionic compounds. It is important to represent the electrons on one atom with a dot and on the other atom with an X.

The first five examples, **hydrogen, chlorine, water, hydrogen chloride and ammonia (NH_3)** all share one electron per atom in a to make a full outer shell of electrons on each atom.



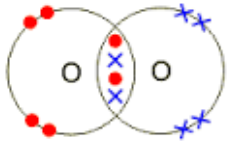


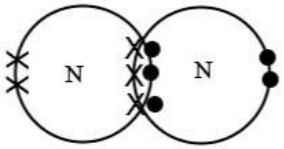




Some atoms need more than one electron to give them a full outer shell, for example oxygen needs 2 electrons to complete its outer shell. Oxygen therefore shares two electrons per atom to make a double bond. Nitrogen needs three electrons to complete its outer shell, this forms a triple bond between the two nitrogen atoms, to make a nitrogen molecule.

Covalent bonds are strong because there is an attraction between the electrons in the covalent bond and the positively charged nucleus. This means a lot of energy is required to break a covalent bond.



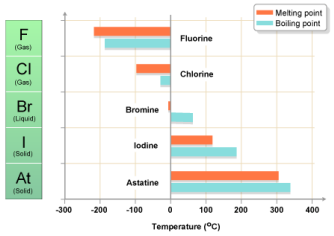


Properties of Simple Covalent Compounds

Simple covalent compounds have low melting points and are often gases at room temperature, for **example oxygen and carbon dioxide.** Although the covalent bonds between the atoms are strong, the **intermolecular forces between the molecules are weak. It is very important to remember that covalent bonds are strong but the intermolecular forces are weak .** This means that only a small amount of energy is required to overcome these weak forces.

The size of the intermolecular force between molecules increases as the molecules get larger. This is because a force called the van der Waals force increases (you do not need to know that for GCSE).

For example as you go down group 7, the boiling points increase because **the molecules get larger**.



As well as having low melting points, covalent compounds **do not conduct electricity. T**his is because they have no free electrons or ions and therefore there is nothing to carry the electric charge**.** Remember pure water does not conduct electricity, only when it has ions dissolved in it will it conduct.

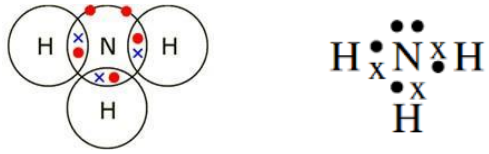
Additional information

https://www.bbc.co.uk/bitesize/topics/zq6h2nb
https://www.youtube.com/watch?v=YpEQ-NWxKBc
https://www.youtube.com/watch?v=o_jDaUe9p5o
https://www.youtube.com/watch?v=9bbCFUyIuWg

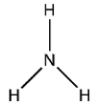
Representing Covalent Compounds

Like ionic compounds, there are variety of ways that scientists use to represent covalent compounds.

1. Dot cross diagram



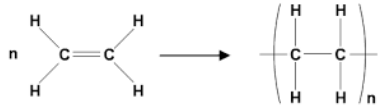
2. Ball and stick model



Polymers

Polymers are large covalent compounds which can be many thousands of atoms in length. They are made from small molecules known as **monomers.**

Rather than drawing out all the atoms in a polymer we draw a **repeating unit** which is the structure of the monomer in square brackets, with a n representing a very large number of atoms. Polymers have higher melting points than smaller covalent compounds like carbon dioxide as the intermolecular bonds are stronger. However the bonds are not as strong as they are in ionic or giant covalent compounds so the melting points are lower than those compounds.



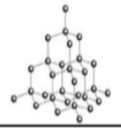
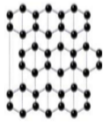
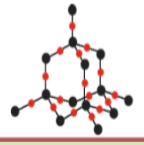
n = a big number of monomers

Giant Covalent Compounds

In a giant covalent structure all atoms are bonded to each other by strong covalent bonds.

Giant covalent compounds have a **high melting point** because many strong covalent bonds need to be broken and this requires a lot of energy.

There are three examples you need to know, diamond, graphite and silicone dioxide - often called silica (see table)

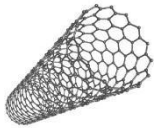
Substance	Diagram	Description	Properties
Diamond		Each carbon is covalently bonded to four other carbons	Very hard, very high melting point, due to strong covalent bonds. Does not conduct electricity – no free electrons/ions.
Graphite		Each carbon is covalently bonded to 3 other carbons, there are weak (non covalent) bonds between the layers.	High melting point, conductor of electricity due to **delocalised electrons which can carry a charge.** Slippery as layers can slide over each other
Silica		Every silicon atom is bonded to 2 oxygen atoms and vice versa	High melting point

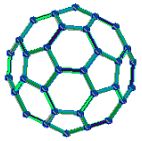
Graphene and Fullerenes

There are other forms of carbon which have been discovered recently: **graphene is a single layer of graphite** so it is 1 atom thick.

Fullerenes are molecules of carbon with hollow shapes. The most famous example is Buckminsterfullerene (C60).

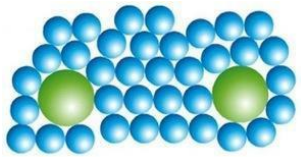
Fullerenes have use in drug delivery and as catalysts. Carbon nanotubes are cylinder shaped fullerenes, these are strong and are excellent conductors of both **heat and electricity.**





Alloys

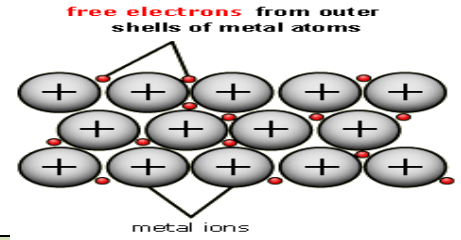
Alloys are mixtures of **2 or more elements, one of which is a metal.** Examples of alloys include brass and steel. Metals are alloyed so that the regular structure of metals is changed and the layers of ions can no longer slide over one another; therefore making it much stronger.



Metallic Bonding

Metals form giant structures. The metal atoms form a regular pattern and the donate their outer electron to the **"sea of delocalised electrons".** These electrons are free to move. The 2D structure of metallic bonding looks like this:

This would be the structure of a group 1 metal like sodium, if it were a group 2 metal like magnesium then the charge on the ions would be Mg^{2+}.



Nanoparticles

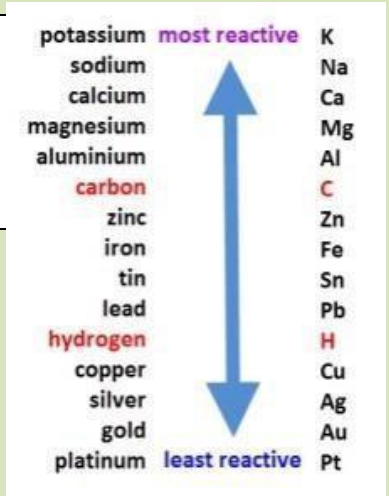
Nanoparticles have a diameter **between 1 nm and 100 nm**, this means they are only a few hundred atoms in size. Nanoparticles have an **extremely large surface area to volume ratio**, this gives them a variety of useful properties.

- The targeted delivery of drugs- they are more easily absorbed into the body and therefore could be use to deliver drugs to specific tissues.
- Making synthetic skin
- Silver nanoparticles have antibacterial properties. These can be used in things like clothing, deodorants and surgical masks.
- Some nanoparticles are electrical conductors, these can be used to make components in very small circuit boards.
- cosmetics, to make them less oily
- sun creams, they provide better protection from UV than conventional sun creams. They also provide better skin coverage.

Properties of Metals

Metals are **good conductors of electricity**, due to the delocalised electrons, which can carry the electric charge. Metals are also **good conductors of heat** as the free electrons can transfer the heat energy through the metal.
Metals are also **malleable** (bendy) as the layers of ions can easily slide over one another. This means that many pure metals are too soft for uses such as building.

Reactivity of metals When a metal reacts it **forms a positive ion.** The easier it is for a metal to form a positive ion, the more reactive it is. This is shown in the reactivity series; you should memorise the position of different elements:



Dangers on Nanomaterials

The long term affects of nanomaterials on the body have not been well researched. For example when using sun cream, nanoparticles are absorbed through the skin. The affects of long term exposure to these has not been well researched. Some people believe anything containing nanoparticles should be clearly labelled.

KS4 Chemistry C4 Chemical Calculations (Separate Foundation)

$$2PbS(s) + 3O_2(g) \rightarrow 2PbO(s) + 2SO_2(g)$$

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

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

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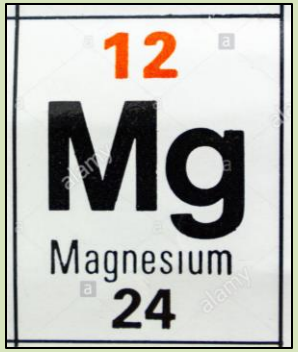
$$= \frac{M_r(2PbO)}{[M_r(2PbS) + M_r(3O_2)]} \times 100\%$$

$$= \frac{2 \times (207 + 16)}{[2 \times (207 + 32)] + [3 \times (16 \times 2)]} \times 100\%$$

$$= \frac{446}{(478 + 96)} \times 100\%$$

$$= 77.7\%$$



Relative formula mass is all the atomic masses in a compound added up.
E.g. CO_2 is 12+16+16 = 44

Further Reading:
https://www.youtube.com/watch?v=q49NwIrjaFw&safe=active
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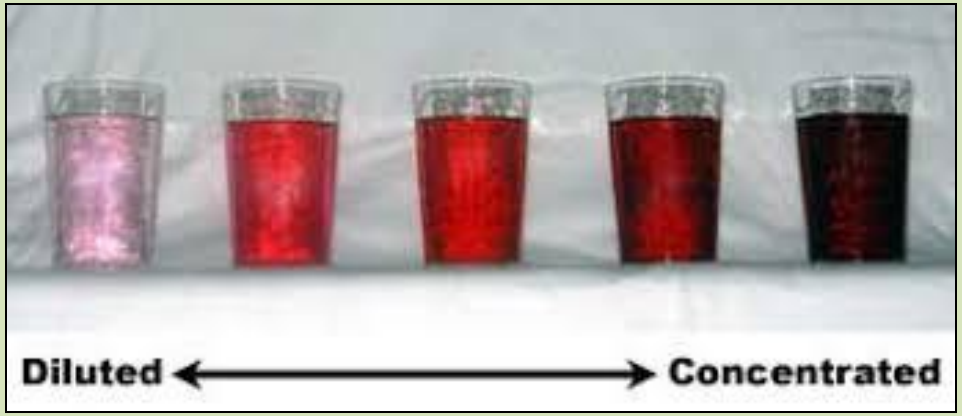
Concentration is a measure of how many particles there are.
High concentration means lots of particles, low concentration means less.



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

Concentration is measured in g/dm^3

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

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

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

Mass = concentration x volume

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 %.

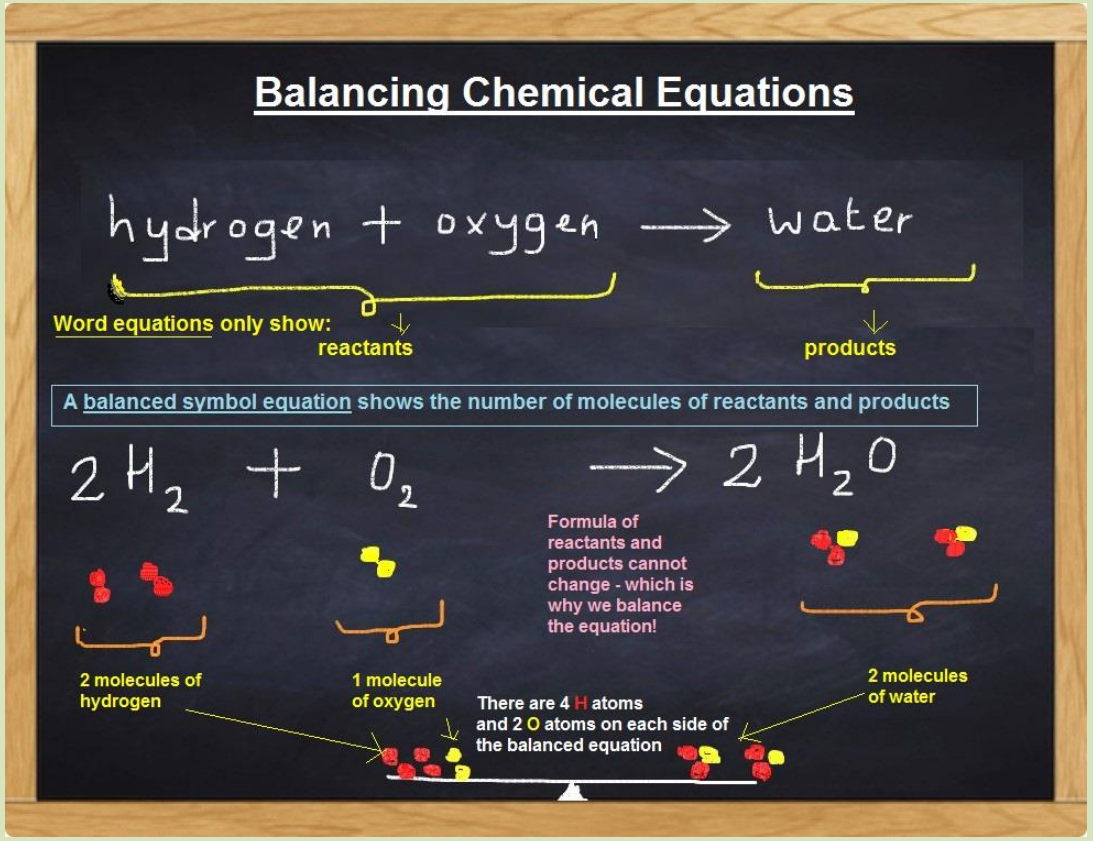
The yield is affected by …
How much product is left in the beaker,
Reactions not fully completing,
Impurities making other products,
Product left in other equipment and on filter papers.

$$\text{Percentage yield} = \frac{\text{actual mass of product made}}{\text{calculated theoretical maximum amount possible}} \times 100$$

This can be simplified to $\text{Percentage yield} = \frac{\text{actual mass}}{\text{theoretical mass}} \times 100$

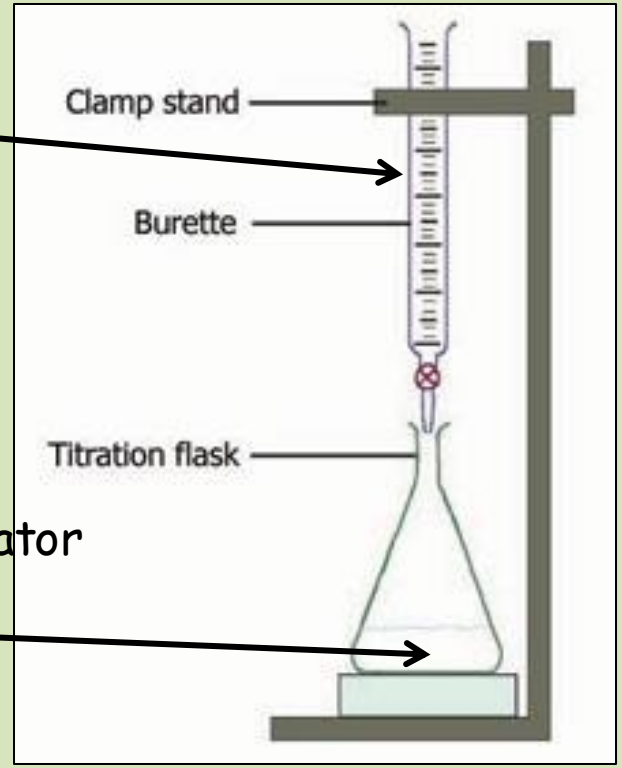
E.g. If it was calculated that 56 tonnes of calcium oxide was to be made and only 45 tonnes were made
Percentage yield = (45/56) x 100 = 80%

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.

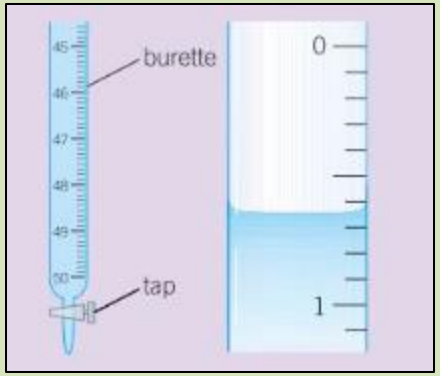


Titration required practical

Acid



Alkali and indicator



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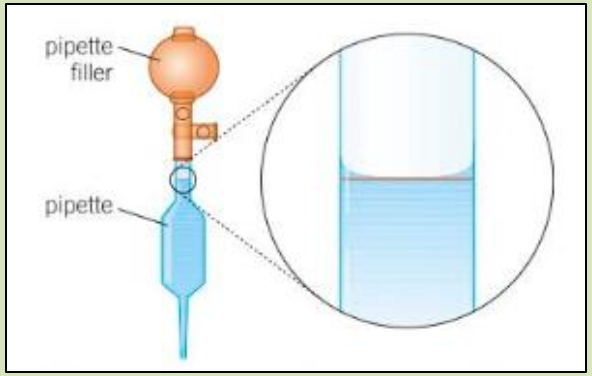

Firstly do a rough run to get an idea of how much acid is needed.
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KS4 Chemistry C4 Chemical Calculations (Separate Higher)

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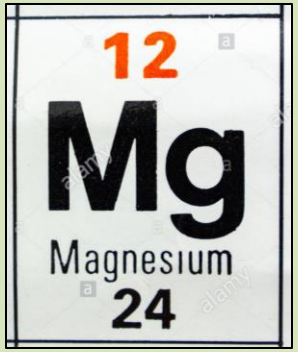

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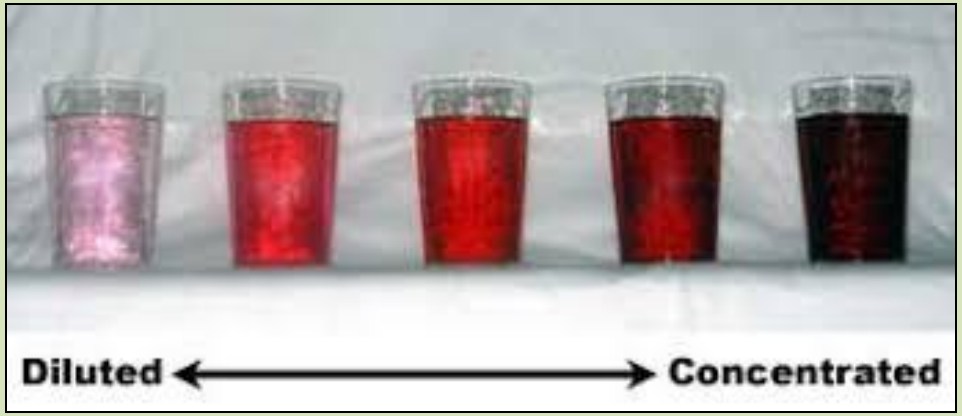

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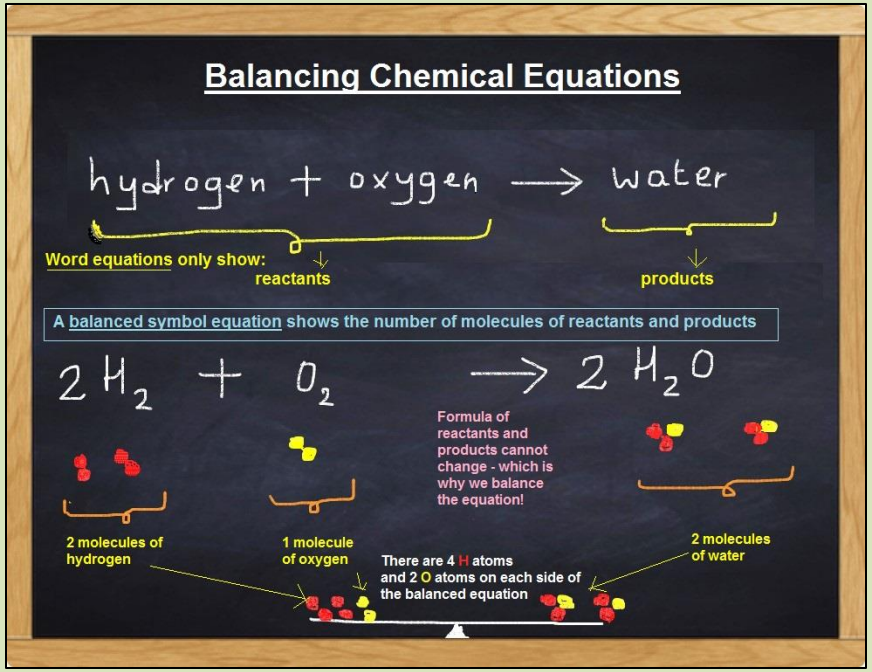
E.g. If it was calculated that 56 tonnes of calcium oxide was to be made and only 45 tonnes were made
Percentage yield = (45/56) x 100 = 80%

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.



one hydrogen molecule		one chlorine molecule		two hydrogen chloride molecules
H_2	+	Cl_2	→	2HCl
1 mole of hydrogen molecules		1 mole of chlorine molecules		2 moles of hydrogen chloride molecules

H_2 + Cl_2 → 2HCl If we divide all by 2 …
1g 35.5g 36.5g If we multiplied all by 8 …
8g 284g 292g

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

H_2 + Cl_2 → 2HCl
2x1=2 2x35.5=71 2x (1+35.5) = 73
2g 71g 73g

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

sodium nitrate → sodium nitrite + oxygen
8.5 g = 6.9 g + x g
(8.5 – 6.9) g = x g
1.6 g = mass of oxygen

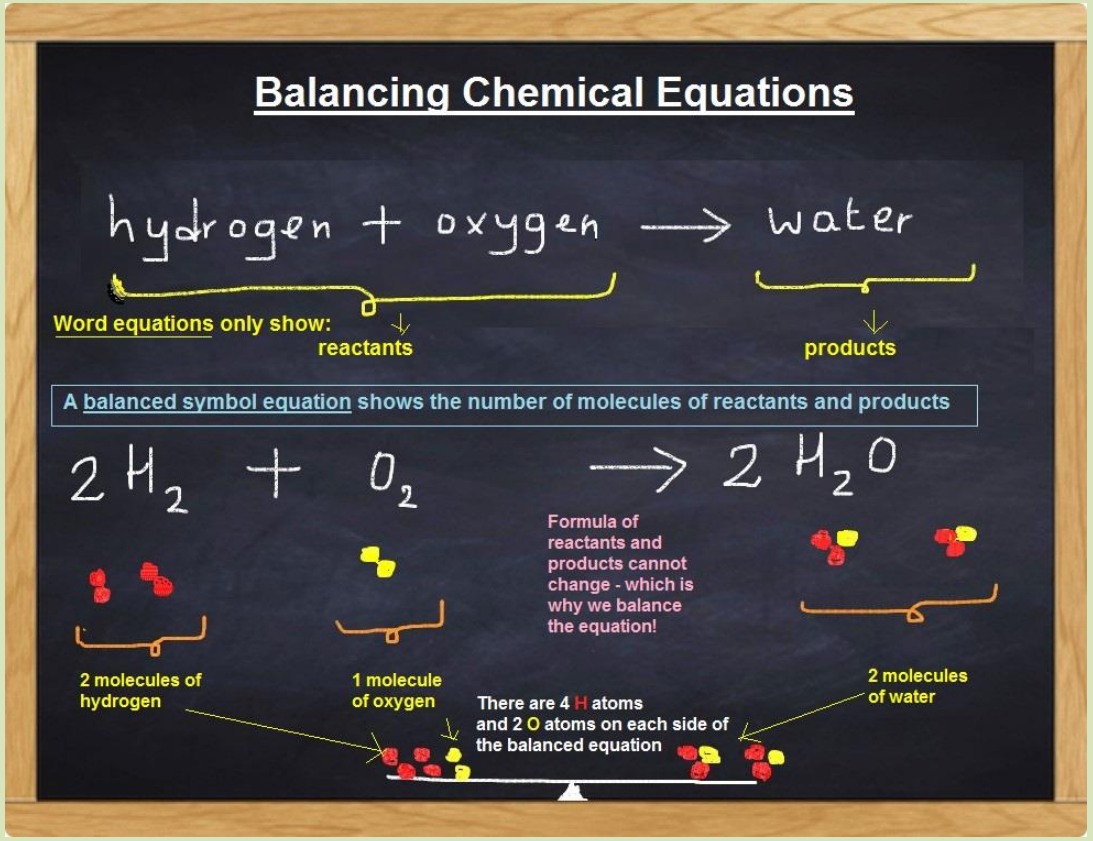
Calculate RFM and divide the mass by it to get number of moles. E.g. …

moles of $NaNO_3$ = $\frac{8.5}{85}$ = 0.1 mol
moles of $NaNO_2$ = $\frac{6.9}{69}$ = 0.1 mol
moles of O_2 = $\frac{1.6}{32}$ = 0.05 mol

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

sodium nitrate → sodium nitrite + oxygen
8.5 g = 6.9 g + x g
(8.5 – 6.9) g = x g
1.6 g = mass of oxygen

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

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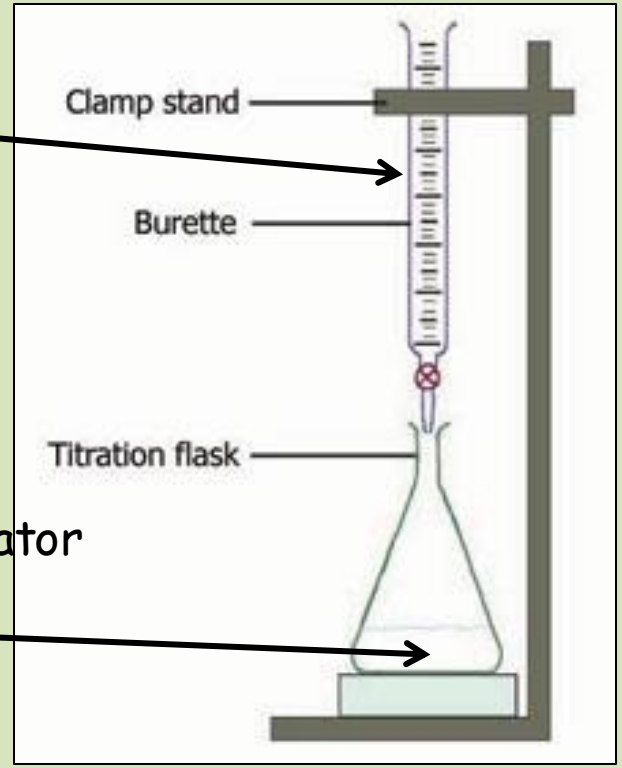

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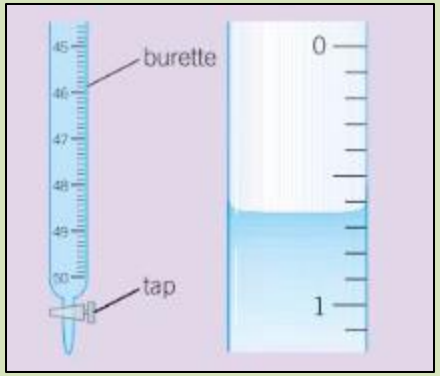

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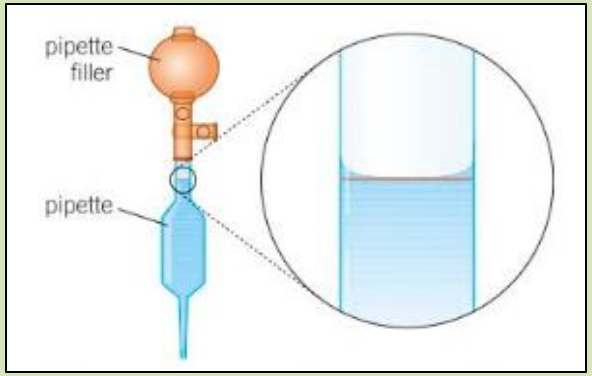
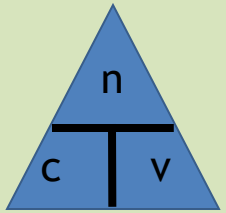


Firstly do a rough run to get an idea of how much acid is needed.
Then repeat until 3 concordant results have been obtained.
Each result is called a titre. Concordant results are within 0.1cm^3.

Titration calculations



Number of moles = volume(dm^3)×concentration (mol/dm^3)

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

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

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:

Acid	Alkali
n = C x V = Calculate	n = ? Step 4
C = Given	C = ? Step 5
V = Average titre in dm^3	V = Given in dm^3

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.

STEP 1: $2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$
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:

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

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

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.

$$2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$$

A certain volume of gas always contains the same number of molecules of gas.
1 mole of ANY gas is 24 dm^3 (24 000 cm^3).
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.

If an air bag is inflated by 70.0g of nitrogen, N_2, what volume is that?
Number of moles = mass/formula mass = 70.0/28 = 2.5
Volume = number of moles x24 = 2.5 x 24 = 60 dm^3

Na =23, N=14
Formula mass of NaN_3 = 23 = (14 x 3) = 65

If only 48 dm^3 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 …
⅓NaN_3 → ⅓Na + N_2
and multiply all by 2 …
4/3NaN_3 → 4/3Na + 2N_2

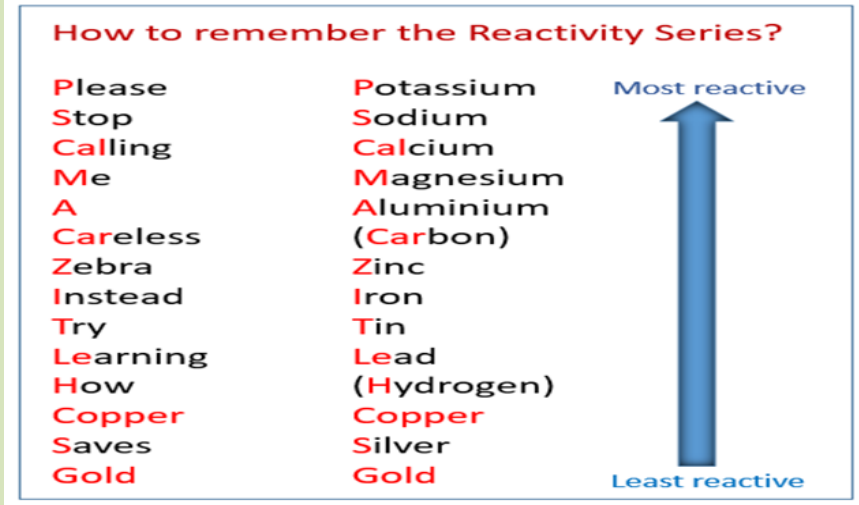
This means that mass of NaN_3 needed is …
Mass = moles x formula mass = 4/3 x 65 = 86.7g

KS4 Chemistry – C5 Chemical Changes

Reactivity Series

A *list* of metals in order of how reactive they are:
Some metals are *very reactive* (at the top) and react easily in chemical reactions. E.g. Sodium
Some metals are u*nreactive* (at the bottom) and do not react easily or at all in reaction e.g. gold

Further reading:
https://www.youtube.com/watch?v=KTmXEIiU_Go&safe=active
https://www.bbc.co.uk/bitesize/topics/zcdj97h



Displacement Reactions

Displacement reactions involve a metal and a compound of a different metal; the more reactive metal *displaces* (pushes out) the less reactive metal from its compound:

Magnesium + Copper Sulfate → Magnesium sulfate + copper
$Mg\ (s) + CuSO_4\ (aq) \rightarrow MgSO_4\ (aq) + Cu\ (s)$

Ionic Equations (H tier only)

$Mg\ (s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu\ (s)$

Half Equations (H tier only)

At the anode: $Mg\ (s) - 2e^- \longrightarrow Mg^{2+}(aq)$
At the cathode: $Cu^{2+}(aq) + 2e^- \longrightarrow Cu\ (s)$

Keyword	Definition
Acid	An acid has a pH value of less than 7
Alkali	Its solution has a pH value more than 7
Base	A soluble alkali that forms a salt when it reacts with an acid
Displacement reaction	When a more reactive metal replaces a less reactive metal in a compound
Electrolysis	The breakdown of a substance containing ions by electricity
Indicator	A substance that changes colour when added to acids or alkalis
Insoluble	Does not dissolve in water
Neutralisation	The reaction of an acid with a base producing salt and water
Ore	Rock which contains enough metal to make it economically worth extracting
Oxidation	The reaction when oxygen is added to a substance or electrons are lost
pH Scale	A number which hshows how strongly acid or alkaline and solution is
Reduction	A reaction in which oxygen is removed or electrons are gained
Salts	A compound formed when some of the H in an acid is replaced by a metal
Soluble	Dissolves in water
Reactivity Series	A list of metals showing how reactive they are
Half Equation	An equation that describes the gain or loss of electrons
Ionic Equation	An equations that shows only those ions or atoms that change in a chemical reaction
Strong Acid	An acid that completely dissociated into ions in solution e.g. nitric acid
Weak Acid	An acid that is only partly ionized e.g. ethanoic acid

KS4 Chemistry – C5 Chemical Changes

OILRIG is a useful way of remembering:
Oxidation Is Losing
Reduction Is Gaining (electrons)

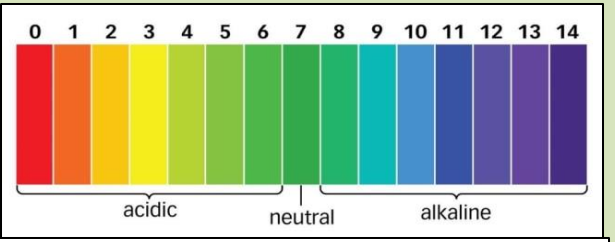
Reduction of metals by carbon and hydrogen

The oxides of metals below carbon in the series can be reduced by carbon

Metal oxide + carbon → metal + carbon dioxide

e.g. lead oxide + carbon → ead + carbon dioxide

$2PbO\ (s) + C\ (s) \rightarrow {}^{2}Pb\ (l) + CO_2\ (g)$



Making Salts

There are various ways salts can be made. You need to know the products.

Acid + metal → salt + Hydrogen

Acid + Base → salt + Water

Acid + Alkali → salt + Water

Acid + metal carbonate → salt + water + Carbon dioxide

pH Scale

Universal Indicator changes colour depending on the pH of a solution.
Acids can be dilute (lots of water) or concentrated (less water)
Weak Acids e.g. citric acid are not harmful even when in concentrated solutions
Strong acids e.g. hydrochloric acid can be harmful even when diluted

Names of Salts

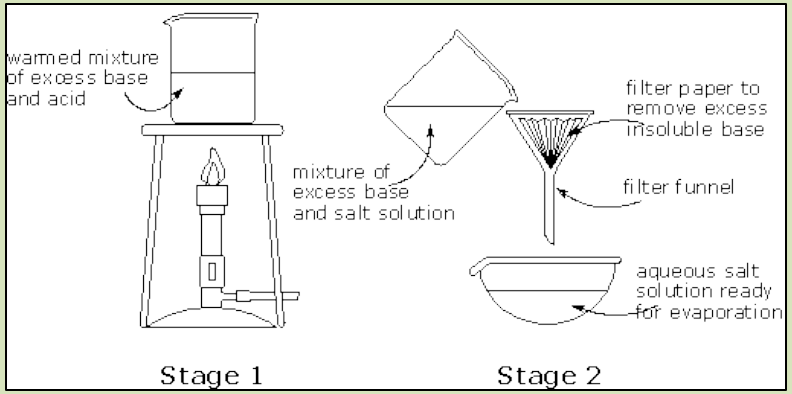
The acid used provides the negative ions present in all salts.
Hydrochloric acids make salts called ***chlorides*** containing Cl^- ions
Sulphuric acid H_2SO_4 makes ***sulphates*** containing SO_4^{2-} ions
Nitric acid HNO_3 makes ***nitrates*** called NO_3^- ions

Making a copper salt – this is a required practical

Sulphuric acid + copper oxide → opper sulphate + water

$H_2SO_4\ (l) + CuO\ (s) \rightarrow uSO_4\ (aq) + H_2O\ (l)$

Method:
Add EXCESS insoluble copper oxide to sulphuric acid and stir
Warm gently on a tripod – the solution will turn blue
Filter off excess copper oxide
Evaporate the water so that crystals of copper sulphate start to form
Stop heating when you have evaporated about half the water and allow the rest of the water to evaporate off naturally



Making a salt from a metal carbonate is also a required practical

KS4 Physics: Energy transfer

Types of energy store

- Kinetic energy store
- Sound energy store
- Light energy store
- Elastic potential energy store
- Thermal energy store
- Gravitational potential energy store
- Electrical energy store
- Chemical energy store
- Nuclear energy store
- Magnetic energy store

➢ Energy stored by moving objects

➢ Energy stored in compressed springs or stretched elastic bands

➢ Energy stored by lifting something against the force of gravity

➢ Energy stored in chemical bonds examples include batteries, coal, gas, and food. Released by chemical reactions.

Energy is measured in Joules (J)

Energy can be transferred:
Mechanically when work is done by a force
Electrically when a moving charge does work
By **Heating** when energy is transferred from a hot object to a cooler one

Energy transformations

Energy transformations describe how the transforms from one form to another.

Chemical energy store → kinetic energy store + sound energy store + thermal energy store

Chemical energy store → Electrical energy store → Light energy store + thermal energy store

The arrow means transforms into

Key words	
Power	The amount of energy transferred per second measured in Watts (W).
Work (work done)	The energy transferred by a force. **Work done** means **Energy transferred**
Conservation of energy	Energy can not be created or destroyed, only transformed from one form to another.
Energy dissipation	Energy transferred to the surroundings, usually as thermal energy or sound.
Friction	A force the opposes the motion of an object.
Efficiency	The proportion energy transferred in a useful way. Given as a percentage, decimal of fraction.
A system	An object or group of objects – In a closed system the energy before and after energy transformations always remain the same.

Friction: When you apply the brakes in a car, the brake pads do work on the brake disks causing the wheel's kinetic energy store to transfer to the thermal energy store of the break disks, resulting in the car slowing down.

input energy: Electrical energy store **200J** → useful output energy: Thermal energy store **160J** + wasted energy: light energy store **40J**

Orders of Magnitude:

1W	1W	Watt	1
1KW	**1,000**W	**Kilo** Watt	$1x10^3$
1MW	**1,000,000**W	**Mega** Watt	$1x10^6$
1GW	**1,000,000,000** W	**Giga** Watt	$1x10^9$

Equations for this topic:

Example Calculation: Calculate the work done if a person lifts a 10N weight 1.5m off the ground?

Work done = Force x distance

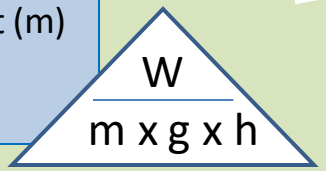
W = F x d

W = 10 x 1.5

W = 15J

Always write out the equation you will use, substitute in the numbers, calculate the answer and give the unit

…nal (N/Kg) x height (m)
…ength



Energy stored = ½ x Spring constant (N/m) x extension ^{2} (m) in a spring(J)

$E_e = ½ kx^2$

Kinetic energy (J) = ½ x mass (Kg) x velocity ^{2} (m/s)

$E_k = ½ mv^2$

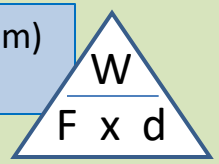
E Energy	**F Force**
P Power	**d distance**
g gravitational field strength	**t time**
E_k Kinetic energy	**v velocity**
E_p Gravitational potential energy	**x extension**
E_e Elastic potential energy	**h height**

Efficiency = $\left(\frac{\text{Useful power output}}{\text{Total power input}}\right)$ x 100

Efficiency = $\left(\frac{\text{Useful energy output}}{\text{Total energy input}}\right)$ x 100

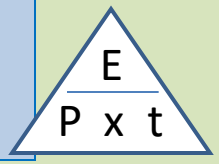
Work done (J) = Force (N) x distance (m)

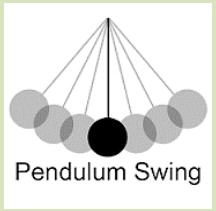
W = F x d



Power (W) = $\frac{\text{Energy (J)}}{\text{Time (s)}}$

$P = \frac{E}{t}$

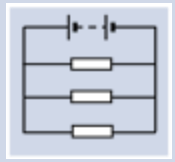
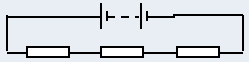


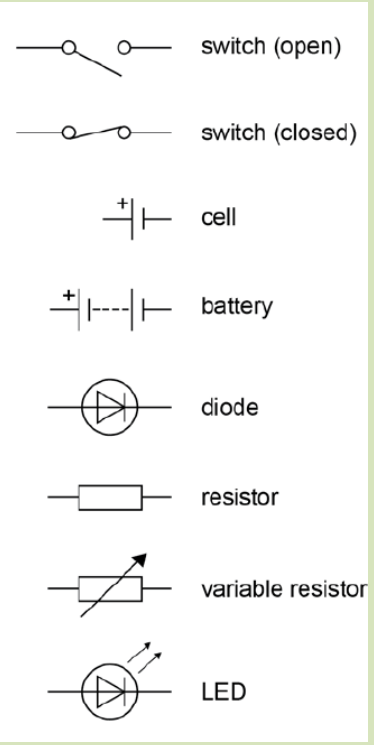


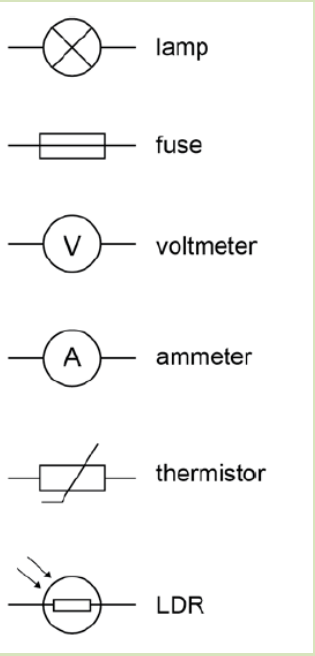
Energy dissipation: A pendulum eventually comes to rest as **energy is transferred to the surrounding**. Energy is **dissipated** as heat caused by friction and air resistance.

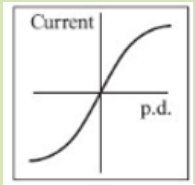
Energy dissipation: When a ball falls, its gravitational potential energy store decreases and its kinetic energy store increases. When it bounces some energy is transferred to the thermal energy store of the ball and ground. Eventually the original energy is transferred to the thermal energy store of the surroundings

KS4 Physics: Electrical circuits

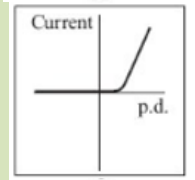
Key words	
Current	The flow of charge. Negatively charged electrons flow in the wire. The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. The greater the resistance of the component the smaller the current for a given potential difference (pd) across the component.
Charge	Charge is a property of a body which experiences a force in an electric field. Charge is measured in coulombs (C).
Potential difference (Voltage)	A measure of the difference in electrical energy between two parts of a circuit. Measured in Volts. It tells us how many joules of energy is transferred by each coulomb of charge. *You will only ever be asked about **potential difference** in exam questions however most equations refer to voltage. So for your GCSEs remember **voltage** is the same as **potential difference***
Resistance	The wires and the other components in a circuit reduces the flow of charge through them. This is called resistance. Resistance is measured in Ohms.
Parallel circuits 	In parallel circuits, electrical components are connected alongside one another, forming extra loops. When two components are connected in parallel, an individual charge will flow through one of the components only, not both.
Series circuits 	When components are connected in series a charge will flow through all the components in the circuit



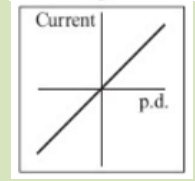




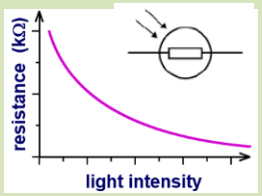
Filament bulb: As you pass a voltage across a filament lamp, the filament wire gets hotter. This causes the ions in the wire to vibrate faster making it harder for electrons to flow, increasing the resistance. As you increase the voltage the current increases but at a decreasing rate.



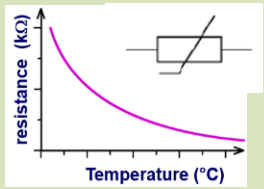
Diode: Diodes only allow current to flow in one direction. In the other direction they have an extremely high resistance



Resistor: For a resistor at a constant temperature current is directly proportional to voltage. The resistance remains constant.

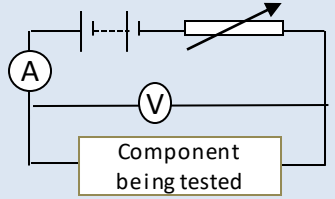


Light dependent resistor (LDR): As the light intensity increases the resistance of an LDR deceases. They are often used as light sensors.

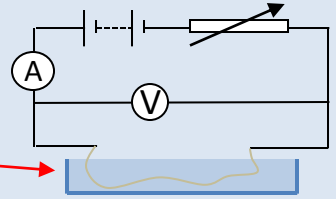


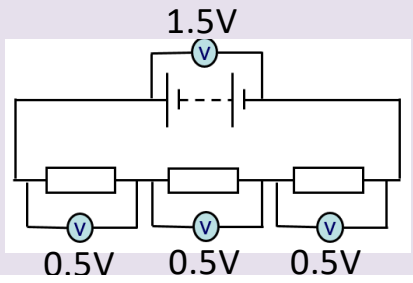
Thermistor: As the temperature of a thermistor increases the resistance deceases. They are often used in thermostats and temperature sensors.

Required practical 4 – investigate the how potential difference affects current for a diode, filament lamp and resistor at constant temperature.

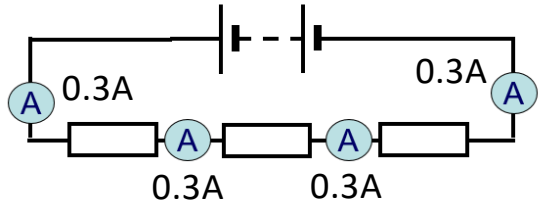


Through of water with wire submerged to maintain a constant temperature





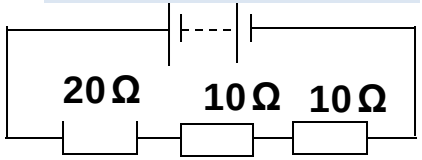
In Series
Potential difference is shared across each component depending on the resistance of each component



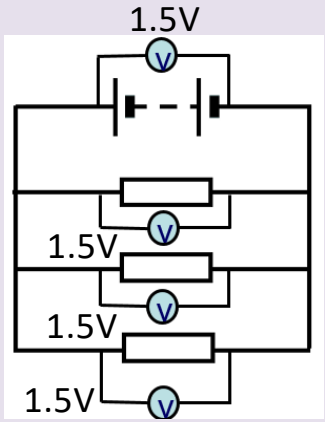
Current is the same every where in the circuit

When **resistors** are connected in **series** the total resistance of the circuit is the sum of their resistances.

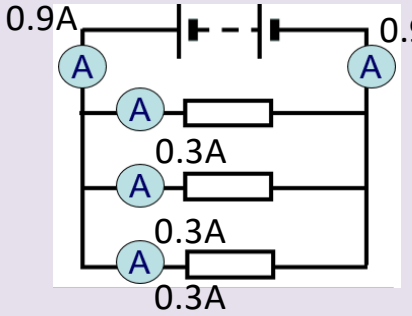
$R_T = R_1 + R_2 + R_3$



total resistance = 20 + 10 + 10 = **40 Ω**



In Parallel
Potential difference the same across each branch of the circuit



Current is shared across each branch of the circuit depending on the resistance of each component

When **resistors** are connected in **parallel**, then the total resistance of the circuit decreases. Even though you have added another resistor, you have given more pathways for current to flow, thus reducing the overall resistance.

KS4 Physics: Electrical circuits

$$Q = I\ t$$

Charge = current x time

Q / I x t

$I = \frac{Q}{t}$

This equation helps us understand current, current is the amount of charge passing a point in a given time (1 Amp = 1 coulomb per second)

$$V = I\ R$$

Voltage = current x Resistance

Potential difference (V, Volts) (A, Amps) (Ω, Ohms)

V / I x R

$$V = \frac{E}{Q}$$

Potential difference Voltage (V, Volts) = Energy (J, Joules) / Charge (C, Coulombs)

E / V x Q

This equation helps us understand voltage, it tells us that voltage is the amount of energy per coulomb of charge

Required practical 3

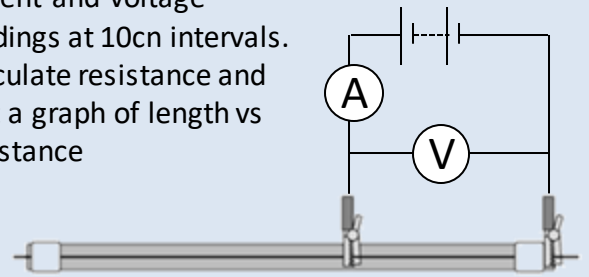
How does length of a wire affect its resistance

IV – length of wire

DV – current and voltage (to calculate resistance)

CVs – cross sectional area of wire, temperature of wire, input voltage

Attach a piece of resistance wire to a meter rule. Take current and Voltage readings at 10cn intervals. Calculate resistance and plot a graph of length vs resistance



Symbols to remember:

V Voltage or Potential difference
I Current
P Power
R Resistance
t Time
E Energy

Power, Current, Voltage

$$P = I \times V$$

Power (W, Watts) = current (A, Amps) x Voltage (V, Volts) Potential difference

P / I x V

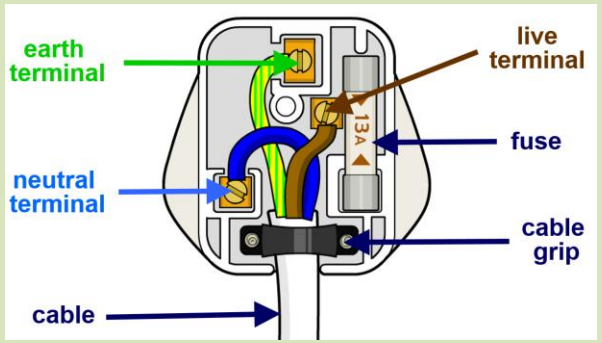
Power, Current, Resistance

$$P = I^2 R$$

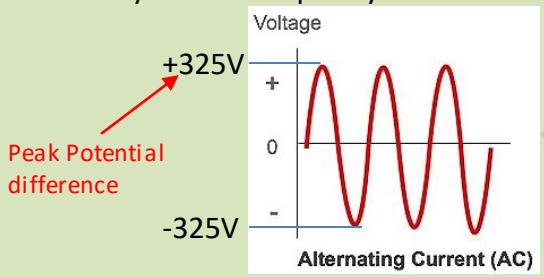
Power (W, Watts) = current (A, Amps) x Resistance (Ω, Ohms)

P / I^2 x R

KS4 Physics: Electricity in the home

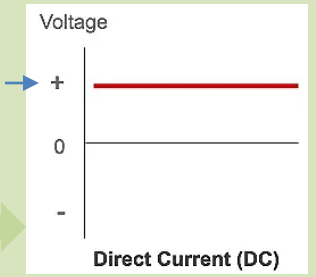


Mains electricity is an **Alternating Current** (AC). The current switches repeatedly from + to –
The electrons flow back and forth in the wire. It does this 50 times a second. We say it has a frequency of 50Hz.

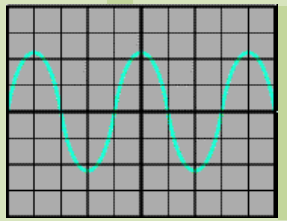


Frequency = $\frac{1}{\text{time taken for 1 cycle}}$

Cells and batteries supply **Direct current**. The electrons in the circuit only travel in **one direction** around the circuit.



These are called oscilloscope traces



Each square on the y axis represents the potential difference (voltage) measured. Each square on the x axis represents a time

If each square on the x-axis represented 0.02s the period of the Alternating current would be 0.08s. The frequency would be 12.5Hz (F = 1/T)

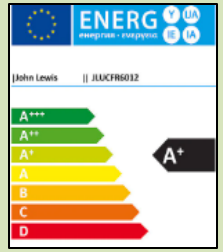
Live wire	**brown**	The live wire carries the alternating potential difference from the supply. The potential difference between the live wire and earth (0 V) is about 230 V (It alternates between +325V and -325 volts)
Neutral wire	**blue**	The neutral wire completes the circuit. The neutral wire is at, or close to, earth potential (0 V).
Earth wire	**green and yellow stripes**	The earth wire is a safety wire to stop the appliance becoming live. The earth wire is at 0 V. If a fault occurs connecting the live wire to the case of the appliance, the current will travel down the earth wire instead of a person! (avoiding an electric shock). If the case of your device has a plastic outer case then it would not need an earth wire as the case could not become live
Fuses		Fuses protect the appliance if the current gets to high. A fuse contains a piece of wire that melts if the current increases above a particular value. Fuses commonly come in 3A, 5A and 13A. If your appliance runs at 3.8A you would use a 5A fuse
Cable		Most electrical appliances are connected to the mains using three core cable. The insulation covering each wire is colour coded for easy identification.

Efficiency = $\frac{\text{Useful energy output}}{\text{Total energy input}} \times 100$

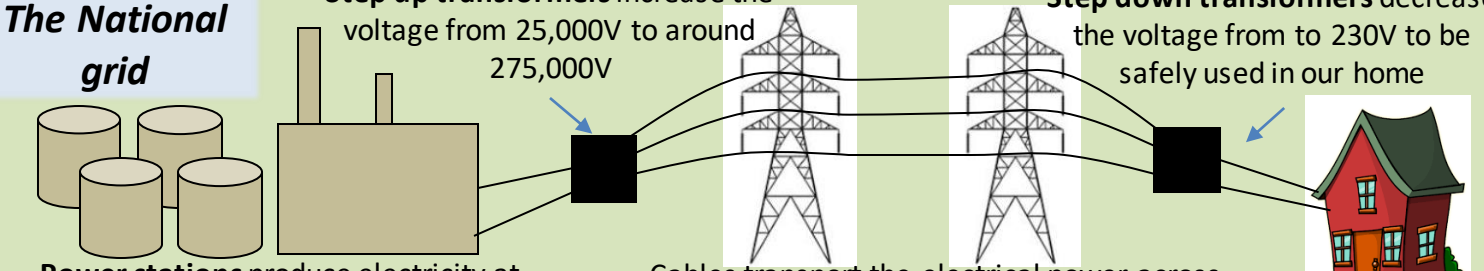
Efficiency = $\frac{\text{Useful power output}}{\text{Total power input}} \times 100$

The efficiency of electrical appliances is very important. An efficient appliance will transfer a high proportion of the electrical energy in a useful way.

Consumers can identify the efficiency of appliances using a rating system



The National grid



Power stations produce electricity at about **25,000V**

Step up transformers increase the voltage from 25,000V to around 275,000V

Cables transport the electrical power across the country at **275,000V**

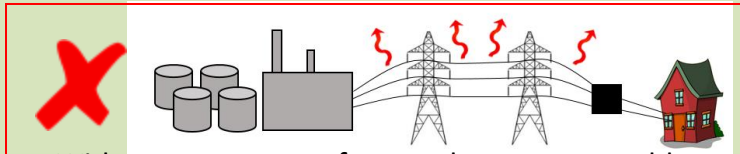
Step down transformers decrease the voltage from to 230V to be safely used in our home

Step up transformers:
Increase voltage
Decrease current
Step down transformers:
Increase voltage
Decrease current

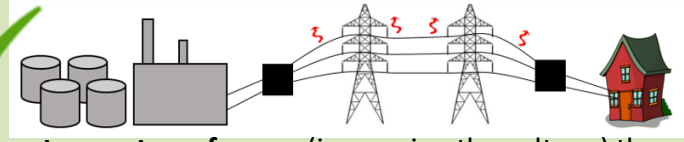
Reducing electrical energy losses

When electrical current passes through a wire it becomes hot. This means electrical power is being transferred to heat, resulting in less power being delivered to our homes.

The higher the current the greater the heating in the wires. Therefore electrical energy needs to be transferred through the cables at a low current. Step up transformers increase the voltage, which decreases the current, so electrical energy is transferred at very high voltages



With no step up transformer, the current would remain high and electrical power would be lost as it transfers to heat energy in the wires, and then to the surroundings

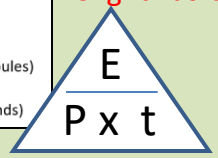


With a **step up transformer** (increasing the voltage) the current would reduce resulting in much less heating in the wires, resulting in more electrical power being supplied to the home.

Power, Energy, Time

$$P = \frac{E}{t}$$

Power = Energy (J, Joules) / time (s, seconds)
(W, Watts)

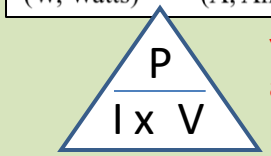


Power is the amount of energy used every second. You can work out how much energy you have used with an appliance if you know the power rating of the appliance and how long it has been on for.

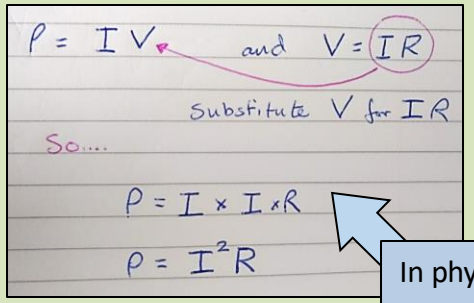
Power, Current, Potential difference

$$P = I \times V$$

Power = current x Voltage (Potential difference)
(W, Watts) (A, Amps) (V, Volts)



You can also work out the power of an appliance if you know the potential difference and the current.



How it works..

2000W of power could be transported at 100A and 20V
(P = IxV , 20x100 = 2000W)
However if you increased the voltage to 1000V using a step up transformer, the current would reduce to 2A reducing power losses due to heating
(P = IxV, so 2 x 1000 = 2000W

In physics you can combine equations. This can be useful if it appears you don't have the right data in the question.

You may also face questions where you need to use one equation first, followed by a second equation

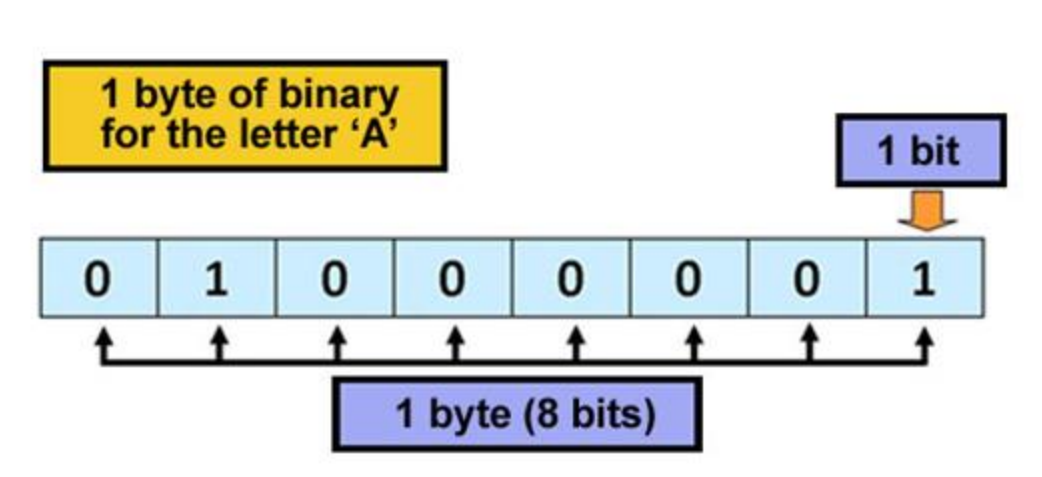
Computational Thinking: Term 1

Data Representation

- 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

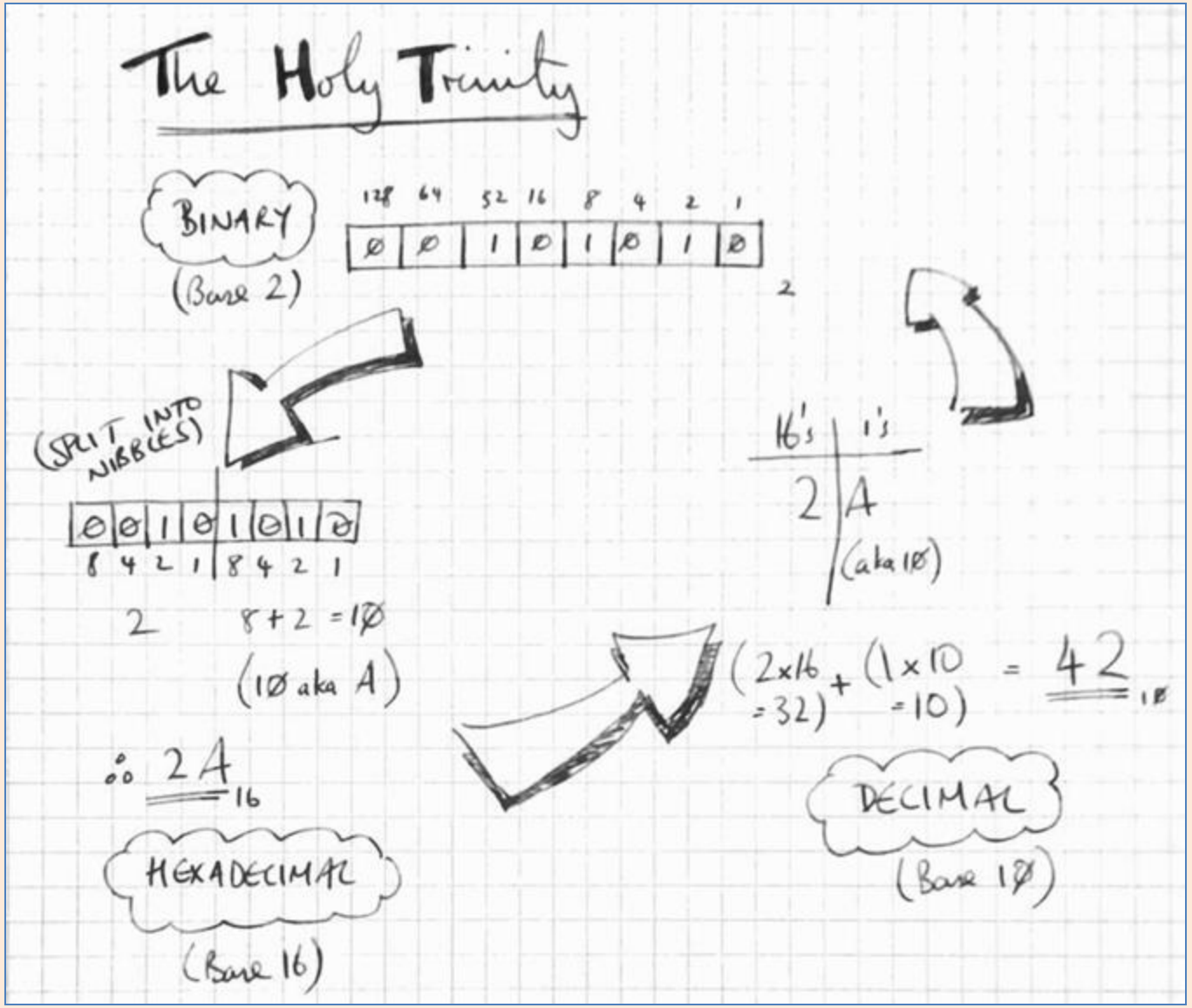
2 + 4 + 16 = 22



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

Computational Thinking:



Representing numbers digitally

Binary shifts:

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

Representing characters:

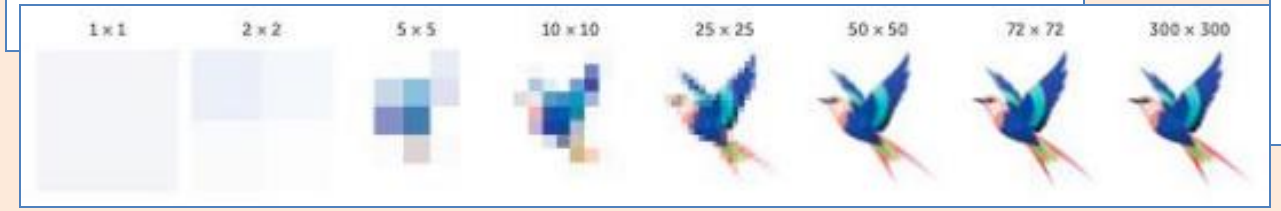
- ASCII (7bit)
- Extended ASCII (8bit)
- Unicode (16bit)

Computational Thinking:

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

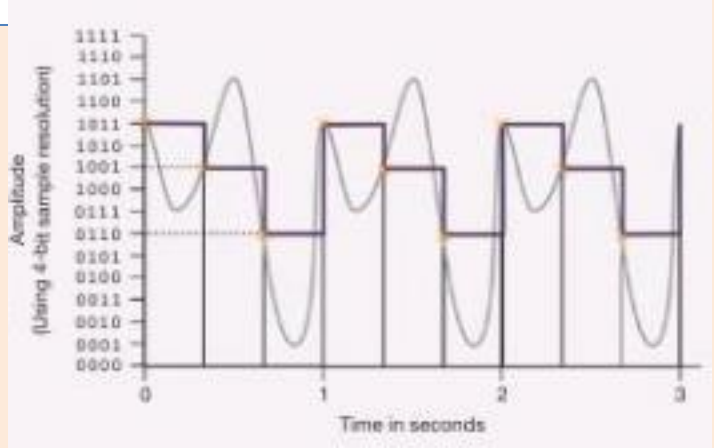
- Image described in terms of polygons
- Image needs to be created each time it is viewed (rendered) by the viewing program. It follows the instructions and draws each polygon in turn.
- File size is proportionate to the complexity of the image (number of polygons)
- As the image is re-drawn each time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

Computational Thinking:

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

Computational Thinking:

Compression

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

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

Computational Thinking:

Networking - connecting x2+ nodes to send data

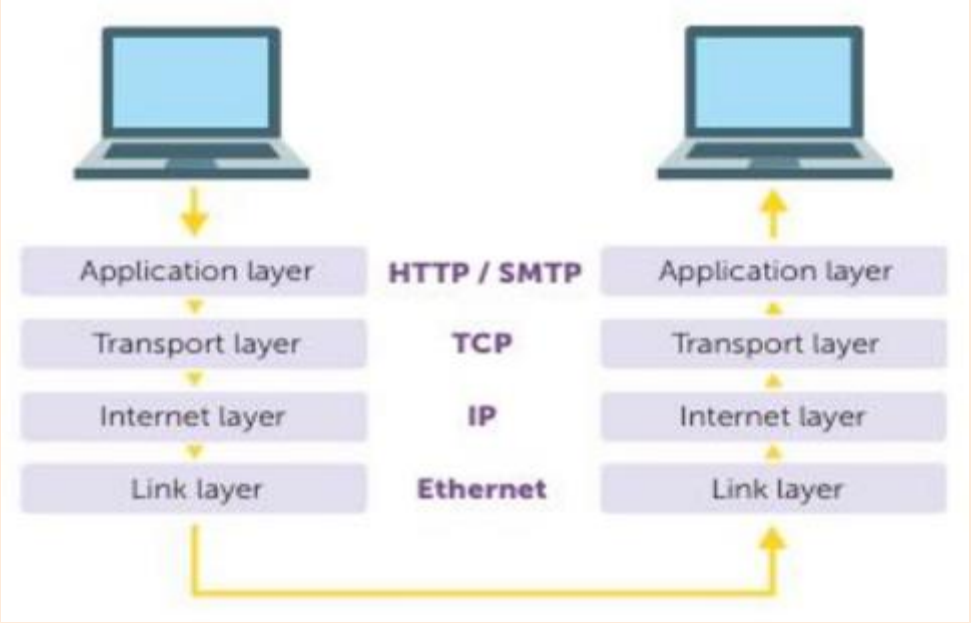
- Why network?
  - To share resources
- Problem with networking?
  - Complexity
  - Security
- Opposite of networking
  - Stand-alone machine
- Types of network
  - PAN - personal area network - eg. bluetooth phone to speaker
  - LAN - local area network - small geographical area
  - MAN - Metropolitan 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

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



Computational Thinking:

Network Topology - network design

Common network topologies:

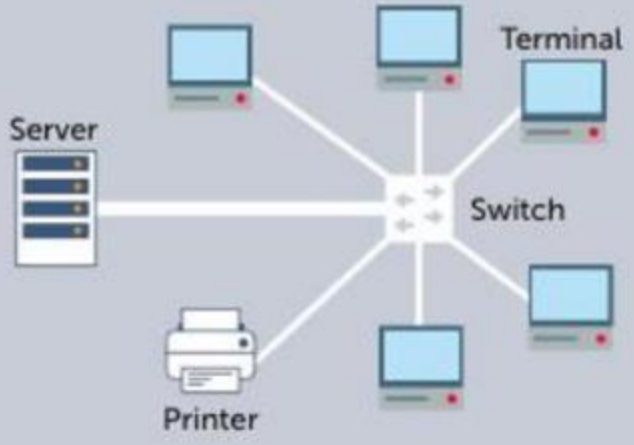
- Star
  - Used at school
- Line/bus
- Mesh
  - highly redundant
  - Used by Internet

Network equipment:

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

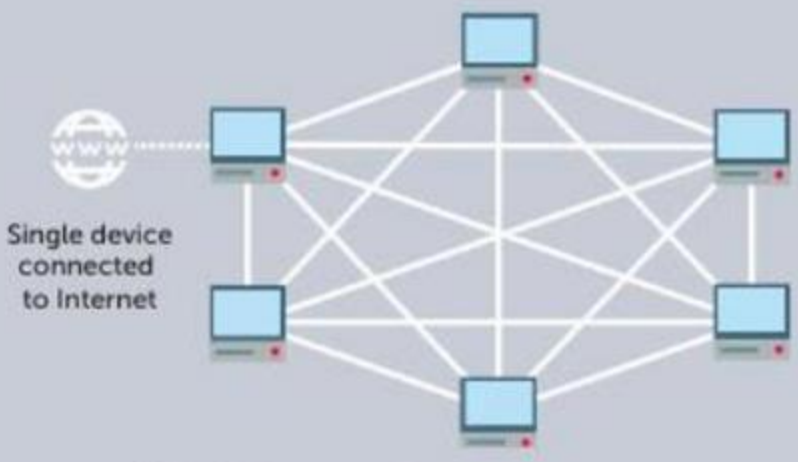
Star networks

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.

Computational Thinking:

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

iMedia: Term One – Pre Production Documents

Mood Boards

Purpose:

· To generate visual ideas about how the campaign or product could look.

· To develop a feel for the Campaign/Products style.

· To show the client the fonts, images, colours to be used in the campaign/product.

· Can be Digital (created on computer) or Physical.

Audience: Client, Design team

Do's and Don'ts:

Don't create layouts in a Grid / Table format

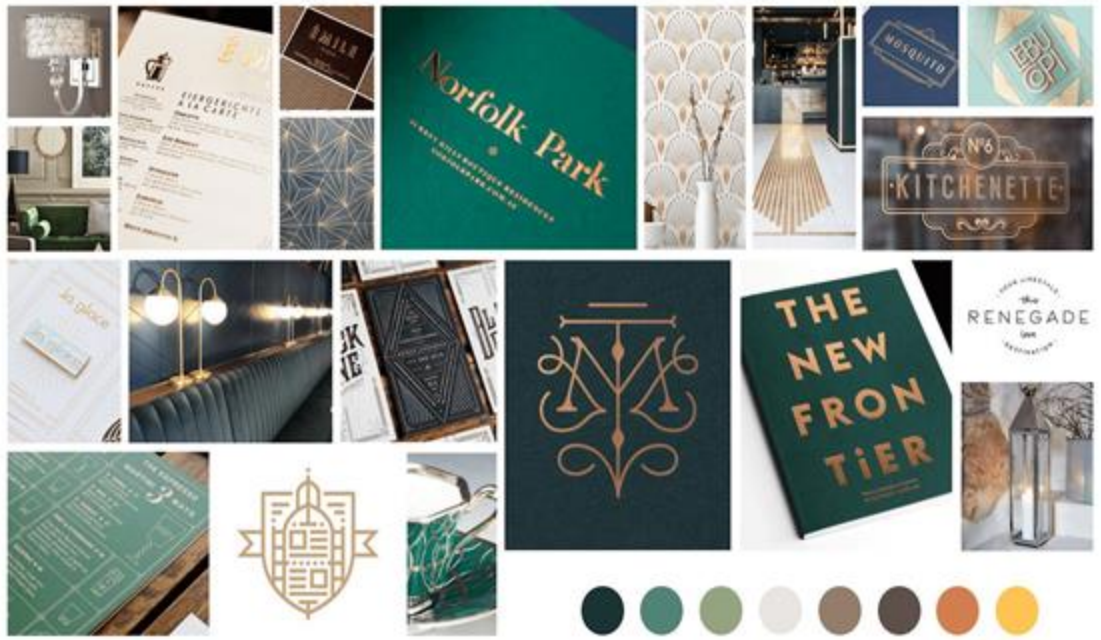
Do group images into themes or concept (Water images together, Fire images together)

Do Add Tag Lines (Helps explain themes to the client.)

Content:

Title, Fonts, Text Boxes, Pictures (Drawings/images) Logo, Colours. (NEVER JUST SAY "TEXT")

Web site or Web advert	Movies, Sounds
TV Advert/Movie/animation	Costume Ideas
Location Ideas	Video Game
Costume ideas	Location
Game Play	



Mind Maps / Spider Diagrams

Purpose: Quickly generate outline ideas and to Link or connect aspects of ideas. Based on Central Idea (Hub) and has Branches off for different aspect using Sub-Nodes

Audience: Design team

Content:
Central Idea (Hub) (Middle of the diagram)
Lines (arrows) to link the Nodes and Sub nodes (Known as relationships)
Linked to related ideas (Sub node) (Ideas that come and link to which expand on the central point)

The idea in a sub node should be directly linked to the Node.

Link / Relationship

Central Hub (idea)

Sub Nodes (Related ideas of the Node)

Node (a Sub title that comes under the main idea)

Scripts

Purpose:

Provide lines for characters so they know what to say

Provide details about expressions or actions

Provide stage directions for actors and production crew

If the scene is set inside (Interior/ INT) or outside (Exterior/EXT) the specific location, and the time of day.

Audience: Film Crew, Actors, Director

Content of a Script:

· Location: Set / Slug line (INT / EXT)

· Direction (Tells the actors what to do, you cannot direct an animal)

· Character names (centred)

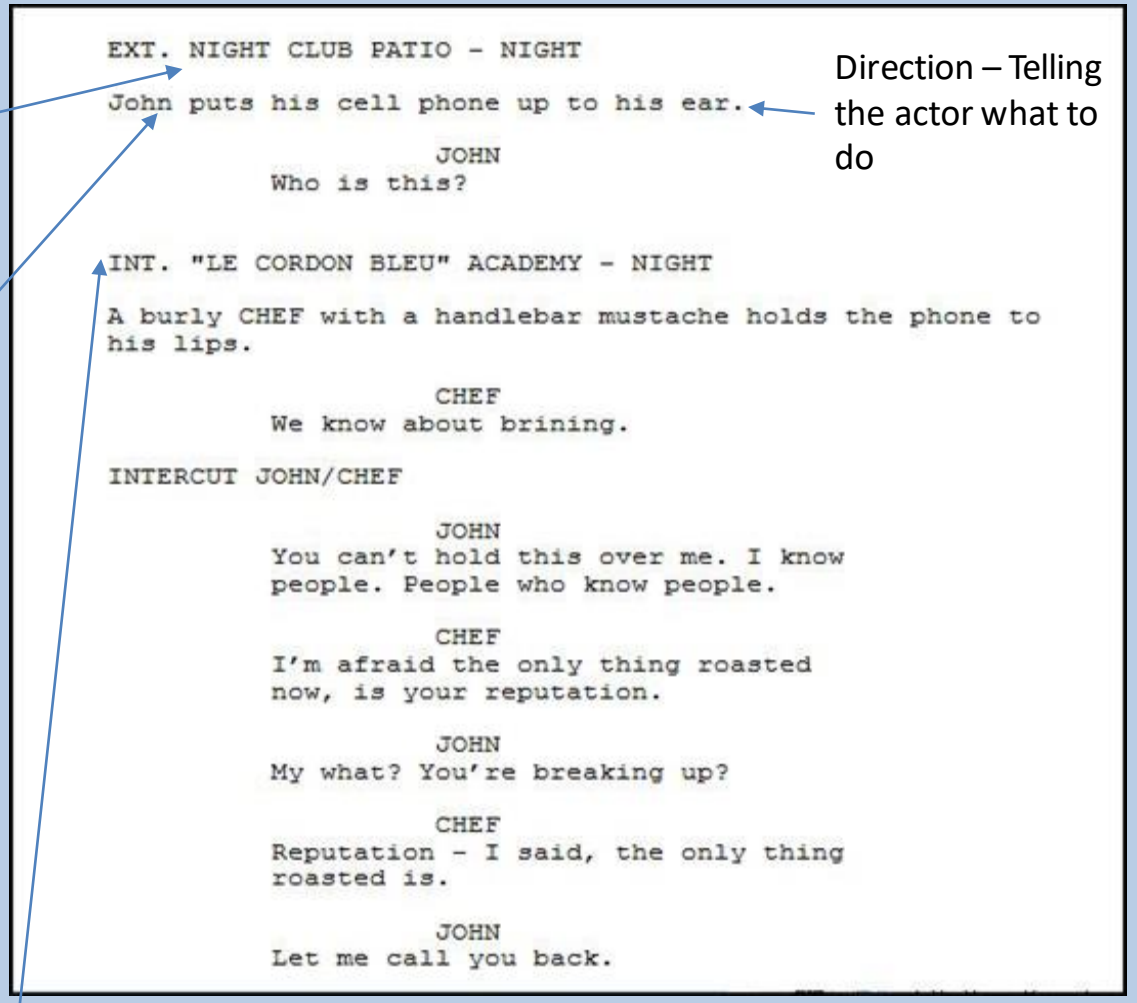
· Speech / Dialogue between characters (centred)

· Sound and sound effects (for actions, events)

· Shot type (close up, mid, long, over shoulder, two shot)

· Camera movement (pan, tilt, zoom)

Both the characters name and the location are shown here



EXT. NIGHT CLUB PATIO - NIGHT

John puts his cell phone up to his ear.

JOHN
Who is this?

INT. "LE CORDON BLEU" ACADEMY - NIGHT

A burly CHEF with a handlebar mustache holds the phone to his lips.

CHEF
We know about brining.

INTERCUT JOHN/CHEF

JOHN
You can't hold this over me. I know people. People who know people.

CHEF
I'm afraid the only thing roasted now, is your reputation.

JOHN
My what? You're breaking up?

CHEF
Reputation - I said, the only thing roasted is.

JOHN
Let me call you back.

Direction – Telling the actor what to do

INT / EXT stand for interior and exterior

Storyboards

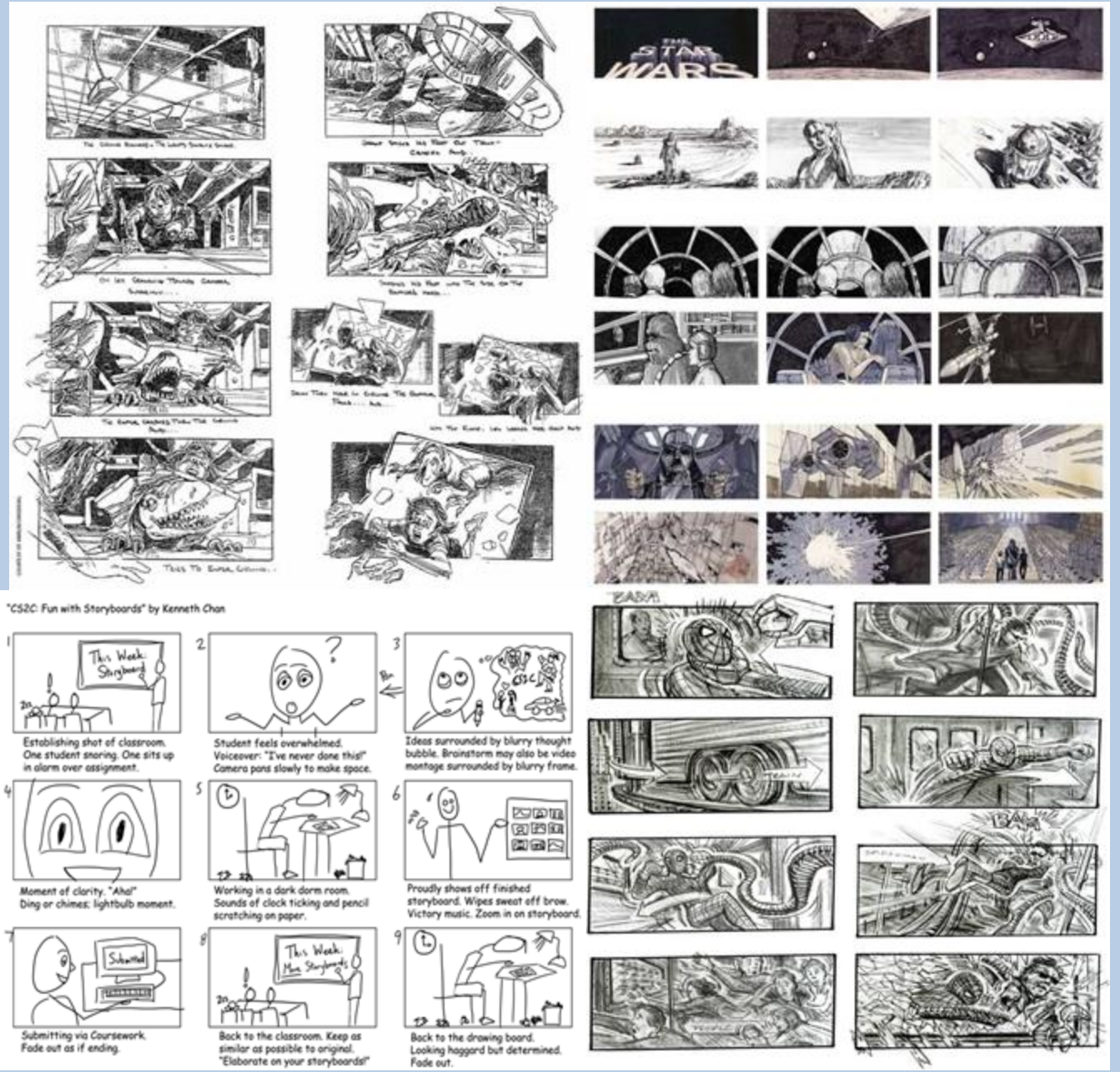
Purpose: Breaks down a film/animation into separate scene. It will have a flow of scenes that follow a timeline. Allows the Editor to piece together the different scenes in to the correct order.

Audience: Film Crew, helps them plan out the scenes or Editor helps them put the movie together (Not Production team)

What to include on a Storyboard?

Numbered scenes	Short Description
Camera Angles	Locations
Camera Movements	Camera type
Timings	Transitions
Lighting	Scene sketch
Sounds (Dialogue, effects)	Colouring

Even a short movie may be shot out of order, a story board means different film crews can work on different scenes and know what each one is doing. Afterwards the editing team can put all the scenes together in the correct order.



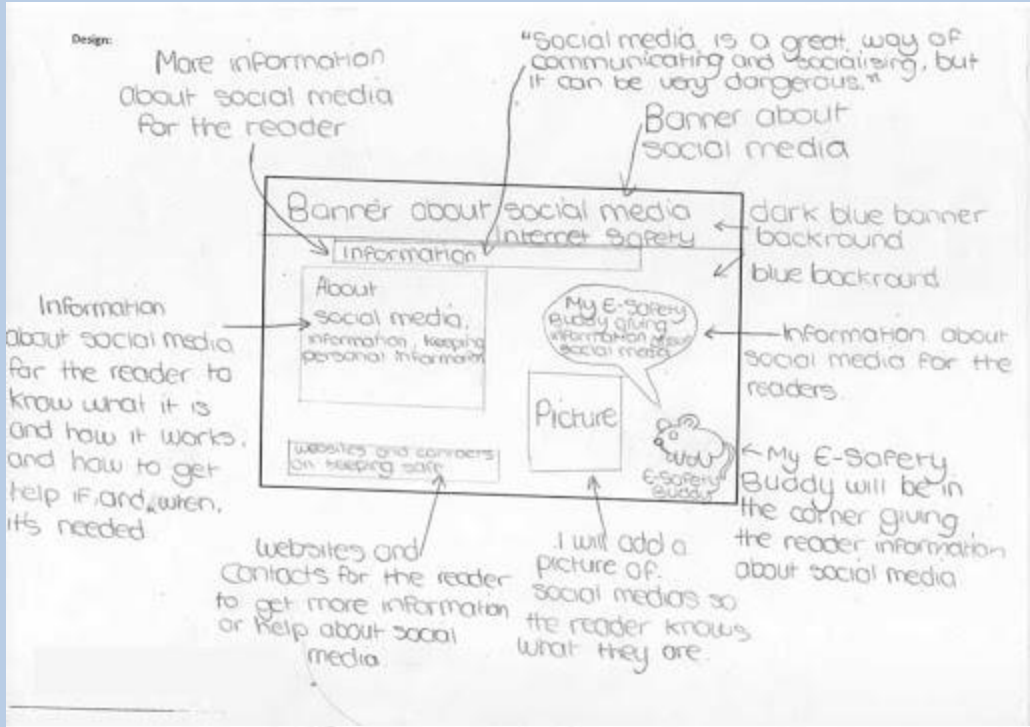
Visualisation Diagrams

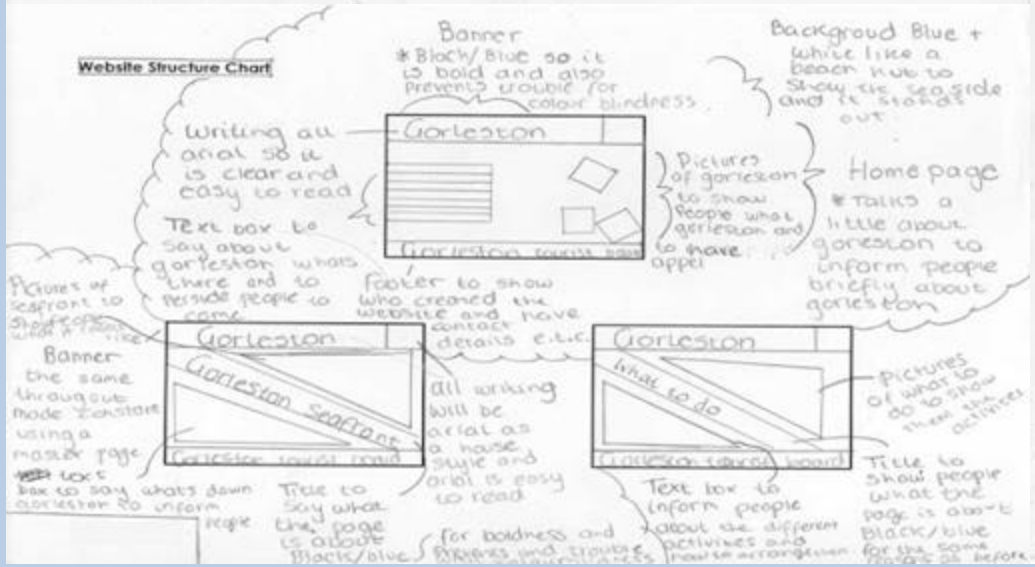
Purpose: A Hand Drawn Design that will plan the layout of a still image in a visual manner. Show how the finished item may look. Magazine cover, website, multimedia product.

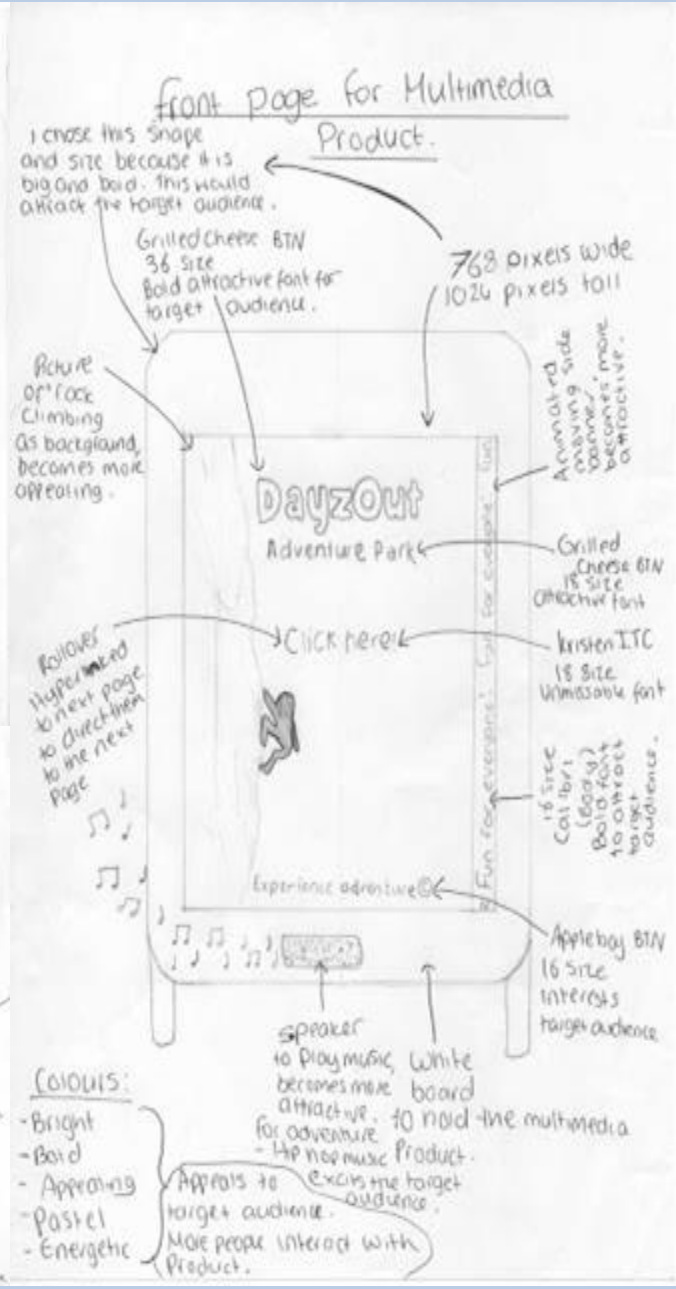
Audience: The designer or developer of the final product.

Content:

Images Annotations
Logos
Colour Scheme Fonts
Quotes
Dimensions







iMedia: Term Two – Pre Production Documents

Client Brief / Specifications

Also known as brief or specification.

Must meet their requirements otherwise your work will not be fit for purpose and the project will be given to another designer or scrapped.

Done by:

- Face to face discussion
- Script
- Specification
- Written brief
- Content (look at brief and use words given):
- Purpose
- Timescale
- Target audience
- Budget
- Content (information / images)
- Theme / style / genre
- Colour scheme (use house style for consistency)

Example Client Briefs

Children's Shoes video

Client brief:

A company that makes designer footwear is about to launch its first footwear for children. They want to create a short promotional video to use on websites. You have been asked to produce the video. The video must last between 20 and 40 seconds and be aimed at an audience of between the ages of 8 and 14. The video needs to be ready for the launch of the new range in five weeks' time.

The video must include:

- shots of the footwear range
- the name, logo and contact details for the company
- shots of the target audience in the street with the product
- a range of different camera angles, shots and movement
- a minimum of four clips
- background music that is up-to-date and appeals to children.

Client brief: Road Safety Computer Game

You have just started work for a well-established company which specialises in creative and educational electronic games. The company has been approached by a road safety organisation, who would be interested to see how games could be used to promote the launch of a new road safety campaign. They are not aware of any games on the market that do this.

You have been asked to submit a design proposal for one level of a new game based on teaching children how to use the roads safely. The game must have clearly defined objectives by which the child playing it can progress through to higher levels. There must be a scoring and time tracking system. The game must also be instructional in how to use the roads safely.

The target audience for the game is children aged between the ages of 6 and 10. The game is to be played on touch enabled devices.

Target Audience

There are many ways to break down the audience of a product. But these are the six you must know and use.

Income: target an audience that can afford your product

Age: different ages appeal e.g. children different from adults (consider colour, language etc.)

Gender: male and female

Location: Audience live a certain distance from store or campaign.

Ethnicity/Race/Religion: This will affect a person's attitudes and outlook

Accessibility/Disability: the Campaign/Product is accessible to as many people as possible

KEY DEMOGRAPHICS

- Age range: 35-49.
- Gender: 65% male, 35% female.
- Common job titles: Head of Digital, Senior Accountant, Chief Financial Officer.

KEY PSYCHOGRAPHICS

- Values job security.
- Likes to review all the data before making a decision.
- Striving for a better work-life balance.
- Skeptical of solutions that promise to solve all their problems.

CHALLENGES

- Their current digital solution is showing its age.
- Current lack of third-party integration is slowing down internal processes.
- Boss/shareholder demands are making work stressful.

PREFERRED CHANNELS

- Email for first contact, then phone conversations.
- Browses social media platforms like LinkedIn, mostly looking for news.

PREFERRED CONTENT TYPES

- Data-rich white papers.
- Case studies.

Communications Boot Camp

Target Audience Profile

Age Range

- ☐ Under 18
- ☐ 18 - 24
- ☐ 25 - 29
- ☐ 30-49
- ☐ 50+

Gender

☐ Male ☐ Female ☐ Not Applicable

Regionality

Is your audience tied to a specific geographical area? (Eg. Your only store is in Vancouver, or you can only deliver within Canada.)

☐ Yes ☐ No If yes, what region _____

Hashtags for this region (eg. #YYC, #Alberta) _____

Interests

- ☐ Sports
- ☐ Business
- ☐ Politics
- ☐ Fitness / Wellness
- ☐ Family & Relationships
- ☐ Design
- ☐ Film / Television
- ☐ Food & Drink
- ☐ Music/Insturments
- ☐ Fashion / Design
- ☐ Computer/ Console gaming
- ☐ Other _____

Hashtags based on Interests: _____

CRFT NEW MEDIA

Work Plans

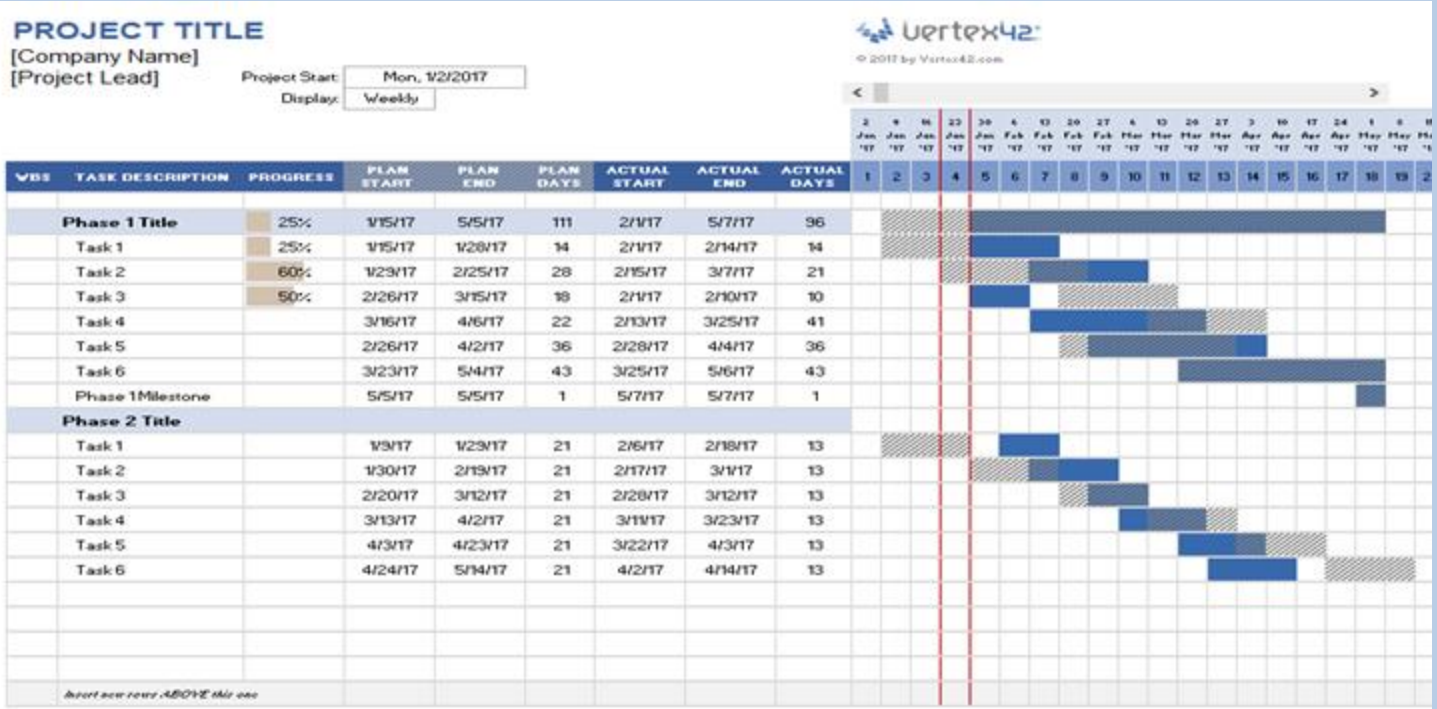
Provide timescales so you don't spend too long on one thing. Allow projects to meet deadline using checkpoints to stay on track.

Advantages:

- Allows team leader to track all member's tasks are being done on time.
- Different team members know what to do to help them finish project
- Unexpected events
- Equipment failure
- Health & Safety concerns
- Conditions not correct for filming

Content:

Tasks, Activities, Duration, Deadlines, Milestones; Contingencies, Resources, Budget Contingency - extra time built in (plus extra costs)



PROJECT TITLE

[Company Name]
[Project Lead]

Project Start: Mon, 1/2/2017
Display: Weekly

vertex42

WBS	TASK DESCRIPTION	PROGRESS	PLAN START	PLAN END	PLAN DAYS	ACTUAL START	ACTUAL END	ACTUAL DAYS
	Phase 1 Title	25%	1/15/17	5/5/17	111	2/1/17	5/7/17	96
	Task 1	25%	1/15/17	1/28/17	14	2/1/17	2/14/17	14
	Task 2	60%	1/29/17	2/25/17	28	2/15/17	3/7/17	21
	Task 3	50%	2/26/17	3/15/17	18	2/1/17	2/10/17	10
	Task 4		3/16/17	4/6/17	22	2/13/17	3/25/17	41
	Task 5		2/26/17	4/2/17	36	2/28/17	4/4/17	36
	Task 6		3/23/17	5/4/17	43	3/25/17	5/6/17	43
	Phase 1 Milestone		5/5/17	5/5/17	1	5/7/17	5/7/17	1
	Phase 2 Title							
	Task 1		1/9/17	1/29/17	21	2/6/17	2/18/17	13
	Task 2		1/30/17	2/19/17	21	2/17/17	3/1/17	13
	Task 3		2/20/17	3/12/17	21	2/28/17	3/12/17	13
	Task 4		3/13/17	4/2/17	21	3/11/17	3/23/17	13
	Task 5		4/3/17	4/23/17	21	3/22/17	4/3/17	13
	Task 6		4/24/17	5/14/17	21	4/2/17	4/14/17	13

Insert new rows ABOVE this one

ACTION PLAN TEMPLATE

PROJECT NAME	PROJECT MANAGER
Event ABC	Anthony G.

ACTION	RESPONSIBLE	PRIORITY	STATUS	START	END	NOTES
Goal #1: Select Venue						
Identify venue options	Sally J.	High	Complete	9/30	10/2	
Visit venues	Sally J.	High	Complete	10/5	10/9	Must send contracts by 10/10
Sign contract	Maria S.	High	Complete	10/12	10/12	
Goal #2: Secure Speakers						
Recruit speakers	Sally J.	High	In progress	10/7	10/12	
Speaker bios	Sally J.	Medium	Not started	10/12	10/14	
Create and send speaker packets	Maria S.	Medium	Not started	10/13	10/16	Send to stakeholders
Confirm speakers	Sally J.	High	Not started	10/17	10/18	
Goal #3: Recruit Sponsors						
Identify sponsors	John S.	High	In progress	10/13	10/19	
Write up sponsor agreement	Maria S.	Medium	Not started	10/15	10/16	
Send emails	John S.	High	In progress	10/19	10/21	
Make cold calls	John S.	Medium	Not started	10/21	10/23	From sales team
Goal #4: Promote event						
Create banners	Morgan K.	Low	Not started	10/26	10/28	
Order swag	Morgan K.	Low	Not started	10/28	10/28	Coffee mugs, totes, pencils
Create social media strategy	Corrine J.	Low	In progress	10/13	10/26	
Make marketing materials	Karen Z.	High	Not started	10/26	10/30	

Legislation (The Basics)

Trademark ™ : When a company has licenced their Name/ Logo so they own it. Other companies must ask for permission to use the name. The Trademark Owner can sell the rights to use the name / Logo. (Lego has bought the Trademark Rights to StarWars)

Copyright: © A company or individual can register an image, song, idea or product. Another company would have to contact the copyright holder and ask for permission to use it.

Creative Common: Ability to use a person's work while following a set of clear rules. (Cannot make money, Cannot alter original)

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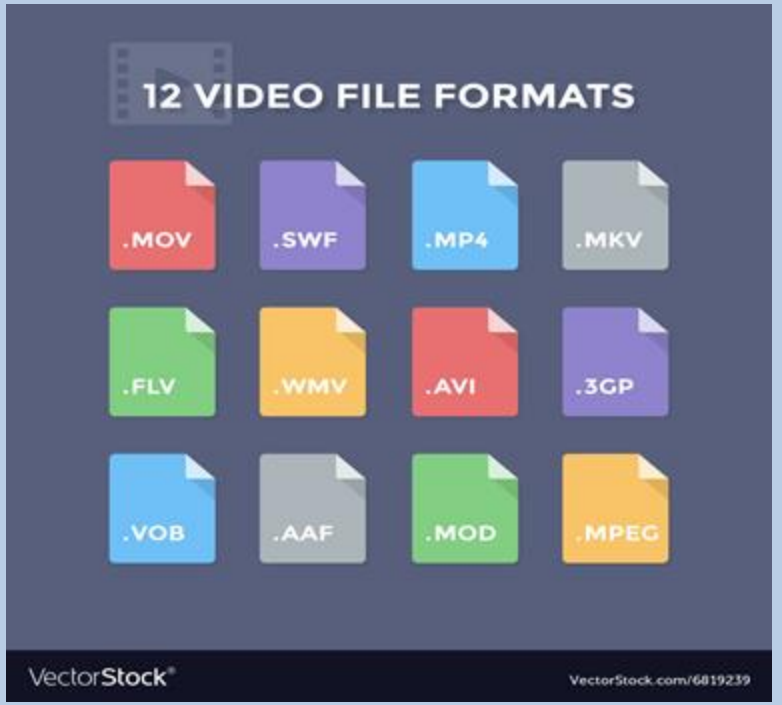
File Formats	
Files	Properties
Tiff	High resolution graphic that can produce high quality prints
JPG	Uses lossy compression to reduce its file size so quick to upload.
PSD	Proprietary format for Adobe software applications
PNG	Keeps transparencies so it can be used on different coloured backgrounds.
GIF	Can be animated and loads quickly.
SVG	Vector graphic that can be scaled without losing quality. (Not for Photographs)
DOC	Standard writing or documenting format.

Video File Formats	
File Format	Properties
.MP4	Compressed format for good quality/small file size video
.MOV	Apple QuickTime movie Format
.WAV	Windows media video format for playback on computer



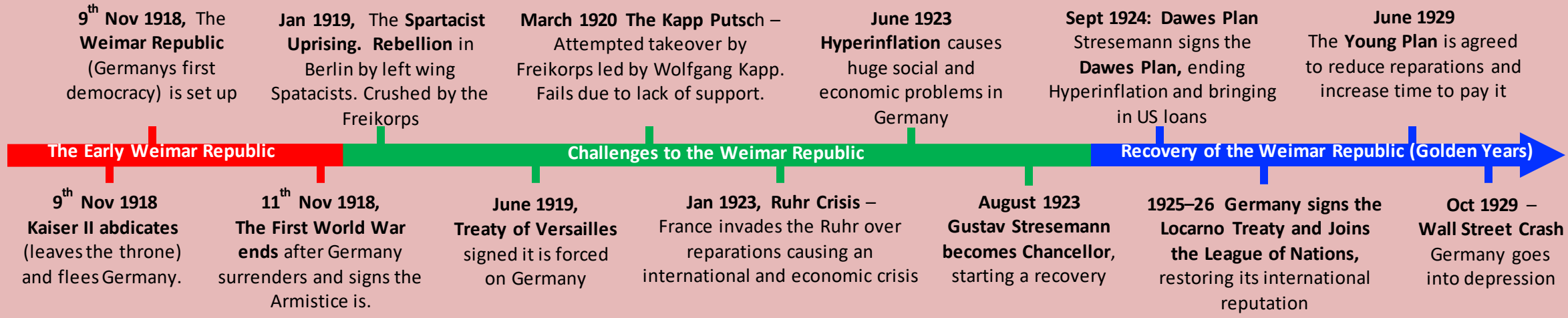
History: Weimar and Nazi Germany 1918-39
Key Topic 1: The Weimar Republic, 1918-29

The Weimar Republic	
1	This was the name given to Germany after the Kaiser had abdicated in November 1918. This was a time of despair and hope for Germany. At first, the country faced lots of chaos but under Gustav Stresemann, there was some stability.
Key events	
2	1918 World War One ended. The Kaiser abdicated and Germany became a country without a monarch (a Republic).
3	1919 January Spartacist Uprising
4	1919 June Signing of the Treaty of Versailles
5	1919 August Weimar Constitution finalised
6	1920 Kapp Putsch
7	1923 French occupation of the Ruhr and hyperinflation
8	1924 Dawes Plan
9	1925 Locarno Pact
10	1926 Germany joins League of Nations
11	1928 Kellogg Briand Pact
12	1929 Young Plan
Key Concepts	
13	The Weimar Republic faced much opposition, It was disliked by the left wing who wanted Germany to be like Communist Russia and it was disliked by the right wing who wanted the monarchy back.
14	The Treaty of Versailles caused many problems for Germany. The German people disliked the politicians for signing it and it caused political problems and economic problems.
15	Gustav Stresemann helped to bring about recovery in Germany after 1924. He solved economic problems by making friends with other countries. However, historians have very different views about the extent of this recovery.
16	The Golden Age was the period from 1924-29 and it saw significant changes in culture, the standard of living and the position of women.

Key Words		
17	Abdication	When a monarch leaves the throne
18	Republic	A country without a King or a Queen
19	Ebert	The first President of the Republic
20	Stresemann	The Chancellor of Germany from the Summer of 1923
21	Article 48	The President could use this to ignore the Reichstag and rule as he saw fit
22	Kaiser	King
23	Armistice	An agreement to end war
24	Weimar	The new government could not meet in Berlin as it was so dangerous, so they met here instead
25	Constitution	This is an agreement about how the country would be ruled
26	Reichstag	German parliament
27	Gewaltfrieden	An enforced peace
28	Freikorps	Ex military soldiers who wanted to overthrow the Republic
29	Rentenmark	The currency of Germany after November 1923
30	Hyperinflation	When money looses its value
31	Dawes Plan	An agreement where the USA would lend Germany money
32	Young Plan	This lowered the reparations payment and gave Germany longer to pay
33	Treaty of Versailles	This decided how Germany was going to be treated after WW1
34	Locarno Pact	An agreement on borders signed by Britain, France, Italy and Belgium
35	Kellogg Briand Pact	65 counties including Germany agreed to resolve conflict peacefully
36	Coalition	A government of two or more political parties

History – Topic One: Weimar Germany 1919-29

Timeline



Key People

1	Kaiser Wilhem II	Emperor of Germany, who fled in November 1918
2	Friedrich Ebert	First Chancellor of Germany, leader of Social Democrats(SPD)
3	Rosa Luxembourg	Leader of the left wing Spartacists, executed after the uprising
4	Wolfgang Kapp	Politician who led the Freikorp in the Kapp Putsch
5	Gustav Stresemann	Chancellor from 1923–29, solved Hyperinflation, Ruhr Crisis and brought about a period of stability and success to Germany

Key Terms

6	Armistice	Agreement to stop fighting, Germany asked for it in 1918
7	November Criminals	Weimar politicians blamed for the 'Stab in the Back' of Germany by surrendering at the end of World War One.
8	Constitution	The system of laws and rules of a country
9	Reichstag	The German Parliament, also name of the government building
10	Article 48	Gave the President 'emergency powers' in times of crisis, this means he can pass any law without permission
11	Proportional Representation	A system where parties gain seats in proportion to the number of votes they receive. E.g. 33% of votes = 33% of seats in the Reichstag. Meant to be fair but led to coalitions
12	Chancellor	Head of Government, chosen by the President
13	President	Head of state (Weimar Republic and Army), voted by people, could use Article 48 and had power to dismiss government.

History– Topic One: Weimar Germany 1919-29

Strengths	Weaknesses
• Equal voting rights for men/women over 21, Freedom of Speech, Press, Religion • Germany is a democracy, voted for parties and President • **Proportional representation** where political parties have fair share of seats in government compared to vote • Not one party or person can become too powerful	**Proportional representation** causes lack of strong government as too many parties (29) means there are coalitions they do not get along! **Article 48** gave President too much power, could pass laws in crisis, this wasn't democratic Army, nationalists and rich wanted return of Kaiser

How did the Treaty of Versailles affect Germany?

Weimar forced to accept Treaty of Versailles 1919, called it the '**Diktat**' a dictated peace: they hated it

- **Military** – 100,000 men, no conscription, 6 battleships, no submarines, no airforce, Rhineland demilitarised. **Result:** Germany felt weak/vulnerable and this helped cause violence 1919–21 (Freikorps)
- **Article 231**, *War Guilt Clause*: Germany had to accept full blame for World War War.` **Result**: They felt humiliated and blamed Weimar
- **Economic** – Reparations of £6.6 billion to pay for WW1 and Saar Coalfields given to France for 15 years. Loss of Navy/Empire. **Result**: Bankruptcy which helps caused Ruhr Crisis & Hyperinflation in 1923
- **Territory** – Lost 10% of land and 13% population. Alsace-Lorraine to France, loses empire, West Prussia and Polish Corridor given to Poland. **Result:** Splits up Germany; loss of economy, population & power.

What threats faced the Weimar Republic 1919-23

Political	**Hatred of Weimar**	Government called November Criminals for loss of WW1 (*Stab in the Back/Dolschtoss*), dislike of new democracy. There is fear of revolution and violence, with 376 assassinations between 1919–21
Political	**Spartacist Uprising, 1919**	Left wing Spartacists, led by Rosa Luxembourg aim to takeover and turn Germany into a communist country. Freikorp puts down, Spartacists fail and Luxembourg killed
Political	**Kapp Putsch 1919**	The Freikorp (ex army nationalists) led by Wolfgang Kapp capture government buildings in Berlin announcing a right wing takeover (putsch). The army refuses to help the Weimar but workers go on strike which causes chaos & putsch fails.
Economic	**ToV 1919**	Reparations, loss of Saar Coalfields and territory/empire causes bankruptcy, government can't pay France, causes Ruhr Crisis and Hyperinflation, 1923
Economic	**Ruhr Crisis 1923**	France invades Ruhr industrial region to take payments, 60,000 workers go on strike and production stops. There are protests & violence. Weimar prints more money to pay strikers & but with no money this causes Hyperinflation, a greater financial crisis.
Economic	**Hyper – inflation 1923**	Hyperinflation = prices rise rapidly whilst value of mark drops. Over the space of months the money value drops Prices rise: Bread rises from 1 mark to 200,000 billion, 1923. Mass poverty and starvation, bankruptcy & loss of savings

How did Stresemann help German recovery 1924-29

	Political stability	Stresemann gets coalitions to work together so decisions can be made and things can get done. As a result, people have more faith in government
Economics	**Young Plan, 1924**	1924, Germany gets loans ($800m at first, $3 billion in total) from US. Stresemann burns mark and introduces temporary currency, the Rentenmark, to end hyperinflation and resets prices, as a result Industry grows by 40%.
Economics	**Dawes Plan**	Another US deal (1928) which reduces reparations from £6 to £1.85 billion, also extends payments by 60 years. Meaning Germany has more money!
Economics	**Ruhr Crisis**	Ends the Ruhr strike and France to leave which means that German industry can start again, allowing Germany to make payments & recover from hyperinflation.
Internationally	**Locarno Treaty**	Stresemann signs Treaty (1925) with France and Belgium, Great Britain and Italy. Agrees ToV borders which improved friendship with countries in Europe.
Internationally	**League of Nations**	Germany joins League in 1925 (after being banned in ToV). This increased Germanys international respect and made them a 'Great Power' again.
Internationally	**Kellogg Briand**	Stresemann signs Kellogg Briand Pact in 1928 with 64 countries who agree to peace and solving future problems peacefully rather than through force.

Had Germany fully recovered by 1929?

- **No:** Germany VERY reliant on US loans/money and If US economy collapsed it would bring down Germany (It did in 1929, Wall Street Crash!) Unemployed remained about % 10, Farmers/Middle Class still struggled
- **Yes:** Weimar Republic was stable, extreme parties like Nazis got few votes, wages increased/working hours decreased, Industry rose 40% and internationally Germanys reputation was stronger.

How did Society change in the Weimar Republic?

Women

Equal rights in voting, marriage & work. Enjoyed social freedom (fashion, smoking and drinking) but opposition by old German. Jobs: Only 36% worked and wages still below men but 3000 doctors by 1930 and 112 elected to Reichstag by 1932.

Standards of Living

Wages increase by 10%, working hours dropped BUT unemployment still remained 10% and middle class struggled. New housing (2 million built), 60% less homeless. Benefits for unemployed (60 marks weekly) war veterans & single mothers

Culture

Germany becomes culture capital, no censorship under Weimar Republic, freedom of speech encourage new architecture (Bauhaus) Art (Modernism) Golden Age of German cinema famous film Metropolis, 3800 cinemas 1932

History: Weimar and Nazi Germany 1918-39
Key Topic 2: Hitler's Rise to Power, 1919-33

Hitler's Rise to Power	
1	Hitler sets up the Nazi Party in 1920 and becomes Chancellor in January 1933. This happens for a variety of reasons – Hitler's strengths, inbuilt problems of the Weimar Republic, and the weaknesses of others.
Key events	
2	1919 Hitler joins the German Worker's Party
3	1920 Hitler sets up the Nazi Party
4	1921 Hitler introduces the SA
5	1923 The Munich Putsch
6	1925 Mein Kampf published
7	1926 Bamberg Conference
8	1928 Nazis win 12 seats in Reichstag
9	1929 Death of Stresemann and Wall Street Crash
10	1930 Nazis win 107 seats in Reichstag
11	1932 July Nazis win 230 seats in Reichstag
12	1932 November Nazis win 196 seats in Reichstag
13	1933 January Hitler becomes Chancellor
Key Concepts	
14	The Munich Putsch is a significant event. Although a failure, Hitler gained publicity, he wrote Mein Kampf and he realised that if he was to win power, he needed to do this by votes and not by force.
15	Stable Stresemann caused problems for the popularity of the Nazi Party. When times were good, voters were not attracted to the Nazi policies.
16	The Wall Street Crash was a major turning point in the fortunes of the Nazi Party. The Nazi message did not change but people were now prepared to hear it.
17	The Backstairs Intrigue - At a time when Nazi popularity at the polls was decreasing, Hitler was handed power by political elites who feared a Communist take over and Civil War.

Key Words		
18	NSDAP	The Nazis
19	Iron Cross Award	Given for bravery in war
20	Volk	The notion of pure German people
21	25 Point Programme	The political manifesto of the Nazi Party
22	Volkischer Beobachter	People's Observer, a Nazi newspaper
23	Fuhrerprinzip	Belief that one person should run a Party
24	Swastika	Emblem of the Nazi Party
25	SA or Sturmabteilung	Private army of the Nazi Party headed by Himmler
26	Aryan	Pure German people
27	Anti-Semitism	Hatred of the Jewish people
28	Mein Kampf	Hitler's autobiography
29	Putsch	An attempt to get power illegally
30	Blood Martyrs	16 Nazis who died at the Munich Putsch
31	Gaue	Local party branches
32	SS or Schutzstaffel	Hitler's bodyguards
33	KPD	German Communist Party
34	Propaganda	Goebbels attempted to make people think in a certain way
35	Hindenburg	The President of the Republic from 1925 to 1934
36	Roter Frontkampferbund	The Communist's own private army

History: Weimar and Nazi Germany 1918-39
Key Topic 3: Nazi Control and Dictatorship

Nazi Control and Dictatorship	
1	This was a time when Hitler formed a legal dictatorship and put in place methods of propaganda and censorship to persuade and encourage all Germany people to support Nazi ideals.
Key events	
2	1933 January Hitler becomes Chancellor
3	1933 February Reichstag Fire
4	1933 March Nazis win 288 seats
5	1933 March Enabling Act passed
6	1933 July Nazis become the only legal party in Germany
7	1934 June Night of the Long Knives
8	1934 August President Hindenburg dies
9	1934 August Hitler combines the post of Chancellor and President and becomes Fuhrer
10	1934 August German army swears allegiance to Hitler
11	1938 Over the course of the year, Hitler removes 16 army generals from their positions
Key Concepts	
12	Removal – From 1933 to 1934, Hitler removed all opposition and established himself as Fuhrer.
13	Control – There was an attempt to control and influence attitudes. This was done by propaganda and terror.
14	Opposition – The youth and the churches opposed the regime.

Key Words		
15	Marinus van der Lubbe	The Reichstag Fire was blamed on this Communist
16	Enabling Act	Gave the Nazis full power for the next 4 years
17	Gleichschaltung	Hitler's attempt to bring German society into line with Nazi philosophy
18	German Labour Front (DAF)	Set up to replace Trade Unions
19	Dachau	First concentration camp
20	Centralisation	Germany had been divided into districts called Lander. Now Germany was run from Belin alone
21	Purge	To get rid of opposition
22	Gestapo	Secret police headed by Goering.
23	Night of the Long Knives	Removal on internal and external opposition
24	Sicherheitsdienst (SD)	The intelligence body of the Nazi Party
25	Concordat	In July 1933 the Pope agreed to stay out of political matters if the Nazis did not interfere with Catholic affairs
26	Eidelweiss Pirates and Swing Youth	Groups who apposed the Hitler Youth
27	Confessional Church	Followed traditional German Protestantism and refused to allow the Nazification of religion. Led by Pastor Martin Niemoller
28	Mit Brennender Sorge (With Burning Concern)	The Pope wrote to priests in Germany about his concerns over the Nazi attempts to control religion

Knowledge Organiser: Weimar and Nazi Germany 1918-39
Key Topic 4: Life in Nazi Germany, 1933-39

Life in Nazi Germany	
1	The lives of German citizens were changed after Hitler's appointment as Chancellor. For some, life was better under the Nazis but for others, it was much worse.
Key events	
2	1933 Boycott of Jewish shops and businesses. Law for the Encouragement of Marriage. Sterilisation Law passed.
3	1935 The Nuremberg Laws were passed.
4	1935 Conscription introduced.
5	1936 Membership of the Hitler Youth made compulsory.
6	1938 Jewish children were not allowed to attend German schools. Lebensborn programme introduced. Kristallnacht.
7	1939 The euthanasia campaign began. Designated Jewish ghettos established.
Key Concepts	
9	Anti-Semitism – Persecution of the Jews grew continuously after 1933.
10	Young– The Nazis placed much emphasis on controlling the young as only then could they secure a 'thousand year Reich'. Youth organisations and education indoctrinated the German youth.
11	Women – The Nazis had traditional family values but even these were tested by the needs of war and the desire to ensure a growing Aryan population.
12	Living Standards – The Nazis did reduce unemployment but they did this by banning Jews and women from the workplace and by putting Germany on a war footing. Workers had limited rights.

Key Words		
13	Kinder, Kuche, Kirche	Children, Kitchen, Church. This summed up the Nazi ideal of womanhood
14	The Motherhood Cross Award	Given to women for large families
15	Lebensborn	Where unmarried women were impregnated by SS men.
16	Napola	Schools intended to train the future leaders of Germany
17	Nazi Teachers League	All teachers had to swear an oath of loyalty to the Nazis
18	Reich Labour Service	A scheme to provide young men with manual labour jobs
19	Invisible unemployment	The Nazi unemployment figures did not include women, Jews, opponent and unmarried men under 25
20	Autobahn	Motorway
21	Rearmament	Building up the armed forces I readiness for war
22	Volksgemeinshaft	The Nazi community
23	Strength Through Joy	An attempt to improve the leisure time of German workers
24	Beauty of Labour	Tried to improve working conditions of German workers.
25	Volkswagon	People's car
26	Eintopf	A one pot dish
27	Herrenvolk	The master race or the Aryans
28	Nuremberg Laws	Jews were stripped of their citizenship rights and marriage between Jews and no Jews was forbidden
29	Kristallnacht (Night of the Broken Glass)	A Nazi sponsored event against the Jewish community

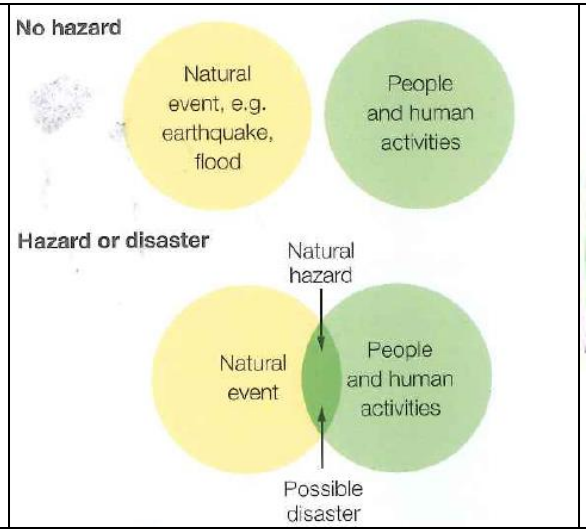
Geography Paper 1 (physical) – Topic: Natural hazards overview and Tectonics

What is a natural hazard?

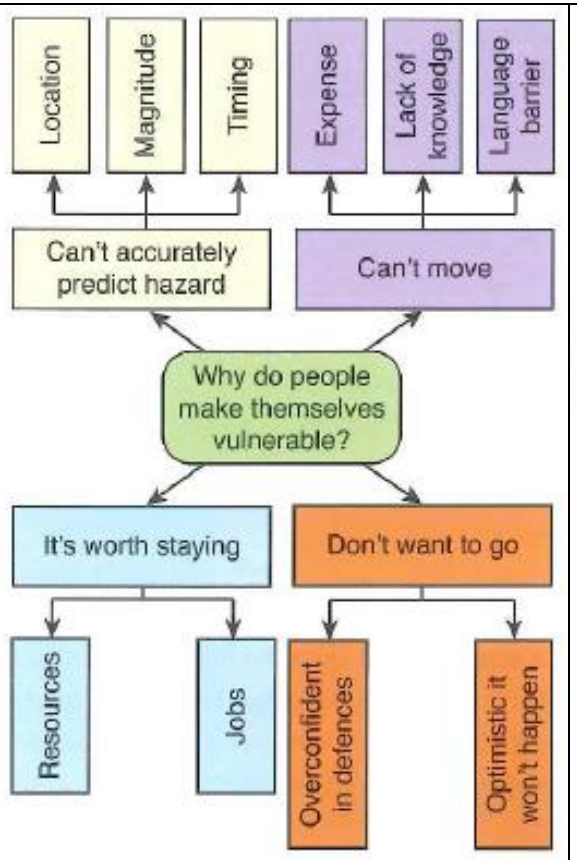
A natural hazard is a naturally occurring event which can cause harm to humans.

Types of natural hazard include:

- Atmospheric (including climatic and meteorological) hazards such as tropical storms
- Geophysical hazards such as earthquakes
- Hydrological hazards such as flooding



Hazard mitigation is the process of trying to mitigate – reduce – the effects of natural hazards. This can take many forms (left) but will need to be tailored for each specific hazard. For example, mitigation strategies for a volcanic eruption are unlikely to be successful in the event of an avalanche. Mitigating the risk of natural disasters is also very expensive – So while HICs may be able to put effective strategies in place that limit the impact of such disasters – less deaths, quicker recover, etc – LICs are likely to be unable to do so, and therefore are more dependent on international assistance in the event of a disaster. These general ideas are trends and patterns you will observe in both the tectonic hazards and weather hazards section.



What factors affect risk?

There are several factors that have led to an increase in the number of people at risk from natural events.

Poverty
In poorer parts of the world poverty may force people to live in areas at risk. This is especially true in cities such as Lima in Peru or Caracas in Venezuela. Here, a shortage of housing has led to people building on unstable slopes prone to floods and landslides.

Urbanisation
Over 50 per cent of the world's population now live in cities. Some of the world's largest cities (for example, Tokyo, Istanbul and Los Angeles) are at risk from earthquakes.
Densely populated urban areas are at great risk from natural events such as earthquakes and tropical cyclones. The 2010 Haiti earthquake destroyed much of the capital Port-au-Prince killing some 230 000 people.

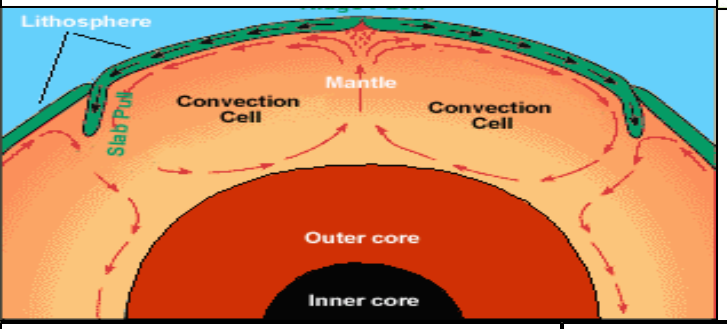
Factors increasing the risk from natural hazards

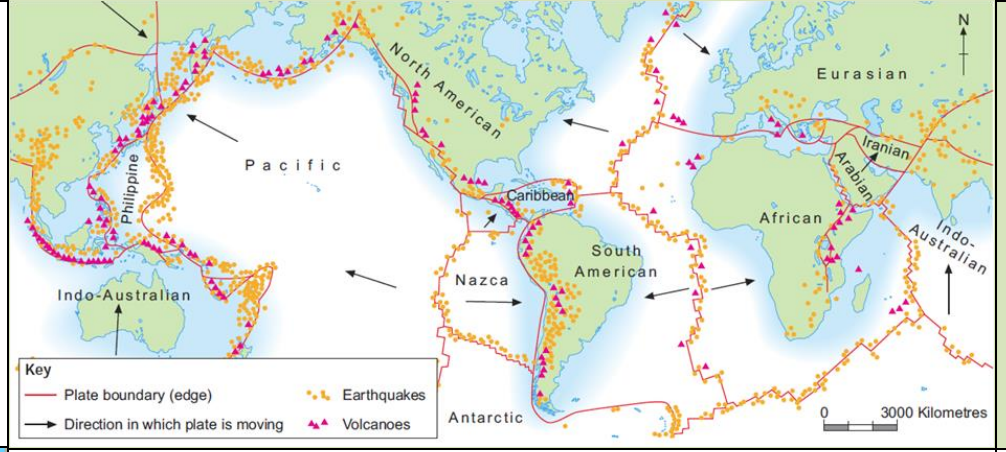
Farming
When a river floods it deposits fertile silt on its floodplain, which is excellent for farming. But when people choose to live there they are putting themselves at risk. In low-lying countries many people may live on floodplains, like that of the River Ganges in Bangladesh.

Climate change
In a warmer world the atmosphere will have more energy leading to more intense storms and hurricanes. Climate change may cause some parts of the world to become wetter with an increased risk of flooding. Other areas may become drier and prone to droughts and famines.

Tectonic theory

Tectonic plates move because the core of the earth is very hot and having heated the magma in the mantle, this then rises as it is less dense, before reaching the crust, travelling in each direction underneath it, cooling again which makes it denser, and sinking back towards the core. As this process happens, friction moves the plates with it. Evidence for this includes matching geology and fossils on different continents, from when they were joined.





Global distribution

Earthquakes are commonly found in thin narrow belts associated with a plate boundary. Most volcanoes are distributed along the plate boundaries, too, but only constructive and destructive boundaries/margins. Occasionally, volcanoes are found in the middle of plates (e.g. Hawaii). These are called hot spots.

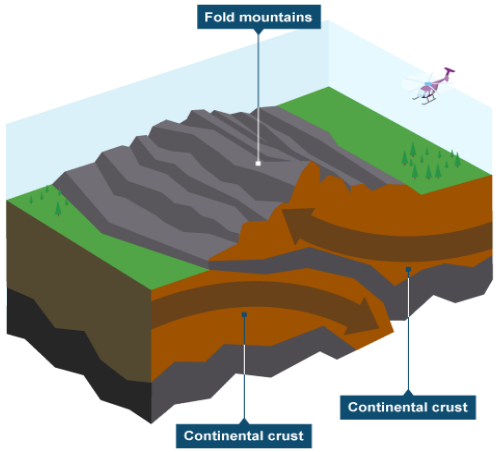
Types of plates

There are two types of tectonic plate: oceanic and continental. Continental plates are less dense and cannot be destroyed or renewed. The Eurasian, African and North American plates are all examples of continental plates.

Oceanic plates are denser and can be destroyed and renewed at plate boundaries. An example of an oceanic plate is the Pacific plate; found beneath the Pacific Ocean.

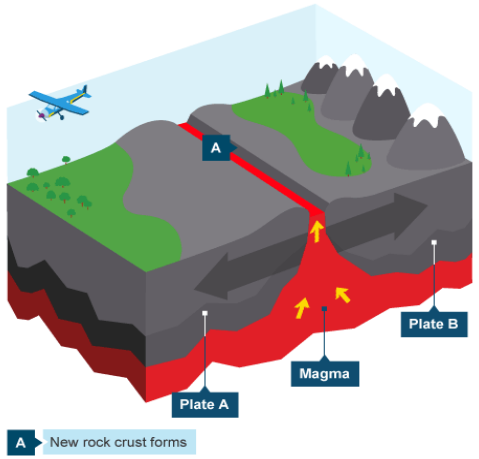
Collision plate boundary

Two plates of equal density collide and buckle to form Fold Mountains. Found in the Himalayas.



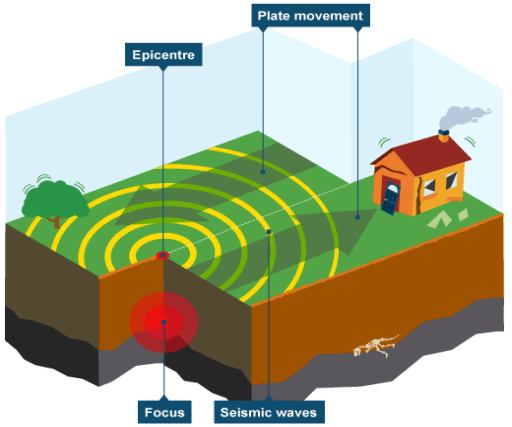
Constructive plate boundary

As 2 plates pull apart, eruptions occur and new crust is formed. Found in the mid-Atlantic ridge.



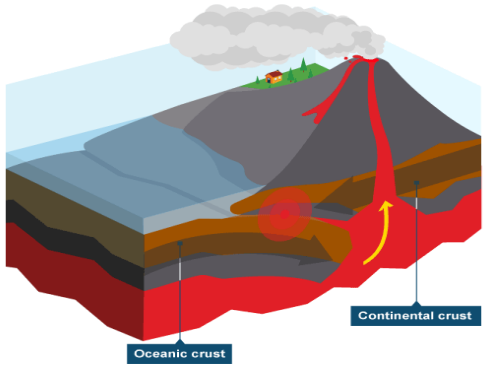
Conservative plate boundary

Two plates scrape past each other, causing violent earthquakes. Found in the San Andreas fault.



Destructive plate boundaries

Two plates of different densities move towards each other. The denser oceanic plate is subducted causing earthquakes, volcanoes and tsunamis. Found in the ring of fire.



Key terms and definitions for this topic

Inner core- solid centre of Earth; 5500°C; extremely dense, mostly made of iron and nickel.

Outer core-liquid around inner core due to lower pressures+ temperatures

Mantle- made mostly of iron, magnesium and silicon, it is dense, hot and semi-solid.

Crust- outer layer, solid but fractured like a broken egg shell

Richter Scale- a numerical, logarithmic scale for expressing the magnitude of an earthquake on the basis of seismograph oscillations

Magnitude- the size of an earthquake measured on the Richter Scale

Subduction- the process of one plate being taken under, and destroyed under, another plate as they move towards each other

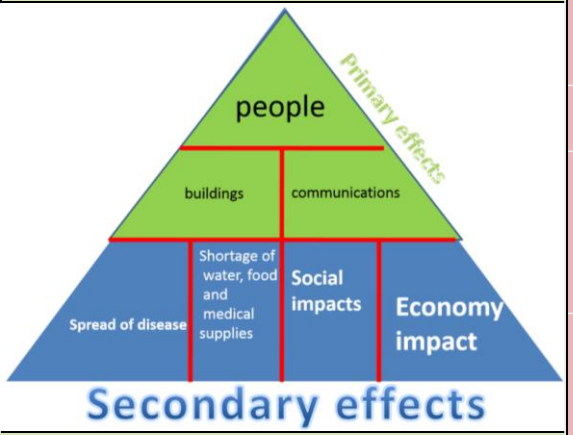
Primary and Secondary effects of tectonic hazards

Primary effects happen immediately as a direct result of the ground shaking

People – dead, injured, trapped
Buildings – collapse
Communications – eg bridge, airport, port, roads – damaged or destroyed.

Secondary effects are driven by the severity of the primary effects

Shortage of food, water and shelter
Spread of disease from dirty water or dead bodies left unattended
Social impacts of trauma and grief – young children not able to go to school
Economic – impacts often higher in richer HIC



Chile = High Income Country
(38th Richest country in the world)
Nepal = Low Income Country
(109th Richest country out of 193)

CHILE HIC – PRIMARY EFFECTS	NEPAL LIC – PRIMARY EFFECTS	IMMEDIATE RESPONSES—CHILE	IMMEDIATE RESPONSES NEPAL	LONG TERM RESPONSE—CHILE	LONG TERM RESPONSE NEPAL
Primary effects—about 500 people died, 12,000 injured and 800,000 people in total affected	9000 people died, 20,000 injured and over 8 million people affected (1/3 pop)	Swift response from all emergency services—international help needed to supply field hospitals, satellite phones and floating bridges.	Search and rescue teams arrived **quickly** from UK, India and China. Helicopters rescued many people caught in avalanches and delivered supplies to villages cut off by landslides.	Month later Chile launched a housing reconstruction for 200,000 households for people affected by the earthquake.	7000 schools to be rebuilt—with improved building regulations.
220,000 homes , 4500 schools and 53 ports and 56 hospitals destroyed.	3 million people left homeless when homes destroyed.	Swift temporary repairs to Route 5 north—south highway to help trade distribution from Santiago capital.	Half a million tents needed to provide shelter for the homeless. Field hospitals set up to cope with demand and overcrowded hospitals. 50,000 simple tents delivered in 4 days to shelter people in minus temps.	President said complete rebuild and recovery may take 4 years including ports and damaged buildings	Very poor country not prepared—Water restored to Kathmandu but it was contaminated
Santiago airport badly damaged – total cost of earthquake US$30 billion	Electricity and water supplies and sanitation and communications affected.—1.4 million people needed food, shelter and water in the days and weeks after the quake. 7000 schools destroyed and cost of damage US$5 billion.	Power and water restored to 90% of homes within 10 days. National appeal raised US$60 million—enough to pay for 30,000 emergency shelters.	300,000 people migrated to Kathmandu to seek shelter with family and friends. Nepal couldn't cope—they asked for $415 million in aid Within 24 hours 100 international search and recue teams arrived to help . Over 100 search dogs help rescue 16 people. Waived visa regulations for rescue workers. India sent 8 helicopters and 1000 people from it's disaster response team.		Geohazards international with Kathmandu Valley risk programme to better prepare Nepal in the future.
SECONDARY EFFECTS	**SECONDARY EFFECTS**				
1500Km of roads damaged by landslides, remote communities cut off for many days.	Ground shaking triggered avalanches—on Mt Everest 19 people died.				
Several coastal towns hit by tsunami and several Pacific countries but no loss of life due to early warning.	Langtang avalanche 250 people missing. Landslide on Kali Gandaka River—people evacuated in case of flooding.				
Santiago chemical plant fire—people evacuated from the area.					

You need to be able to confidently compare the effects and responses of the two earthquakes (Chile 2010 and Nepal 2015), both in terms of similarities and differences, but also considering their relative wealth – this has a massive impact upon both effects and response.

Geography

Protection

Many areas prone to earthquake hazards now use building codes. Any new building or adjustment to existing buildings must be built to strict guidelines that would protect people from future earthquake hazards. Protection involves constructing buildings so that they are safe to live in and will not collapse. Some examples of building improvements are:

Rubber shock absorbers in the foundations to absorb the earth tremors.
Steel frames that can sway during earth movements.
Open areas outside of the buildings where people can assemble during an evacuation.
Low cost methods, such as wire mesh retrofitting, are used in rural areas and developing countries. These are affordable and appropriate to the resources and people living there.
Lightweight roofs and safety glass designed to reduce damage and injury.
Example of an earthquake-proof building.
An earthquake-proof tower block has steel frames that can sway, has rubber shock absorbers in the foundations, and has open areas outside for people to assemble

Reducing vulnerability in earthquake active regions

Preparation

Hospitals, emergency services and residents practise for an earthquake in earthquake-prone countries. They have drills in all public buildings so that people know what to do in the event of an earthquake. This helps to reduce the impact and increases people's chance of survival.

Prediction

Prediction involves using seismometers to monitor earth tremors. Experts know where earthquakes are likely to happen, however it's very difficult to predict when they will happen. Even looking at the time between earthquakes doesn't seem to work. Along the San Andreas fault in California, USA, scientists have some of the most advanced technical equipment and education in predicting earthquakes – but they too cannot be exactly sure of when or where an earthquake may strike.

Reducing vulnerability in volcanically active regions

Volcanic eruptions are unpredictable, however scientists can monitor volcanoes to try and estimate when they are likely to erupt. Scientists can use a variety of techniques to do this, such as:

- seismometers – used to measure earthquakes occurring near an eruption
- tiltmeters and global positioning systems (GPS) satellites – these devices monitor any changes in landscape, e.g. volcanoes tend to swell near an eruption
- thermal imaging – this allows a camera to monitor heat sources within the crust or volcano, it may help predict the onset of an eruption
- infrared camera imagery – these images can potentially show the magma chamber and any build-up of hot gases, steam or lava
- monitoring gases escaping from a volcano using robots called spiders – often there is an increased release of sulphur dioxide near an eruption as the magma gets closer to the surface
- measuring temperature – volcanoes become hotter when magma starts to rise through the **main vent**
- looking at previous eruptions – scientists can identify patterns of activity

Practice questions worth 1 or 2 marks

Define what a natural hazard is.

What are the characteristics of oceanic plates?

Suggest two pieces of evidence that plates have moved around earth.

Practice questions worth 8 or 9 marks

Evaluate the response to the Nepal earthquake.

Evaluate to what extent different factors increase the risk from natural hazards.

It is understandable millions of people live in zones of tectonic activity. Using evidence explain why this is the case.

Practice questions worth 4 marks

With the aid of a diagram explain how earthquakes occur at conservative margins.

With the aid of a diagram(s) explain how volcanoes are formed at destructive margins.

Describe the structure of the earth.

Explain why people live near a natural hazard.

Compare the difference between a constructive and conservative plate.

Explain the physical processes that happen at destructive plate margins.

Practice questions worth 6 marks

To what extent can we reduce the effects of an earthquake?

Use an example to illustrate how buildings can be protected against earthquakes.

Discuss the differences between an earthquake in an HIC and LIC, using examples you have studied, in terms of their effects.

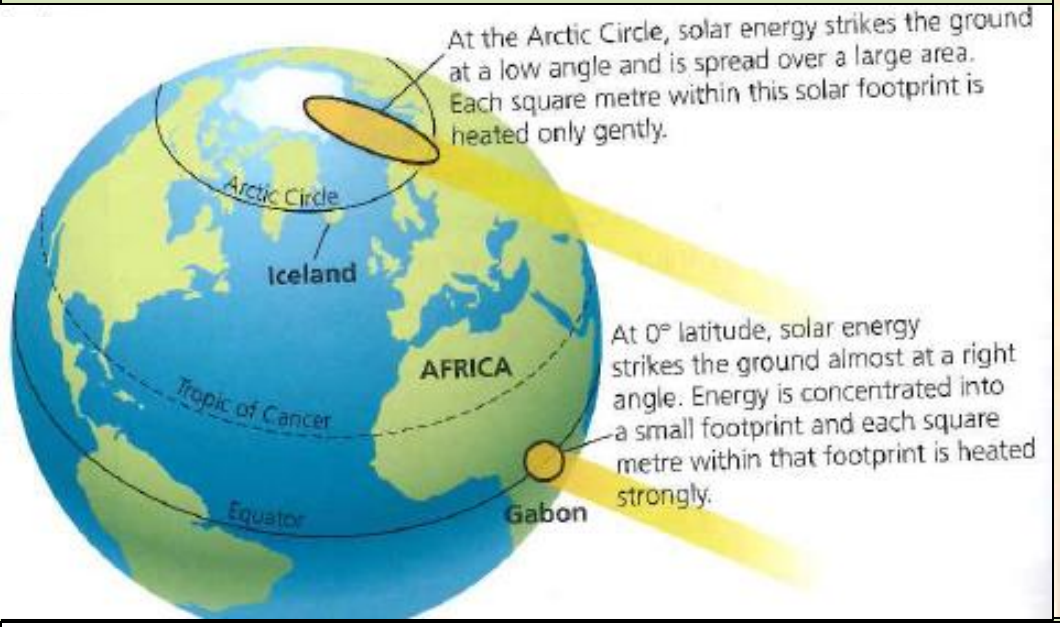
Explain how different levels of wealth and development affected the impact of the earthquakes in Chile and Nepal.

For an earthquake you have studied describe the immediate and long term responses to the disaster.

Geography Paper 1 (physical) – Topic: Weather hazards and tropical storms

What causes global patterns of weather and climate?

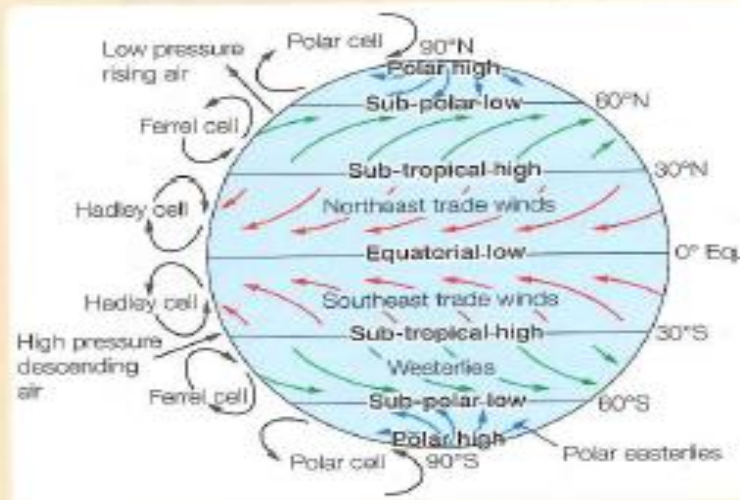
It is all to do with the circulation of air and convection currents! But how? The most important influence on variations in climate is **LATITUDE.** This is because of the Earth's curved surface. The Equator receives much higher **INSOLATION (solar heating)** than the Polar latitudes. It is, therefore, warmer. (see diagram below)



How does global atmospheric circulation work?

Diagram **B** shows global atmospheric circulation. This involves a number of circular air movements called cells. These cells all join together to form the overall circulation of the Earth's atmosphere.

- Air that is *sinking* towards the ground surface forms areas of *high pressure* (for example, at the North Pole). Winds on the ground move outwards from these areas.
- Air that is *rising* from the ground surface forms areas of *low pressure* on the ground, for example at the Equator. Winds on the ground move towards these areas of low pressure.
- Winds on the ground are distorted by the Earth's rotation. They curve as they move from areas of high pressure to areas of low pressure.
- Surface winds are very important in transferring heat and moisture from one place to another.
- The patterns of pressure belts and winds are affected by seasonal changes. The tilt and rotation of the Earth causes relative changes in the position of the overhead Sun. These seasonal changes cause pressure belts and winds to move north during our summer and then south during our winter.



B *Global atmospheric circulation*

Global Atmospheric Circulation – further detail

- Air sinks towards the ground surface because it is cool and more dense, forming areas of high pressure (for example, the North Pole); wind on the ground move outward from these areas.
- Air that is rising from the ground surface because it is warm and less dense forms areas of low pressure (for example, the Equator); wind on the ground move towards these areas of low pressure.
- These winds are distorted by Earth's rotation, and curve as they move from areas of high to low pressure. (Green/Red/Blue arrows on diagram B)
- Surface winds are important in transferring heat and moisture from place to another.
- Pressure belts and winds are affected by seasonal changes. The tilt and rotation of the Earth causes changes in the position of the overhead sun, which means the pressure belts and winds move North during the summer and South during the winter.

Typhoon Haiyan, a category 5 typhoon, struck the Philippines on 8th November 2013 at 4.40am. The tropical storm originated in the northwest Pacific Ocean. It is one of the most powerful typhoons to affect the Philippines. Wind speeds of 314 kilometres per hour (195 miles per hour) were recorded.

Tropical storms (hurricanes, cyclones, typhoons)

Definition

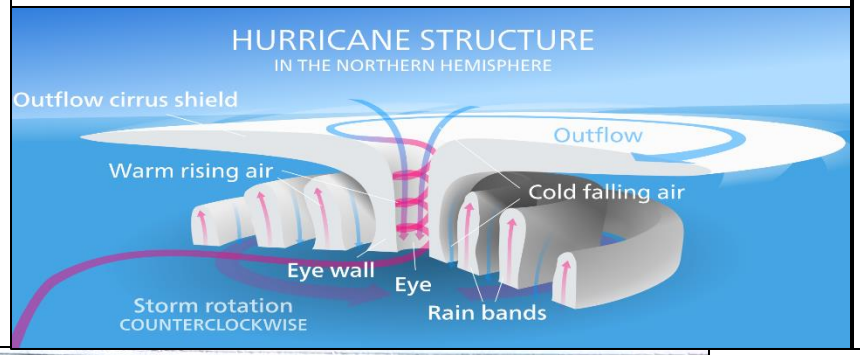
A tropical storm is a natural hazard that occurs when warm tropical air rises over a body of water which is at least 27°C, to create an area of intense low pressure. As this warm, moist air reaches high altitudes powerful winds spiral around the calm central point (the eye of the storm). The moisture condenses leading to heavy rainfall.

Statistics/Key Facts

- 80-100 tropical storms occur every year
- Can't be on the equator
- Sea temperature must be over 27 degrees Celsius
- Must be between 5 and 30 degrees North or South of the equator
- Sea depth must be roughly 60-70 metres
- When 75mph is reached it officially becomes a tropical storm
- The Coriolis affect is what causes things to veer clockwise or anticlockwise

Lifecycle of a tropical storm

- A strong upward movement of air draws water vapour up from the warm ocean surface
- Evaporated air cools as it rises and condenses to form thunder clouds
- As the air condenses it releases heat which powers the storm
- Smaller thunderstorms join to a giant spinning storm
- The eye of the storm is now formed
- The storm is carried across the ocean by prevailing winds, gathering strength
- Once the land is reached the storms energy supply is cut off
- Friction with the land will cause the storm to weaken



Typhoon Haiyan- *Primary Effects:*

- Building and possessions destroyed/damaged
- 6300 people killedand 6000000 homeless
- 40 000 homes damaged/destroyed
- 90% of Tacloban City destroyed
- Tacloban airport terminal badly damaged
- 30 000 fishing boats destroyed
- Damaged buildings, power lines and crops
- Over 400mm of rain causing flooding

Secondary Effects-

- Looting and violence broke out in Tacloban City
- Jobs lost, hospitals and schools damaged affecting livelihood and education
- Water, food and shelter shortages- disease
- Ferry and airline flights disrupted, hindering aid
- Power supplies cut off for around a month
- 6 million have lost their source of income
- Flooding caused landslides, in turn blocking roads and cutting off aid to remote locations

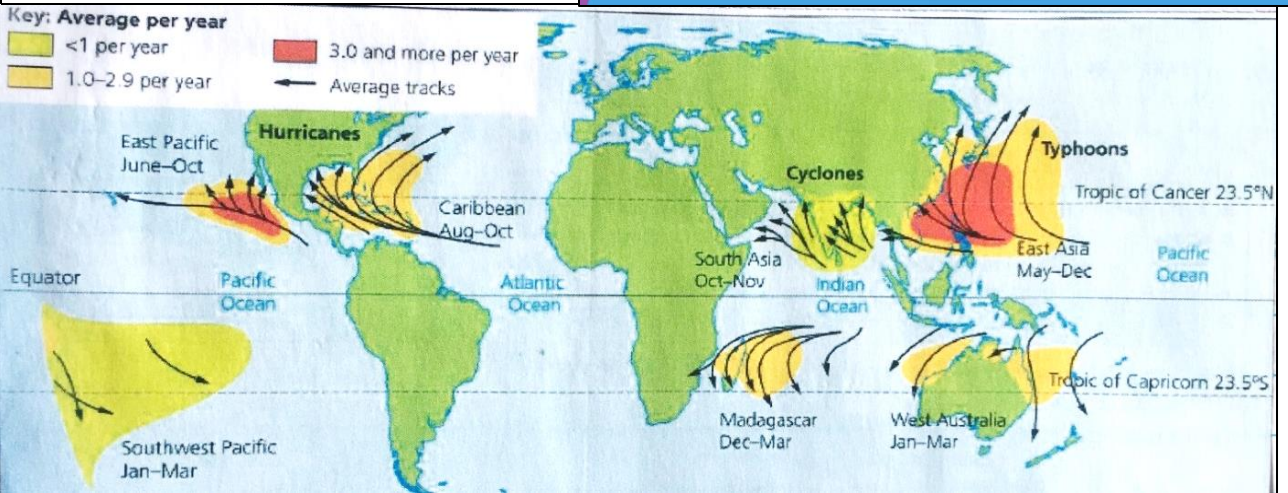
Typhoon Haiyan – November 2013

Short-term Responses:

- International government and aid responded with water, food and shelter
- The US helped with search and rescue
- The UK sent shelter kits
- The French, Belgian and Israeli set up field hospitals
- The Philippines' Red Cross delivered food
- 1200 evacuation centres set up

Long-term Responses:

- Other countries/organisations (such as the UN) donated aid
- Roads and bridges were rebuilt
- "cash for work" projects set up
- Farming was re-established
- More cyclone shelters were built
- Thousands od home were built in better places



Storm Shelters – protection method

- Constructed out of concrete (durable)
- Stilts (in case of flooding)
- Stairs (to reach ground)
- Built on raised ground (flooding)
- Shutters on windows (wind/debris)
- Can be used as a medical centre or school at other times

Affects of climate change on tropical storms

Distribution-
Climate change will cause tropical storms to be distributed more evenly all over the world. This is because there will be warmer oceans able to support storms where they used to be cold.

Frequency-
Climate change will not affect the frequency.

Intensity-
Climate change will cause tropical storms to become more intense. This is because the sea is warmer and will be able to provide more energy for stronger storms.

UK Weather Hazards

There are various types of extreme weather that affect the UK.

Drought

A prolonged period of abnormally low rainfall, leading to a shortage of water

Potential Impacts:

- Crop failure can lead to higher food prices, lower incomes for farmers and reliance on food imports.
- Water conservation regulations, such as hosepipe bans, may be introduced, which can affect businesses and householders.

Gales

A period of strong, sustained surface winds (common in the west and in upland and coastal regions)

Potential Impacts:

- Buildings, transport links and electricity lines may be damaged.
- Fallen trees and large branches block roads and cause injury.

Heavy Rain

A period of abnormally heavy rain

Potential Impacts:

- Short periods of intense rain can cause flash floods. Prolonged rain saturates the ground, which can lead to river flooding.
- Damage may occur to buildings, transport links, communication links and energy supplies.
- Flooded farmland kills crops and animals.
- Repairs often cost millions and can take years to complete.
- Businesses and homeowners in high-risk areas may be denied insurance.

Extreme Cold Weather

A period of abnormally cold weather leading to snow and ice

Potential Impacts:

- Travel disruptions and safety concerns force businesses and schools to close.
- Food shortages may occur.
- People may become hypothermic and die.
- Slippery conditions cause an increase in fall-related injuries.
- Councils have to spend money on salting, gritting and snow ploughing.
- Crops may be damaged and livestock killed.

Heatwaves

A prolonged period of abnormally hot weather

Potential Impacts:

- Fatalities and health issues, such as heat exhaustion and breathing difficulties, can occur.
- Road surfaces can melt and rail lines can deform, disrupting transport.
- Crops wither and scorch, which may lead to higher food prices, lower incomes for farmers and reliance on food imports.

Thunderstorms

A heavy rain storm accompanied by thunder and lightning, caused by hot and humid conditions (common in the south-east)

Potential Impacts:

- Lightning can cause fires, electricity surges, fatalities and damage to buildings.
- Flash flooding due to heavy rainfall can damage buildings and transport links.
- Associated winds and hail may damage crops and buildings.

Evidence shows that the weather in the UK is becoming more extreme.

- Temperatures are becoming more extreme: 2014 was the warmest year since 1910, and December 2014 was the coldest month for over 100 years.
- Rainfall is heavier, and storms are more intense and frequent. December 2015 was the wettest UK month on record.

Polar Maritime Air Mass

Originates from: Greenland
Wet, cold air brings cold, showery weather

Arctic Maritime Air Mass

Originates from: Arctic
Wet, cold air brings snow in winter

Polar Continental Air Mass

Originates from: Central Europe
Hot air brings dry summers
Cold air brings snow in winter

Returning Polar Maritime

Originates from: Greenland/ Arctic via North Atlantic Moist, mild and unstable air bringing cloud and showers

Tropical Maritime Air Mass

Originates from: The Atlantic
Warm, moist air brings cloud, rain and mild weather

Tropical Continental Air Mass

Originates from: North Africa
Hot, dry air brings hot weather in summer

The Somerset Levels Flood Case Study – an example of extreme weather in the UK

The Somerset Levels are a coastal plain and wetland area of Somerset, England. Thousands of years ago the area was covered by the sea, but today it's a landscape of rivers and wetlands – artificially drained, irrigated and modified to allow productive farming. The Somerset Levels are one of the lowest areas in the UK. Much of the area lies below the high-water mark of spring tides. The area is very flat and has a maximum altitude of 8m above sea level. In January 2014 the Somerset Levels experienced floods greater than any other in living memory. Estimates suggest that 10% of the area was underwater when the flooding was greatest.

Causes

A quick succession of prolonged Atlantic storms, with persistent rainfall and gale-force winds were the major cause of flooding. The rivers could not cope with the significant amount of rainfall that fell. Additionally, high tides in the Bristol Channel and its narrowing estuary created tidal surges. These blocked the floodwater trying to escape the Somerset Levels. Coastal defences coped with the tidal surges.

Leading up to 2014 there had been less dredging of the river channels on the Somerset Levels. As a result of this, the channels had raised due to the accumulation of sediment. This reduced the capacity of rivers to transport water, leading to flooding. Change in farming practices has also contributed to flooding. Much of the land has been converted from grassland to grow maize. This more intensive use of the land means it is less able to retain water, causing it to run over the surface rather than being absorbed.

Impacts

Over 600 homes and 6880 hectares of agricultural land were flooded. A number of villages were cut off after roads were flooded. There were several incidents of crime during the floods. 900 litres of fuel was stolen from a pumping station in Westonzoyland. There were also reports of heating oil and quad bikes being stolen from homes affected by flooding. Many main roads were closed, including the A361 linking Taunton and Street. Flooding also disrupted train services on the main Bristol line between Taunton and Bridgwater. There were considerable economic costs associated with the floods. Fuel used to power emergency pumps cost £200 000 per week. An estimated £1 million was lost by local businesses. The Somerset floods cost the county's tourism industry an estimated £200 million. Soil was damaged after being underwater for nearly three months. In some areas, it took over two years to restore the soil before crops could be grown. Insurance costs increased in flood-hit areas of Somerset.

Immediate Response

As expected for a high-income country (HIC), the response to the flood was well organised and rapid. Local people in South West England were warned of heavy rain when the Met Office issued an amber warning. The public was advised to prepare for significant flooding by the Environmental Agency. Many people used sandbags to protect their property and moved valuable items upstairs. In Moorland, a man constructed a large wall out of clay and mud to protect his house from flooding. Rescue boats were used to help stranded people by the fire brigade who also visited hundreds of properties. Rescue crews supported residents of Moorland in evacuating. The owners of some 80 homes agreed to evacuate, however, around 30 residents stayed at home. Additional police patrols were introduced as the result of increased crime. The army was sent into the area with specialist equipment towards the end of January. The issued sandbags and distributed food. They were later joined by 40 Royal Marines to provide additional support. Sixty-five pumps were used to drain 65 million m3 of floodwater. Local people, led by the Flooding on the Levels Action Group (FLAG) provided local support to people affected by the floods. This included fundraising and the collection and distribution of food. They also used social media, such as Facebook and Twitter, to share news. An estimated £15m was made available by the government to meet the immediate costs associated with protecting lives and properties.

Long Term Response

The long-term response to the Somerset Levels flood focussed on management techniques to reduce the risk of future floods on this scale. The Somerset Levels and Moors Action Plan was developed and included measures such as reintroducing dredging to increase capacity in the rivers, the construction of a tidal barrage and additional permanent pumping stations. The scheme is part of a 20-year plan for the Somerset Levels and will cost of £100 million.

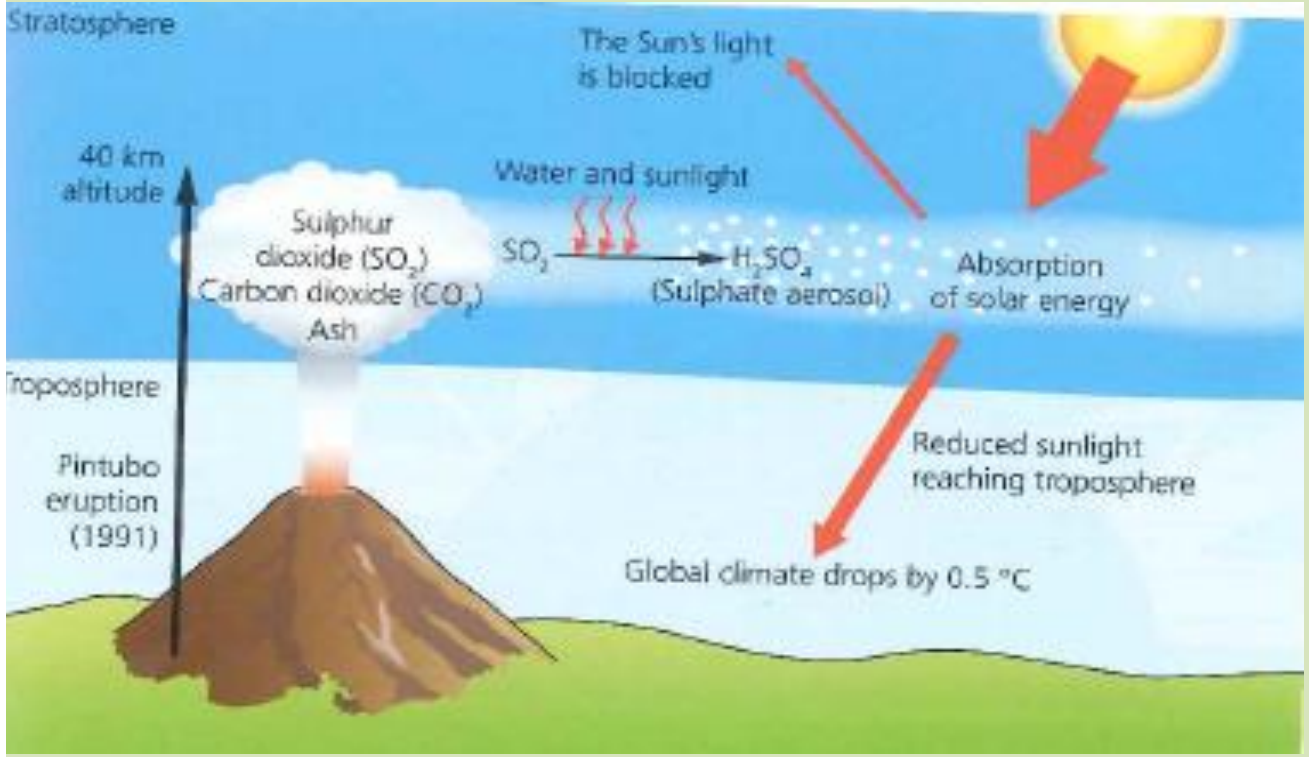
Causes of climate change

Orbital changes

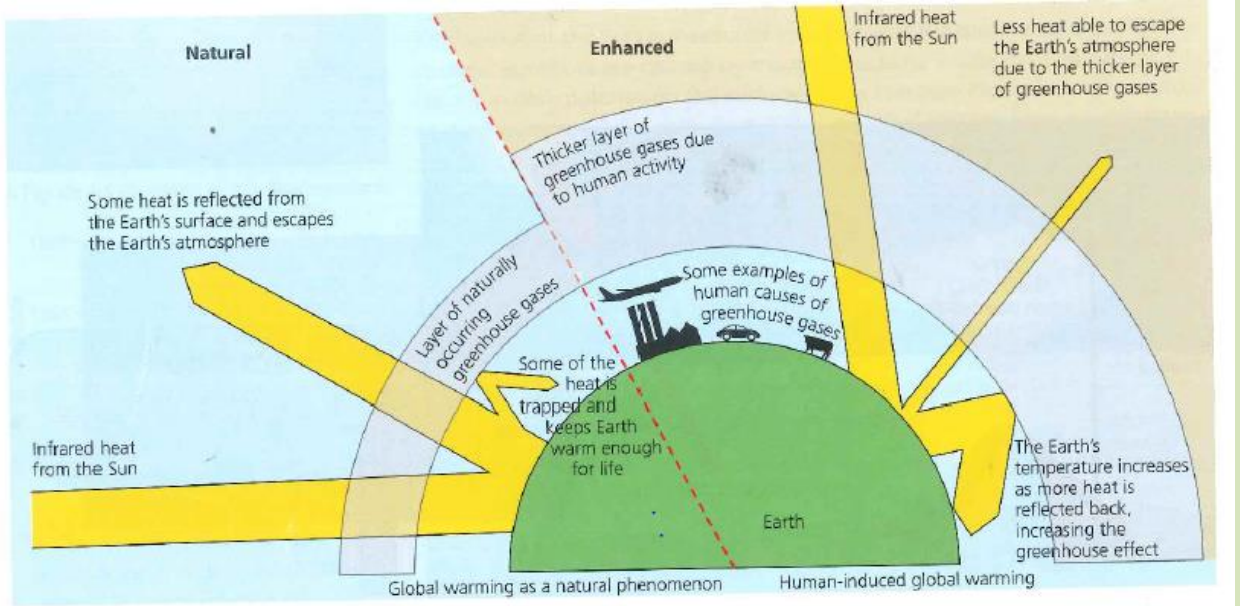
The distribution of the Sun's energy on the Earth changes due to the Earth's orbit:

- The Earth's orbit is an ellipse. The Sun is not perfectly in the centre of the ellipse and the ellipse changes shape every 100,000 years. This means the distance between the Earth and the Sun changes as the Earth orbits. As the Earth orbits closer to the Sun, the climate becomes warmer, and the opposite happens as it orbits away.
- The Earth's axis is tilted on an angle. The angle of the tilt changes due to the gravitational pull of the Moon. When the angle of the tilt increases, this can exaggerate the climate, so summers get warmer and winters get colder. The angle of the tilt moves back and forth every 41,000 years.
- The Earth is not a perfect sphere, so as the Earth spins, it wobbles on its axis in a 20,000-year cycle.

Together, these three **orbital changes** vary the distribution of the Sun's energy on the Earth. This can mean a significant impact on climate change. However, scientists suggest that orbital changes would not cause an ice age for at least 30,000 years.



- Fossil Fuels release greenhouse gases as they are burnt, for transport, energy generation, etc. More people on the planet need more energy, so this problem is getting worse…
- Agriculture – As the world's population continues to increase, so we need more food. Livestock produces huge amounts of methane, as does decaying organic matter used to fertilise crops.
- Deforestation – cutting down trees for building roads, farms etc is in itself bad but also trees take in CO2 during photosynthesis, so by reducing the number of trees, we are also reducing the capacity for greenhouse gases to be absorbed in this way.



▲ Figure 4.9 The greenhouse effect: natural and enhanced

What is the evidence for climate change?

Temperature is measured directly using an instrument called a thermometer. Reliable measurements using thermometers go back only about a hundred years. In the UK, for example, reliable weather records began in 1910. So, how do we know what temperatures were in the distant past?

Without the use of thermometers, scientists use indirect data stored as a fossil record. These are found in deep ocean sediments and frozen ice cores.

When layers of sediment or fresh falls of snow become buried they trap and preserve evidence of the global temperature at that time. Scientists can study the oxygen in ocean sediments or water molecules in ice to calculate temperature. They can be accurately dated and this information used to plot graphs such as graph **A**. Ice cores have been used to reconstruct temperature patterns from as long as 400000 years ago (photo **C**).

Positive and negative impacts of climate change

Impact on the world

The possible impacts of climate change will vary widely across the globe. People who live in the least developed countries will be the hardest hit.

Negative impacts could include:

- rising sea levels due to melting ice and thermal expansion (a billion people live in coastal areas)
- changing patterns of rainfall, causing desertification in some areas and increased flooding in others
- more frequent extreme weather events including heatwaves, droughts and heavy rainfall; tropical storms would also increase in strength and frequency
- extinction of certain species due to shifting temperature regimes
- spreading of diseases such as malaria (an additional 280 million people could be affected)
- desertification or coastal flooding leading to human migration which could become a source of political and even military conflict
- ski resorts, in places such as the Alps, could close due to a lack of snow

Positive impacts of a warmer global climate could include:

- warmer temperatures and increased CO_2 levels, leading to more vigorous plant growth
- longer growing season leading to a higher yields in current farming areas
- frozen regions, such as Canada and Siberia, could be able to grow crops

Impact on the UK

<u>Negative impacts of climate change in the UK include:</u>

- rising sea levels flooding low-lying areas, particularly in southeast England - valuable farmland such as the Fens would be lost
- increased cost of building sea defences
- droughts and floods would become more likely as extreme weather increases
- increased demand for water in hotter summers putting pressure on water supplies

<u>Positive impacts of climate change in the UK include:</u>

- higher year-round temperatures and longer growing seasons could mean that new crops such as oranges flourish in the UK
- higher yields of many outdoor crops such as cereals due to a longer growing season and higher temperatures
- warmer temperatures would reduce winter heating costs
- warmer temperatures could lead to healthier outdoor lifestyles
- growth in the UK tourist industry, particularly seaside resorts, with warmer, drier summers

How can we adapt to climate change?

Scientists believe that climate change will have a huge impact on agricultural systems across the world.

- Patterns of rainfall and temperature will change.
- Extreme weather events such as heatwaves, droughts and floods will become more common.
- The distribution of pests and diseases will change.

Farmers will need to adapt to these changes.

Agricultural adaptation in low latitudes

Scientists think that the greatest changes to agriculture will occur in low latitudes. Southern Africa's maize crop could fall by 30 per cent by 2030 and the production of rice in South Asia could fall by 10 per cent.

There are several adaptations that can be made (photo **A**).

Agricultural adaptation in middle latitudes

A warmer climate in Europe and North America could lead to an increase in production of certain crops such as wheat. In the UK, Mediterranean crops such as vines (photo **B**) and olives may thrive.

Solar energy

In 2013, 14.9 per cent of the UK's electricity was generated by renewable energy sources. Photovoltaic solar energy generated 3.8 per cent of renewable energy sources. When light shines on solar panels it creates an electrical field. The stronger the sunshine on solar panels, the more electricity that is produced. A typical home saves over a tonne of CO_2 per year as there are no greenhouse gas emissions to contribute to climate change (Energy Saving Trust, 2014). However, at times when there is no sunshine, such as night, solar energy cannot be relied on to generate electricity.

International agreements

The UN negotiated a new international climate change agreement for all countries at the 2015 Paris climate conference. It will be implemented from 2020. The European Commission has set the EU's vision for a new agreement that will reduce global emissions by at least 40 per cent below 2010 levels by 2030, and by 60 per cent by 2050. It was a challenge for countries to agree on targets that will go far enough to manage climate change. Some countries can afford to mitigate climate change more than others, and some are considered more responsible for causing climate change than others.

Planting trees

Deforestation is a global problem as it is a major driver of climate change (see Chapter 6). According to the United Nations Environment Programme, deforestation and forest degradation occurs at a rate of 13 million hectares per year. A US$40 billion investment in **reforestation**, and payments to landholders for conservation each year from 2010 to 2050, could increase forest carbon storage by 28 per cent.

Practice questions worth 1 or 2 marks

Define a natural hazard.

What are the characteristics of a tropical storm?

Suggest two natural causes of climate change.

Outline how humans are also causing climate change.

Practice questions worth 8 or 9 marks

Evaluate how effective the government of the Philippines were in their response to Typhoon Haiyan.

Evaluate how effective the overall response to Typhoon Haiyan was.

Assess the extent to which the long term responses to the Somerset Floods in 2014 will stop a recurrence of such a disaster in the area.

Practice questions worth 4 marks

Explain how a tropical storm develops.

Describe how global warming affects the intensity, frequency and distribution of tropical storms.

Suggest two reasons for an extreme weather event in the UK you have studied.

Practice questions worth 6 marks

To what extent do you agree that the government of the Philippines did enough in response to Typhoon Haiyan?

Compare the short-term effects and the long-term effects of Typhoon Haiyan.

Discuss the effects of a UK extreme weather event you have studied, considering the impact on people and businesses.

To what extent do you feel methods of adapting and mitigating for climate change are working?

Beliefs, Values & Traditions– Term 1

Christian Beliefs

The Nature of God (his qualities)

Omnipotent:
This means God is all powerful
Examples of this include
- God creating the world in 7 days
- God working through Moses and Jesus to perform miracles e.g. calming of the storm / 10 plagues
- Resurrection of Christ

The **impact** of this on Christians is that they may feel protected by God and safe. They may feel in awe of God's power and wonder, that nothing can defeat him.

All-Loving
This means that God is caring and looks out for religious believers.
Examples of God being all loving include
- The incarnation of Jesus. This is where God lives through Jesus on earth – showing that God sent down his son to earth to guide us. The quote *"The Word became flesh and lived among us for a while"* shows this
- The parable of the Prodigal Son.
- Jesus said that people should "Pray for your enemies and those that persecute you"
- Gods sacrifice to let Jesus die also shows he is all loving to us: "for God loved the world so much He gave His only Son"

The **impact** of God being all loving is that it would give Christians a personal relationship with God. They believe that he is present within their lives and can intervene if they need help. They may pray often to speak to God or ask him for forgiveness because of this closeness. This will influence them to be loving and forgiving.

Key vocabulary
Omnipotent
Incarnation
Parable
Trinity
Baptism
Immanent

Trinity
This means the 3 parts that make up God – The Father, the Son and the Holy Spirit. The Father is God, the Son is Jesus and the Holy Spirit is the power that binds the 3 together.
Examples that illustrate the Trinity are
- Incarnation of Jesus. This is where God lives through Jesus on earth – showing that God sent down his son to earth to guide us. The quote *"The Word became flesh and lived among us for a while"* shows this
- On Jesus return after death he told the disciples to *"Go make disciples of all nations and baptise them in the name of the Father, Son and Holy Spirit".*

The impacts of this on Christians is they will follow Jesus' teachings to become baptised and embrace the Holy Spirit within them. It will also teaches them that God is all powerful and can intervene through Jesus Christ (incarnation).

God is immanent

This means God is **active in our lives** – he is involved in our lives.
Examples of this would be incarnation, miracles, resurrection of Christ, Judgement and punishment for sin.
This would develop a **personal relationship** with God

Parable of the Prodigal Son

A farmer leaves his inheritance for his 2 sons. One son saves his inheritance and stays to work on the farm, the other son leaves and spends all his inheritance. He returns home with no money and no place to go. The farmer welcomes his son back and forgives him.

This parable story teaches to be loving to one another and forgiving of mistakes

The Nature of God - continued (his qualities)

Beliefs, Values & Traditions– Term 1

Christian Beliefs

Key vocabulary

Omnipotent
Parable
Original Sin
Transcendent

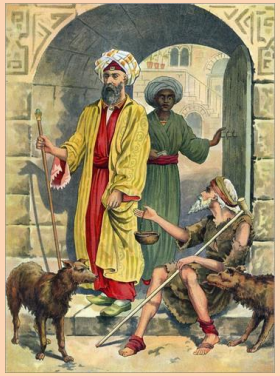
Just

This is the belief that God is fair and brings justice: He can reward those that serve him and punish those that commit sin.

Examples of God being just include:

- Judgement day. When religious believers die they believe if they are good their souls will go to Heaven, if not they will go to Hell.
- The parable of Lazarus and the Rich man.
- The Original Sin (the Story of Adam and Eve)

The **impact** of believing God is just on Christians is that they will understand that their actions have consequences. This will make them live their lives by caring and showing respect for others. Making sure they pray and connect to God – following in his and Jesus' teachings. They will understand that sin and evil will be punished.



Parable of Lazarus and the Rich man

A beggar called Lazarus is begging on the street. Each day a rich man walks past and does not give him any money or food. When the rich man dies God sends him to hell.

This teaches God is almighty and can punish those that sin

God is Transcendent

This means God is **beyond our world, understanding and intelligence**.

Examples of this would be his omnipotence, creation, Judgement and punishment for sin.

This would develop an **impersonal relationship** with God

Is God is all loving? - Suffering

One of the Key arguments is if God is All Loving – why is there suffering?

These are arguments that Christians would make to explain suffering:

- "Suffering is caused by evil in the world, Satan has made individuals to act in evil ways"
- "Suffering is a test from God to strengthen your faith"
- "Suffering is God balancing out the world, it can't always be all good!"
- "God is too powerful and divine to understand what he does" (transcendent)
- "Suffering is God's way to allow us to grow stronger"
- "Suffering is a punishment for sin" (God is Just)

Beliefs, Values & Traditions– Term 1

Christian Beliefs

The birth of Jesus

Incarnation of Jesus

This means God lives through Jesus on Earth. He came to earth to guide and teach us ***"The Word became flesh and lived among us for a while"*** *– The Word is God*

The incarnation is also proof that God is **Omnipotent** and of the **Trinity**

The idea for Christians that God would humble us to come to earth fills Christians with the idea that God is **all loving**.

It impacts Christians and inspires them to be loving to others too. It shows them that God is **immanent** and this will give them comfort.

Example of incarnation **IMPACT:**

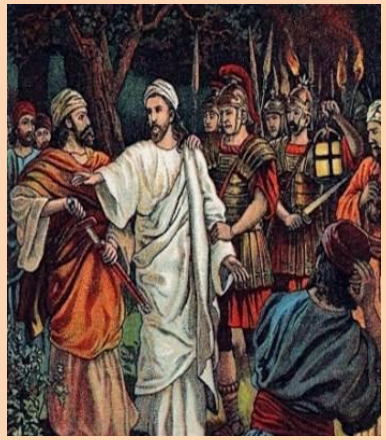
Mather Teresa is a great example of how God's love has inspired her to give love back to others:

Mother Teresa moved to the poor city of Calcutta in India. She lived in the slums with the poor and treated and cared for lepers, the homeless and the poorest of the poor. She was proclaimed a saint by the Catholic Church in 2016

Caiaphas (above) Pilate (right)

Key vocabulary

Incarnation
Omnipotent
Trinity
Immanent
Jerusalem
Blasphemy
Gethsamane
Caiaphas
Pontius Pilate



Jesus arrested in the garden of Gethsamane

The death of Jesus

How and why did Jesus die?

Jerusalem was controlled much by religious leaders at this time. The Jewish high priests had a lot of power, wealth and influence and because of this and did not want anything to threaten their status.

Jesus had come to Jerusalem stating that he was the Son of God – this was Blasphemy. This made the Jewish high priests (and some Jews) very angry. Who was this man to say he was the Lord's son!!

The Jewish high priest called Caiaphas wanted to get rid of Jesus, as Jesus had been causing trouble and gaining some support. He bribed Judas (one of Jesus' disciples) to tell him where Jesus was. Caiaphas' Guards then went to the Garden of Gethsamane and arrested Jesus.

Jerusalem at this time was ruled by the Roman Empire. The Jewish priest were very influential and powerful but they did not have the right to sentence criminals to death. Caiaphas needed the Roman governor Pontius Pilate to do so. Pilate did not believe that Jesus should be put to death, he was put under pressure – by the crowds but also because he had already failed to deal with a rebellion before and was seen as weak by the Roman Emperor, so he needed to show strength against enemies of the state.

Pilate sentenced Jesus to death by crucifixion.

These clips below cover the story of Jesus' death

https://www.youtube.com/watch?v=sz7UICFortc&safe=active

https://www.youtube.com/watch?v=5CLBy2r72Cg&safe=active

https://www.youtube.com/watch?v=HL8R158Ujp4&safe=active

The Events: crucifixion to ascension

Beliefs, Values & Traditions– Term 1

The importance of Jesus' Death

On Good Friday Jesus' was crucified. He was hung on a cross and left there. Just before his death he called out "My God , My God, why have you forsaken me". Jesus took 6 hours to die in a very painful way. When he died is it said that the curtain temple tor in two.
Jesus' body was put into a tomb and a stone bolder rolled across its entrance.
On the Sunday morning 3 women returned to tend to the body of Jesus. When they reached the tomb the stone in font had been rolled to the side. They went inside and the body had disappeared. According to the Gospel of Mark – a young man had told them that Jesus had risen and he would be in Galilee. Mary Magdalene was one of the women, she went to tell the disciples that Jesus had risen (called the **resurrection**.)
When the disciples meet with Jesus, they preached with him for 40 days about God. Jesus told the disciples to **"make disciples of all nations, baptising them in the name of the Father and of the Son and of the Holy Spirit".**
After 40 days Jesus died and ascended to Heaven, this is called his **ascension**.

Watch the clip below: Jesus' death
https://www.youtube.com/watch?v=Y3UKd6LQKng

Christian Beliefs

Key vocabulary
Atonement
Reconciliation
Salvation
Resurrection
Ascension

KEY QUOTE
"God loved the world so much he gave his only son"

Why did Jesus die?

Many people question some things about Jesus' death…
Why did he have to die? If he was the Son of God why didn't he save himself? Why did God want him dead?

God had decided that Jesus had to die. Jesus had accepted this with God the night before his death "Your will, not mine, be done" (Jesus).

God saw how the mankind behaving badly, sinning, turning away from God…
God is JUST so mankind needed punishing.
However God is also ALL LOVING he cannot punish all people (he has done this before; stories such as Noah's Ark show this).
God decides that Jesus will take the punishment for mankind; This was a sacrifice for God as well as Jesus.
This is called Jesus' atonement – Jesus make up for the sins of mankind

When Jesus atoned mankind's sin it **reconciled the relationship between God and mankind.** God forgave man and man saw what Jesus had done.

Many believed in Jesus and God and stopped sinning, they had gained **salvation – God's love and acceptance into Heaven**.
Salvation comes from the word save – it is often said that Jesus saved us. This means Jesus' death saved us from sin and therefore acceptance into Heaven by God.

IMPACT of crucifixion and death:

The crucifixion shows Christians no matter what suffering they go through, that if Jesus can endure 6 hours of suffering they can too; this gives them strength to keep going. The sacrifice shows that God and Jesus love them deeply. It also inspires them to love others and sacrifice things for others and be giving.

Why is the Resurrection and ascension of Jesus important

Beliefs, Values & Traditions– Term 1

Christian Beliefs

The **impact** of the resurrection is when Jesus resurrected and came back to life for 40 days, is that it shows Jesus ready **IS** the Son of God.
"The word became flesh and lived among us for a while"

This goes to show God's POWER – that he is **omnipotent**. This gives Jesus' teaching **authority** and meaning. Christians today will follow Jesus' teachings to follow God.

The **impact** of Jesus' ascension when he went to Heaven – shows Christians that there is an after life. This gives them **hope** and **comfort** knowing there is eternal love and life with God.

Key vocabulary

Resurrection
Omnipotence
Ascension
Crucifixion
Atonement
Reconciliation
Salvation
Salvation through law
Salvation through Grace
God's Grace

Salvation

Key term	Definition
Salvation	Acceptance by God into Heaven
Salvation through Law	Following Gods laws (e.g. 10 Commandments) will earn you a place into Heaven
God's Grace	God loves you
Salvation through Grace	God loves you and therefore you are allowed into Heaven
Universalism of Heaven	God is by nature all loving (his love is universal – meaning for everyone) and therefore you will go to heaven, no matter what, because God is all loving.

Summary of Key concepts

Concept	Evidence	Impact
Crucifixion	6 hours Jesus died on the cross	Empathy for suffering. Determination to get through difficult times
Atonement	"God loved the world so much he gave his only Son"	God and Jesus are all loving to mankind. Sacrifice: willing to give. This will inspire Christians to be loving and self sacrificing.
Reconciliation	Jesus died for our sins to repair our relationship with God	God and man have reconciled (repaired) their relationship. Mankind's' sins have been forgiven. It will encourage Christians to forgive others.
Salvation	The reconciliation of man and God. Jesus said "Go make disciples of all nations"	God and Jesus are all loving to mankind. Christians should be baptised to accept the Holy trinity then they are accepted to heaven.
Resurrection	"The word became flesh and lived among us for a while"	Jesus is really the Son of God. Jesus' teachings have authority
Ascension	Jesus died after 40 days	Proof of the after life. Gives Christians hope and comfort for eternal life with God

Judgement

Beliefs, Values & Traditions– Term 1 The afterlife

Christian Beliefs

Key vocabulary

Judgement Day
Final judgement
Parable
Heaven
Hell
Purgatory

Judgement day:

This is when Christians die they will face judgement by God on the actions of their life. This follows with the idea that **God is just** and will reward those with the after life of Heaven and condemn those who have sinned to Hell. Some Christians believe in **purgatory**. This is a waiting state before Heaven. It is similar to Hell – like a state of punishment for their sins before being accepted into Heaven.

Jesus taught about Judgement through **parables; Lazarus and the Rich Man and the Sheep and the Goats**.

Final Judgement:

This is something different. Final Judgement is when Judgement will come to the whole world. This is believed by **Catholics**.
The belief is that Jesus will return to earth, bringing the age of time and space to an end (end of the world). There will be a final judgement on all living and dead souls for a place in Heaven or Hell.

Parable of the Sheep and Goats.

This parable makes reference to God being like a shepherd. The shepherd separates the sheep from the goats (the sheep being the ones to stay with the shepherd). The reference is liking God separating the good from the bad, in teaching the idea of judgement.

Parable of Lazarus and the Rich man

A beggar called Lazarus is begging on the street. Each day a rich man walks past and does not give him any money or food. When the rich man dies God sends him to hell.

This teaches God is almighty and can punish those that sin

The Impacts of this will by significant on how a Christians lives:
Following law e.g. 10 commandment
Behaviour to others
Following teachings of Jesus ..e.g.'s...

HEAVEN

Christians do **NOT believe** that Heaven is a place in the clouds with a big pearly gate. Images we have of Heaven have come from illustrations in History, many of which were from the renaissance period of art and culture within religion.

Christians believe that **Heaven is a STATE OF BEING (not a physical place) ETERNALLY WITH GOD.**

WITH HIM

GOD

WITH OUT HIM

HELL

Much like Heaven, the notion that Hell is a place of fire and punishment is **NOT believed** by Christians. This image had been created by the Medieval church to scare people into following the Churches rules – maintaining the power of the church in History.

Christians believe that **Hell is ETERNAL SEPARATION FROM GOD**.

Many Christians see that though God is JUST **Hell has not been decided by God, but by themselves because God gave mankind FREE WILL.** Therefore you are responsible for your actions and consequences.

Beliefs, Values & Traditions– Term 2

Religion and Life

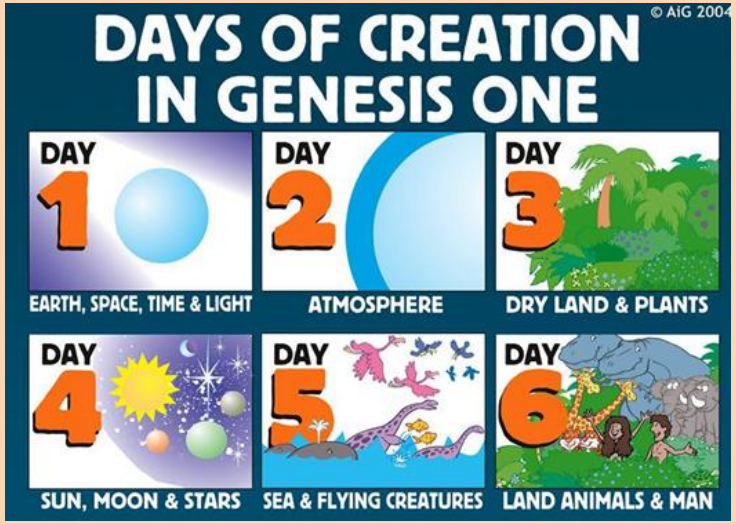
Where do we come from?

This unit looks at different theories on how we were created and how we have evolved.
Below shows the different theories.

It is important think about the problems with these theories, but also the impacts for people holding these beliefs.

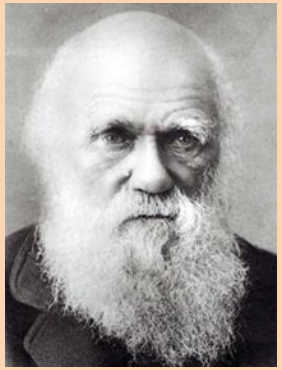
It will show that science and religion can go hand in hand!

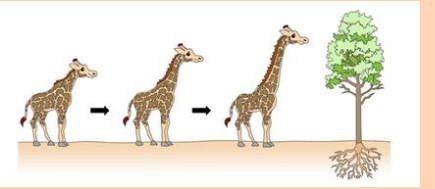
Key vocabulary
Literalist
Non-Literalist
Big bang theory
Theory of Evolution
Theory of Intellectual Design



Different Theories of Creation and Evolution

Literalist Christians	Non-Literalist Christians	Big Bang Theory	Charles Darwin
These are Christians that believe the bible literally – word for word, of the creation story in the book of genesis. "In the beginning was the Word… and the Word was God" (Genesis) – therefore God created the world. • "let there be light" – first day • 6 days different things on each day • E.g. 6th day Adam and Eve • 7th Day rested	These are Christians that believe God created the world – but maybe in 6 stages. These stages could be longer periods of time – e.g. thousands or millions of years. This comes from when the bible was translated into English – the word used in Hebrew meant period of time, however the English bible used the word day. They believe that it was the power of God that started the universe … maybe they believe that God created the explosion at the start?? Also non-litertalists are not so concerned with how God created the world – but that he created it for them, with love.	About 20 billion years ago, an incredibly powerful explosion occurred, called a Big Bang. Scientists theorise that energy created this explosion, however where did the energy come from? There is always the unknown question – what came before this? Within a millionth of a second after the explosion, neutrons and electrons were created. In the explosion, enormous heat was generated, but as the universe cooler down a little, elements like helium and hydrogen were created. From these elements, stars, galaxies, planets and solar systems were formed. As the universe continued to cool, on at least one planet (which we call earth) about 3 billion years ago, life began to develop. Today scientists have found background radiation. Scientists believe that this radiation has existed since the big bang.	Darwin believed that as environments changed, some species died and some survived – this was called "Natural selection". Those that survived adapted due to their changing environment e.g. giraffe grew long neck to reach tall trees. **Theory of evolution.** Darwin was a Christian and believed God played a part in this; he came up with the **"Theory of intellectual design"** – that God gave some animals ability to adapt and survive.





Environment and Animals

Beliefs, Values & Traditions– Term 2

CAUSES	IMPACTS
Global Warming: Build-up of greenhouse gases in the atmosphere e.g. CO2 due to development of industrialisation and burning of fossil fuels. Some countries are not decreasing their levels e.g. China largest producer	Climate change – melting ice caps – rising sea levels and flooding. Drought in areas. Impact on animals, food production and safety. Impact of protest; Gretta Thunberg, climate change protests
Plastics: More usage of plastics in modern life e.g. food packaging. 8 million tons in the oceans in 2019 	- killing coral reefs, being ingested by animals e.g. birds + LAWS changing attitudes. Recycling more in plastics. Plastic Pact in UK retailers have committed to using recyclable or compostable plastic by 2025.

Religion and Life

Key vocabulary

Stewardship
Dominion
Ummah
Sewa

Watch these clips on environmental issues:
https://www.youtube.com/watch?v=G4H1N_yXBiA
https://www.youtube.com/watch?v=xLx4fVsYdTI

Animal Testing

There are many appalling things about animal testing:

- ❑ Animals will endure pain when tested on
- ❑ Some testing is for worthless gain e.g. cosmetic testing
- ❑ Some testing for cosmetics could be done of human tissue samples rather than animals.

However some people believe that animals testing has benefits too:

- ❑ Terminal disease drugs like cancer, can be tested on animals to preserve life for humans with life threatening diseases.
- ❑ Procedures for transplants, e.g. heart, can be done by trainee doctors on animals in preparation for humans.

Religious Groups that support Stewardship:

Green Christian

- Are concerned that the earths resources are limited and we are using them too fast.
- Publicise stewardship through leaflets, write blogs, pray and fast for the environment.

Ifee (Islamic Foundation for Ecology and Environment)

- Concerned with destruction of ecosystem / climate change
- Project: Green mosques – making them eco-friendly e.g. saving water systems.

GreenChristian

Religious Beliefs about Environment / Animals

Protecting environment and animals rights	Humans are more important than animals
• "The earth is the Lord's and everything in it" Bible • "The world is green and beautiful and Allah appointed us stewards over it" Qur'an • Muslims believe in **Ummah** – which means community. • God appointed humans with **dominion** (responsibility) to look after the world • Religious believers believe in **Stewardship** – they should protect the environment and animals. • Animal testing is cruel and does not show stewardship • Pope John Paul wrote "We must abandon these factories of death" talking about animal testing labs • Many religions are vegetarian	• God gave humans **dominion** (power) over animals. • God created animals for humans to eat • Animal experimentation can be used to help humans such as advances in medical procedure or cures for diseases. • Sikhs believing **Sewa** – meaning service to other humans. For this reason they are pro animal testing for medical reasons to help other humans • Humans life is sacred and should be preserved at whatever cost – therefore testing to preserve human life is acceptable.

Medical Ethics

Beliefs, Values & Traditions– Term 2

Religion and Life

Key vocabulary

Hippocratic oath
Sanctity of Life
Quality of Life
Abortion
Pro Life
Pro Choice
Euthanasia
Hospices

Medical Ethics means doing what is ethical and right in Medicine and healthcare.
In order for doctors to comply with this they take the **Hippocratic oath**. The key messages of this are:

- To preserve all life.
- That the patient is most important, not the science, or medicine or family.
- That the need to be careful not to play God but to use their knowledge and experience with each individual patient.

Sanctity of Life	Quality of Life
All life is special and should be preserved at all costs. Abortion and Euthanasia go AGAINST the sanctity of life It is not our right to take away life	How good our lives are: this could be in terms of health, living conditions, mental state…. Sometimes quality of life becomes so awful that some people feel it is acceptable to end life.

Abortion

Abortion is legally available in the UK up to **24 weeks** since 1967.
However it must be agreed that either the **baby or mother's life will be impacted in a negative way.** E.g. for the mother/child this could be socio-economic factors as well as health.
Most abortions are done before 8 weeks. Early abortions are done by taking a pill that induces miscarriage. Later abortions are more invasive.

The topic of Abortion has divided many of their viewpoint.
What is important to remember is that there are many different situations when people have abortions.
You may be against abortion totally, or you may think there are circumstances when abortion is acceptable.

Catholics	Anglicans	Muslims
Are against abortion as they believe that life begins at conception. The only exception for Catholics is if the mother's life is in danger. Catholics believe in the Sanctity of life, that all life is sacred The bible teaches: 10 Commandments – Thou shall not kill. "I your God, give life, and I take it away" Only God has the right to take away life	Abortion is seen as an evil necessity sometimes. Like Catholics if there is danger to the mother – her life is sacred. BUT also in cases of rape or if the if child maybe mentally or physically disabled, abortion is allowed.	Abortion is frowned upon - however can happen before ensoulment. Ensoulment is when it is believed that a foetus has a soul. Ensoulment is usually at 120 days (so abortion before then is acceptable if necessary).

Medical Ethics

Beliefs, Values & Traditions– Term 2

Religion and Life

Key vocabulary

Sanctity of Life
Quality of Life
Euthanasia
4 Noble truths
Hospices

Euthanasia

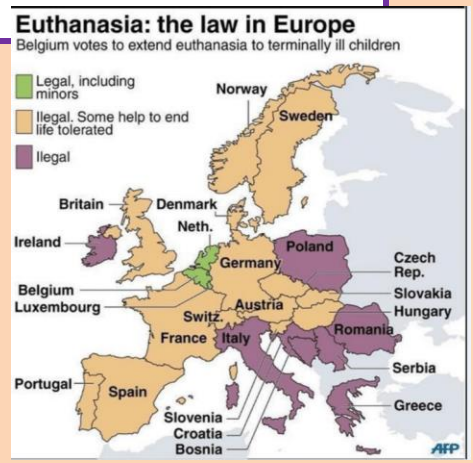
Euthanasia ending someone's life. It is illegal under the UK Suicide Act of 1961. However in some countries such as Switzerland and Belgium Euthanasia is legal.

There are 4 kinds:

1. **Voluntary Euthanasia** – person asks to be helped to die
2. **Involuntary Euthanasia** – person has no say
3. **Active Euthanasia** – a specific action takes place to end a persons life, such as an overdose of tablets
4. **Passive Euthanasia** – stopping doing something e.g. life support treatment is removed

Catholics	Buddhists
Are against Euthanasia as they believe in the Sanctity of life, that all life is sacred. The bible teaches: 10 Commandments – Thou shall not kill. "I your God, give life, and I take it away" Only God has the right to take away life	A primary principle of Buddhists is to reduce suffering – this is part of the belief the **4 Noble Truths** Dalai Lama "Where a person is going to die and keeping them alive leads to more suffering, then termination of their life is permitted" Buddhists must show compassion (understanding and love) to other humans. However – every situation needs to be judged separately.

The topic of Euthanasia has divided many of their viewpoint.
There are 2 main situations when Euthanasia occurs:
Involuntary - ending someone's life in **critical care / life support**
Voluntary – when someone wants to end their life due to health problems – these could be a **terminal illness, a degenerate illness or prolonged mental health issues.**
You may be against Euthanasia totally, or you may think there are circumstances when Euthanasia is acceptable.



Salisbury Hospice Charity

Hospices

Originally they were set up by Christians. Hospices are an **alternative to euthanasia, specialising in end of life care.** They are voluntary funded and each patient is given an individual care plan, suited to their personal needs.

Hospices help by:

1. Relieve physical pain of an illness through medicine, but also massage / meditation
2. Care for the emotional and spiritual side for patients reaching the end of their life.
3. To support families. They offer services to help families come to terms with loosing someone
4. Educate others about hospices as a way of helping those terminally dying.

Term 1&2 French

Présente-toi *(Present yourself / tell me about yourself)*

je m'appelle *(my name is / I'm called)*

j'ai … ans (I'm … years old)

j'ai les cheveux blonds / bruns / courts / longs *(I've go blonde / brown / short / long hair)*

j'ai les yeux bleus / verts *(I've got blue / green eyes)*

je suis timide / calme / intelligent(e) *(I'm shy / quiet / clever)*

Est-ce qu'on se dispute? *(Do you / do people argue [in your house])*

on se dispute quand / si… *(we argue when / if…)*

on s'entend bien *(we get on well)*

on ne s'entend pas bien *(we don't get on well)*

je m'entends bien avec… *(I get on well with…)*

Comment est ta famille? *(What's your family like)* + As-tu un meilleur ami? *(Do you have a best friend?)* + As-tu un petit ami / une petite amie? *(Do you have a boyfriend / girlfriend?)*

j'ai un frère / une soeur / un demi frère **qui** s'appelle… *(I have a brother /sister / step-brother **who** is called…)*

je suis fille /fils unique *(I'm an only child)*

mon père / ma mère / mes parents *(my dad / mum / parents)*

il / elle est *(he / she is)*

ils / elles sont *(they are)*

il / elle a *(he/ she has)*

ils /elles ont *(they have)*

ils s'appellent *(they are called)*

Veux-tu te marier dans le futur? *(Do you want to marry in the future?)*

Je vais / je veux / je voudrais me marier avec … *(I'm going / I want / I would like to get married to, with…)*

Je pense que le mariage est… *(I think that marriage is…)*

Si / quand *(if / when)*

Le partenaire / l'homme / la femme de mes rêves *(the partner / man / woman of my dreams)*

serait / aurait *(would be / would have)*

As-tu une fête préférée? Lesquelles préfères-tu: les fêtes anglaises ou françaises? *(Do you have a favourite festival? Which do you prefer – English or French festivals?)*

j'aime / j'adore… *(I like / love)*

ma fête préférée est… *(my favourite festival is…)*

Noël / Pâques ***(Christmas / Easter)***

je préfère / j'aime mieux ***(I prefer)***

car / parce que / puisque ***(as / because / since)***

Term 1&2 French

Key Grammar

Describing yourself – using key basic verbs

Using adjectives

Adjectives describe things or people. They need to show agreement with the thing they are describing. To do this accurately, you need to consider whether the word is MASCULINE (a 'le' or 'un' word), FEMININE (a 'la' or 'une' word) or PLURAL (more than one).

Adjective	*masculine*	*feminine*
white	blanc(s)	blanche(s)
black	noir(s)	noire(s)
green	vert(s)	verte(s)
red	rouge(s)	rouge(s)
blue	bleu(s)	bleue(s)
funny	amusant(s)	amusante(s)
clever	intelligent(s)	intelligente(s)
*big**	grand(s)	grande(s)
*small**	petit(s)	petite(s)

Usually, adjectives go **AFTER** the thing you're describing. Some (only a few) go **BEFORE**.

Examples:

j'ai les cheveux **noirs** = I have **black** hair

mon **grand** frère a les yeux **bleus** = my **big** brother has **blue** eyes

Pronoun	être *(to be)*	avoir *(to have)*	s'appeller *(to be called)*
je *(I)*	suis *(am)*	ai *(have)*	m'appelle *(am called)*
tu *(you)*	es *(are)*	as *(have)*	t'appelles *(are called)*
il / elle / on *(he/she/one)*	est *(is)*	a *(has)*	s'appelle *(is called)*
nous *(we)*	sommes *(are)*	avons *(have)*	nous appellons *(are called)*
vous *(you)*	êtes *(are)*	avez *(have)*	vous appellez *(are called)*
ils / elles *(they)*	sont *(are)*	ont *(have)*	s'appellent *(are called)*

NB:

tu = you (informal; talking to younger people, people you know)

vous = you (formal; talking to older people, adults, people you don't know or groups)

Term 1&2 French

Using reflexive verbs

This is a group of verbs which have an extra **pronoun**. You have met one already when you give your name. ***'Je m'appelle'*** = I am called **LITERALLY** I call **myself.** ***This is what the 'me' stands for.***

Pronoun	**s'entendre *(to get on with)***	**se disputer *(to argue)***
je *(I)*	**m'entends**	**me dispute**
tu *(you)*	**t'entends**	**te dispute**
il / elle / on *(he/she/one)*	**s'entend**	**se dispute**
nous *(we)*	**nous entendons**	**nous disputons**
vous *(you)*	**vous entendez**	**vous disputez**
ils / elles *(they)*	**s'entendent**	**se disputent**

Talking about the future

There are a number of ways you can talk about future plans. These all use the INFINITVE form of the verb.

Examples:

Je veux = *I want*	+	aller *(to go)* avoir *(to have)* être *(to be)* habiter *(to live)* trouver *(to find)* me marier avec *(to get myself married to / with)* travailler *(to work)* gagner *(to earn)*
Je voudrais = *I would like*		
J'espère = *I hope*		
Je vais = *I am going*		
J'aimerais = *I would like*		
J'ai l'intention de = *I intend*		
Je pense à = *I'm thinking about*		

Term 1&2 French

As-tu un portable? Que fais-tu avec? *(Do you have a mobile? What do you do with it?)*

j'ai un portable / je n'ai pas de portable / c'est un… *(I have / don't have a phone / it's a…)*

mes parents m'ont donné mon portable *(my parents gave me my phone)*

mes parents me paient mon forfeit *(my parents pay for my contract)*

j'utilise mon portable pour …. *(I use my phone to…)*

envoyer des textos *(sending texts)*

faire mes devoirs *(doing my homework)*

jouer aux jeux *(playing games)*

regarder des vidéos *(watching videos)*

Quels sont les avantages et les inconvénients de la technologie moderne? *(What are the advantages and disadvantages of modern technology?)*

ça nous aide beaucoup *(it helps us a lot)*

c'est très important pour les étudiants *(it's very important for students)*

on ne pourrait pas survivre sans internet *(you couldn't survive without the Internet)*

utile *(useful)*

dangereux *(dangerous)*

il y a des inconnus *(there are unknown people / strangers)*

il y a un problème avec… *(there is a problem with…)*

la cybercriminalité *(cyber crime)*

la cyber intimidation *(cyber bullying)*

Est-ce que internet c'est nécessaire de nos jours? *(Is the Internet necessary these days?)*

A mon avis *(in my opinion)*

Je pense que *(I think that)*

Je crois que *(I believe that)*

aujourd'hui *(today)*

de nos jours *(these days)*

c'est important / indispensable *(it's important / indispensable)*

surtout / especialement *(above all / especially)*

Que penses-tu de 'Facebook' et des autres réseaux sociaux? *(What do you think of Facebook and other social media?)*

c'est très utile *(it's very useful)*

je n'aime pas beaucoup *(I don't really like it)*

on peut rester en contact avec … *(you can stay in contact with…)*

on peut envoyer / échanger des photos *(you can send / exchange photos)*

je préfère Instagram car… *(I prefer Instagram because…)*

Term 1&2 French

Aimes-tu lire? Quel genre de livres aimes-tu? (Do you like to read? What type of books do you like?) + Aimes-tu regarder la télé? (Do you like to watch TV?) + Parle-moi des films que tu aimes… / As-tu jamais vu un film français? (Tell me about films you like… / Have you ever seen a French film?)

j'aime / je n'aime pas *(I like / don't like)*

regarder / voir / lire / écouter *(to watch / to see / to read / to listen)*

je suis fana de *(I'm a fan of)*

je ne supporte pas *(I can't stand)*

le genre *(type)*

la sorte *(type)*

le roman *(novel)*

le film *(film)*

l'émission *(TV programme)*

hier / la semaine dernère / il y a un mois *(yesterday / last week / a month ago)*

j'ai vu / j'ai regardé *(I saw / I watched)*

j'ai lu / j'ai écouté *(I read / I listened to)*

c'était *(it was)*

j'ai beaucoup aimé *(I really liked)*

je n'ai pas aimé *(I didn't like)*

je l'ai trouvé *(I found it)*

Using past tenses

When talking about something you've done, you will be using either the perfect or imperfect tense.

Reminder:

use 'avoir' or 'être' + past participle to make the **perfect tense:**

j'ai vu – *I have seen / I saw*

j'ai regardé – *I have watched / I watched*

nous avons écouté – *we listened (to)*

je suis allé au cinéma – *I went to the cinema*

nous sommes allés à un concert – *we went to a concert*

The **imperfect tense** will describe what something **was** like or what you **were doing**.

c'était – *it was*

j'aimais – *I used to like*

je regardais – *I was watching / I used to watch*

j'avais – *I used to have / I had*

Using infinitives

The ***infinitive*** form of the verb can be used to help give opinions.

j'aime **regarder** / je déteste **voir** / j'adore **lire** *(I like **to watch** / I hate **to see** / I love to **read**)*

If you want to say 'in order to do something' use **pour** + **infinitive**

j'ustilise mon portable **pour** envoyer des photos – I use my phone to send photos

Using adverbs of time

Develop your sentences by making references to when / how often you do something. Notice that a lot of the time, words ending in –lly in English will end with –ment in French

normalement – normally

géneralement – generally

habituellement - usually

quelquefois – sometimes

des fois – at times

une fois par semaine – once a week

Using negatives

Making negative sentences will help give your responses contrast. *Notice they go round the verb.*

ne…pas – not / don't

ne…jamais – never

ne…que – only

Examples:

je **ne** regarde **pas** la télé – I don't watch TV

je **ne** regarde **jamais** des émissions de sport – I never watch sports programmes

je **n'**écoute **que** la musique hip-hop (I only listen to hip-hop)

Term 1&2 Spanish

Presentate *(Present yourself / tell me about yourself)*

Me llamo *(my name is / I'm called)*

tengo… años (I'm … years old)

Tengo el pelo rubio/ castaño / corto / largo *(I've go blonde / brown / short / long hair)*

Tengo los ojos azules/ verdes *(I've got blue / green eyes)*

Soy timido/a/ calmo/a / intelligente *(I'm shy / quiet / clever)*

¿Cómo us tu familia? *(What's your family like)* + ¿Tienes un mejor amigo? *(Do you have a best friend?)* + ¿Tienes un novio/ una novia? *(Do you have a boyfriend / girlfriend?)*

Tengo un hermano/ una hermana/ un hermanastro **que** se llama… *(I have a brother /sister / step-brother **who** is called…)*

Soy hijo único/Soy hija única *(I'm an only child)*

mi padre / madre / mis padres *(my dad / mum / parents)*

es*(he / she is)*

Son *(they are)*

Tiene *(he/ she has)*

Tienen *(they have)*

Se llaman *(they are called)*

Discutes (Do you / do people argue [in your house])

Discutimos cuando/so… *(we argue when / if…)*

Nos llevamos bien*(we get on well)*

Nos llevamos mal *(we don't get on well)*

Me llevo bien con… *(I get on well with…)*

¿Quieres casarte en el futuro? *(Do you want to marry in the future?)*

Voy a / quiero / Me gustaría casarme con *(I'm going / I want / I would like to get married to, with…)*

Creo que el matrimonio es… *(I think that marriage is…)*

Si / cuando *(if / when)*

La pareja / hombre / mujer de mis sueños *(the partner / man / woman of my dreams)*

Sería/ tendría *(would be / would have*)

¿Tienes una fiesta favorita? Do you have a favourite festival? ¿Cual prefieres? : ¿Festivales ingleses o españoles? *(Which do you prefer – English or French festivals?)*

Me encanta/ me gusta*(I like / love)*

Mi festival favorito es*(my favourite festival is…)*

Navidad / Pasqua ***(Christmas / Easter)***

prefiero***(I prefer)***

porque / ya que ***(as / because)***

Term 1&2 Spanish

Using adjectives

Adjectives describe things or people. They need to show agreement with the thing they are describing. To do this accurately, you need to consider whether the word is MASCULINE (un/el), FEMININE (una/ la) or PLURAL (los/unos).

Masculine Singular	Feminine Singular	Masculine plural	Feminine Plural	ENGLISH
alto	alta	altos	altas	***Tall***
Bajo	baja	bajos	bajas	***Short***
debil	debil	debiles	debiles	***Weak***
delgado	delgada	delgados	delgadas	***Thin***
De estatura media				***Medium height***
De talla media				***Medium build***
esbelto	esbelta	esbeltos	esbeltas	***Slim***
feo	fea	feos	feas	***Ugly***
flojo	floja	flojos	flojas	***Weak***
fuerte	fuerte	fuertes	fuertes	***Strong***
gordo	gorda	gordos	gordas	***Fat***
guapo	guapa	guapos	guapas	***Good-looking***
hermoso	hermosa	hermosos	hermosas	***Beautiful***
moreno	morena	morenos	morenas	***Dark***
precioso	preciosa	preciosos	preciosas	***beautiful***
rubia	rubia	rubios	Rubias	***Blond***

Usually, adjectives go **AFTER** the thing you're describing. Some (only a few) go **BEFORE**.

Key Grammar

Describing yourself – using key basic verbs

Pronoun	**ser *(to be)***	**tener *(to have)***	**llamarse *(to be called)***
yo *(I)*	soy *(am)*	tengo*(have)*	Me llamo *(am called)*
tú *(you)*	eres *(are)*	tienes *(have)*	Te llamas *(are called)*
él/ ella / on *(he/she/one)*	es *(is)*	tiene *(has)*	Se llama *(is called)*
nosotros *(we)*	somos *(are)*	tenemos *(have)*	Nos llamamos *(are called)*
vosotros *(you)*	sois *(are)*	tenéis *(have)*	Os llamais*(are called)*
ellos / ellas *(they)*	son *(are)*	tienen *(have)*	Se llaman *(are called)*

NB:

tú = you (informal; talking to younger people, people you know)

vosotros = you; talking to groups)

Term 1&2 Spanish

Using reflexive verbs

This is a group of verbs which have an extra **pronoun**. You have met one already when you give your name. ***'me llamo'*** = I am called **LITERALLY** I call **myself.** ***This is what the 'me' stands for.***

Pronoun	**llevarse*(to get on with)***
yo *(I)*	Me llevo
tú *(you)*	Te llevas
él/ ella / on *(he/she/one)*	Se lleva
nosotros *(we)*	Nos llevamos
vosotros *(you)*	Os llevais
ellos / ellas *(they)*	Se llevan

Here are some more….

aburrir *to bore*	**aburrirse** *to get bored*
acordar (o:ue) *to agree*	**acordarse (de) (o:ue)** *to remember*
comer *to eat*	**comerse** *to eat up*
dormir (o:ue) *to sleep*	**dormirse (o:ue)** *to fall asleep*
ir *to go*	**irse (de)** *to go away (from)*
llevar *to carry*	**llevarse** *to carry away*
mudar *to change*	**mudarse** *to move (change residence)*
parecer *to seem*	**parecerse (a)** *to resemble; to look like*
poner *to put*	**ponerse** *to put on (clothing)*
quitar *to take away*	**quitarse** *to take off (clothing)*

Talking about the future

There are a number of ways you can talk about future plans. These all use the INFINITVE form of the verb.

Examples:

quiero=*I want*	+	ir *(to go)* tener *(to have)* Ser/estar *(to be)* vivir *(to live)* encontrar *(to find)* Casarme con *(to get myself married to / with)* trabajar *(to work)* ganar *(to earn)*
Me gustaría= *I would like*		
espero = *I hope*		
Voy a = *I am going*		
quisiera =*I would like*		
intento=*I intend*		
Pienso de=*I'm thinking about*		

Term 1&2 Spanish

¿Tienes un móvil? Que haces con él? (Do you have a mobile? What do you do with it?)

Tengo un móvil / No tengo un móvil / es un (I have / don't have a phone / it's a…)

mis padres me dieron mi móvil (my parents gave me my phone)

mis padres me pagan mi contrato (my parents pay for my contract)

Uso mi móvil para…. *(I use my phone to…)*

Mandar mensajes *(sending texts)*

Hacer mis deberes *(doing my homework)*

Jugar a los juegos *(playing games)*

Ver videos*(watching videos)*

Est-ce que internet c'est nécessaire de nos jours? *(Is the Internet necessary these days?)*

En mi opinion *(in my opinion)*

Pienso que *(I think that)*

Creo que *(I believe that)*

hoy *(today)*

de nuestros días*(these days)*

Es importante/ necesario *(it's important / indispensable)*

Sobre todo / especialmente*(above all / especially)*

¿Cuáles son las ventajas y desventajas de la tecnología moderna? *(What are the advantages and disadvantages of modern technology?)*

nos ayuda mucho *(it helps us a lot)*

esto es muy importante para los estudiantes *(it's very important for students)*

no podríamos sobrevivir sin internet *(we couldn't survive without the Internet)*

útil *(useful)*

pelogroso *(dangerous)*

hay extraños *(there are unknown people / strangers)*

hay un problema con… *(there is a problem with…)*

Cibercrimen *(cyber crime)*

acoso cibernético *(cyber bullying)*

Term 1&2 Spanish

¿Qué opinas de "Facebook" y otras redes sociales? *(What do you think of Facebook and other social media?)*

es muy útil *(it's very useful)*

no me gusta mucho *(I don't really like it)*

Se puede mantanerse en contacto con… *(you can stay in contact with…)*

Se puede mandar/ intercambiar fotos *(you can send / exchange photos)*

Prefiero Instagram porque… *(I prefer Instagram because…)*

¿Te gusta leer? ¿Que tipo de libros te gusta? (Do you like to read? What type of books do you like?) + ¿Te gusta ver televisión? (Do you like to watch TV?) + Cuéntame sobre las películas que te gustan … / ¿Alguna vez has visto una película española? (Tell me about films you like… / Have you ever seen a Spanish film?)

Me gusta/no me gusta*(I like / don't like)*

ver / mirar / leer / escuchar *(to watch / to see / to read / to listen)*

soy aficionado de *(I'm a fan of)*

No soporto *(I can't stand)*

el género *(type)*

El tipo *(type)*

Una novela*(novel)*

La película *(film)*

Una programa *(TV programme)*

ayer / la semana pasada/ hace un mes *(yesterday / last week / a month ago)*

Ví/miré*(I saw / I watched)*

leí/ escuché*(I read / I listened to)*

era *(it was)*

Me gusto mucho *(I really liked)*

No me gustó*(I didn't like)*

Lo encontré*(I found it)*

Key grammar

Term 1&2 Spanish

Using infinitives

The ***infinitive*** form of the verb can be used to help give opinions.

Me gusta ver/ odio ver/ me encanta leer*(I like **to watch** / I hate **to see** / I love to **read**)*

If you want to say 'in order to do something' use **para** + **infinitive**

Uso mi móvil para enviar fotos– I use my phone to send photos

Using adverbs of time

Develop your sentences by making references to when / how often you do something. Notice that a lot of the time, words ending in –lly in English will end with –mente in Spanish

normalment – normally

géneralemente – generally

habitualmente - usually

A menudo – sometimes

A veces – at times

Un vez a la semana– once a week

Using negatives

Making negative sentences will help give your responses contrast. **no** – not / don't

nunca – never

nada – nothing

Examples:

No veo la tele– I don't watch TV

No veo programas de deporte – I never watch sports programmes

No escucho nada (I don't listen to anything)

The imperfect tense

The first past tense that you learnt in Spanish was the preterite tense. This describes single completed actions that took place at a particular time in the past and had a clear beginning and end. You are now going to learn the imperfect tense. This has two main uses:

1. To say what someone used to do or what used to happen over a longer and vaguer time frame (i.e. when I was little)

2. To describe a scene or say what something was like. For example: Llovía mucho y la gente era antipática (It was raining a lot and the people were unpleasant).

Fortunately, the imperfect is fairly easy to form. It has two sets of endings and only three irregulars. The endings are as follows:

	hablar	comer	decidir
yo	hab**laba**	com**ía**	decid**ía**
tú	hab**labas**	com**ías**	decid**ías**
él/ella	hab**laba**	com**ía**	decid**ía**
nosotros	hab**lábamos**	com**íamos**	decid**íamos**
vosotros	hab**labais**	com**íais**	decid**íais**
ellos/as	hab**laban**	com**ían**	decid**ían**

The three irregulars are:

	Ser (to be)	Ir (to go)	Ver (to see)
yo	era	iba	ve**ía**
tú	eras	ibas	ve**ías**
él/ella	era	iba	ve**ía**
nosotros	éramos	íbamos	ve**íamos**
vosotros	erais	ibais	ve**íais**
ellos/as	eran	iban	ve**ían**

Be sure to check if you need the Preterite or the Imperfect tense!

Art– Term 1 and 2

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.

Art– Term 1 and 2

Presentation and Layout

Presentation and clear layout of your work is vital so you display your work clearly and logically for final marking and examining at the end of your course. This website is a good one to get you into Art ideas.
https://www.studentartguide.com

Arrange work so it makes visual lines ie. Align the top of each piece of art work – see below.

Wonky mounted work does not look good. Measure with a ruler if necessary.

Consider the art first and then fit the comments in the spaces below or at the side of each piece of art work

When using glue to stick down do not use too much so it goes everywhere and onto the black paper. This does not show care.
Glue the back of the piece of art well away from the black paper or paper coloured mount if you use one – then stick it down in place with care keeping it straight. Use a ruler and measure if necessary.

You might wish to use a contrasting background mount for art – consider the colour you use with care if you do. The example sheet far left has used brown wrapping paper for several photos to give a cohesive look to the set of work.

Put similar colours together on one A1 sheet. …so bright colours together , neutral subdued colours together as these examples

Only a small heading is necessary – just make it the same font for every sheet you do – again be consistent

If unsure – try using blu-tac to temporary fix work in place and then move things around – see yellow/white print on sheet above

Sometimes you might have to type out a glue down comments on the side to they fit on your sheet – that is OK.

Examples of coursework
https://www.youtube.com/watch?v=WIY5irSOr28&safe=active
https://www.youtube.com/watch?v=XwYkfSstt4Y&safe=active
https://www.youtube.com/watch?v=W6UGxVJv9F4&safe=active

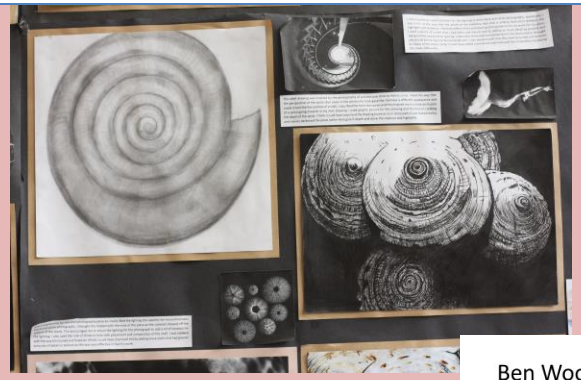
Do not cut around a shape randomly with scissors – it looks like you have not taken care…..see this example on the right.
Do not try to just cut straight lines with scissors.

USE THE PAPER TRIMMER AND CUT AT RIGHT ANGLES

Art– Term 1 and 2

Natural Forms - Shells

This is an example of a set of work produced by an ex-student during term 1 of year 10



You will need to build a set of work based around shell art and artists. You will be required to create art using a variety of different art media.

Georgia O'Keefe

Kaffe Fassett

Pieces of art produced need to be large scale in order to allow you to show detail and skill eg. in shading/ blending of pencil, using collage or oil pastel.

Maggi Hambling –scallop shell sculpture at Aldeburge

Edward Weston - photographer

You will need to use on-line searches and use PINTEREST to find artists to be inspired by and find artists to link your work to…see example on left which could link to the one on the right.

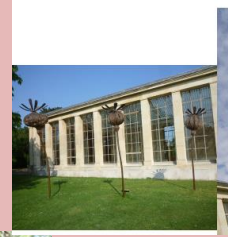
Art– Term 1 and 2

Natural Forms - Collections

This is an example of a ex-student's set of work produced in term 2 of year 10

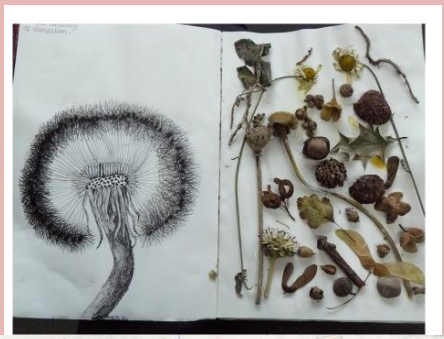
You will need to record via photography and collect fruits, seeds and seedcases, leaves, feathers, moss, fir cones and any other interesting autumnal natural forms ready to produce art work based on their structure, colour shape and form.

Tom Hare – willow sculpture



David Mayne

Karl Blossfeldt

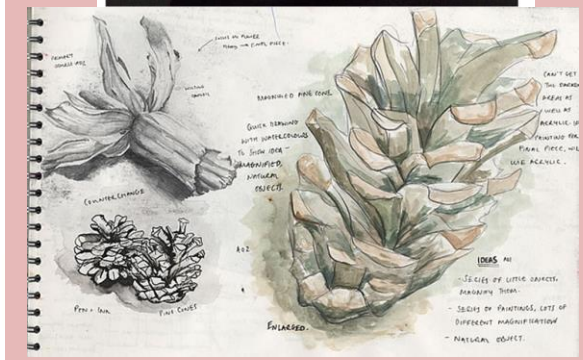


Karl Blossfeldt photographed natural form shapes and structures

Phillip Randall-Page uses natural forms to inspire his sculptures

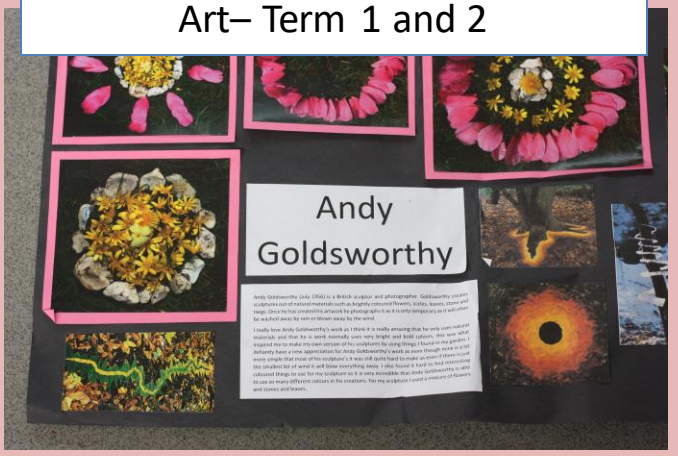
Kate Malone - ceramicist

- Fir cone, blackberry, pumpkin



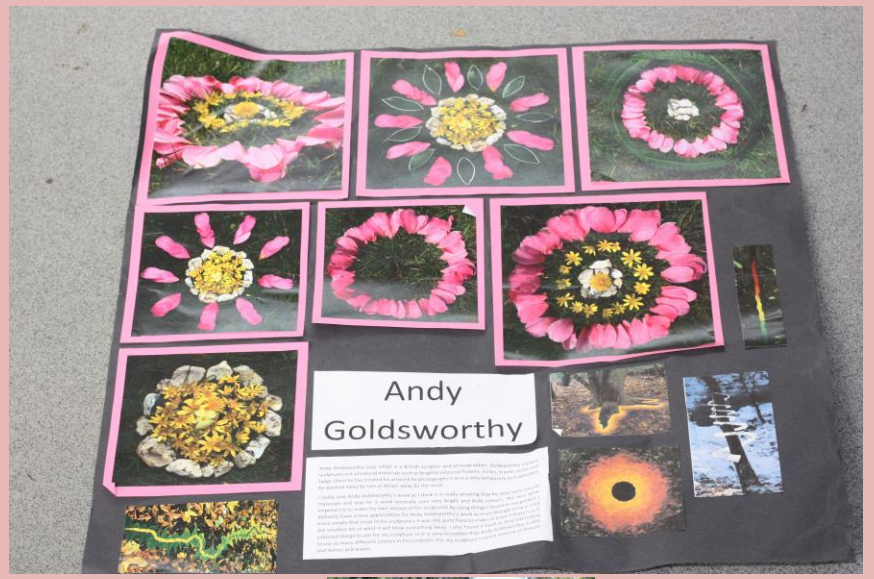
Art– Term 1 and 2

Natural Forms – Collections of Found Natural Forms



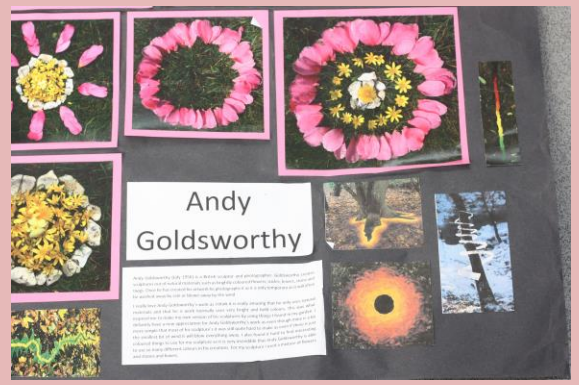
This is an example of a set of work produced by a student during term 1 and 2 of year 10 to show independent study at home based on the artist Andy Goldsworthy.

You will be expected to produce your own set of work to be presented effectively in this way. You will need to show in words and images how your work relates to the artist Andy Goldsworthy.



Andy Goldsworthy

- Andy Goldsworthy is a British artist who uses nature to produce unique artworks.
- He uses a range of natural materials—snow, ice, leaves, bark, rock, clay, stones, feathers petals, twigs—he creates outdoor sculpture that is not intended to last.
- Before they disappear, or as they disappear, Goldsworthy, records his work in colour photographs.



Drama – Terms 1 & 2

New skills. New ideas

Theatre In Education (TIE)

Background

After the Second World War, people with an interest in education realised the huge potential that drama and theatre techniques might have in of harnessing effective learning in schools. This became known as Theatre in education or 'TIE' for short. Brian Way, who founded the Theatre Centre in 1953, was an early practitioner, and influenced the team, including Gordon Vallins, who established TIE at the Belgrade Theatre, Coventry in 1965. Their work was so influential that it spread nationwide.

Originally, TIE companies received funding from various Arts Councils to research and develop and tour their plays in schools in their regional base and across the country. Now, TIE companies rely on fees from schools to fund their projects. As schools have had little spare money in recent years there has been a decline in TIE companies bringing plays into school and where they have appeared it is with subjects specifically requested by schools.

We are lucky to have Forest Forge on our doorstep. Hopefully we will be able to meet with them and maybe see a production.

When asked how to create a play for children, Stanislavski replied: The same as for adults, only better.

https://www.bbc.co.uk/bitesize/guides/zsbjn39/revision/1

The main elements of TIE

It's important for you to remember the following characteristics that typify TIE:

- **There is a clear aim and educational objective running throughout.**
- **A small cast so actors must be versatile and often multi-role. (you will be a small group)**
- **A low budget so actors often play instruments too.(we will review this)**
- **The production must be portable so the design is simple and representational.**
- **They explore issues from various viewpoints, so we can see the effect of an action upon a range of people.**
- **There is some level of audience involvement. (We will have to review this)**
- **They are rarely wholly naturalistic because direct audience address (breaking the 4th wall) or narration is used to engage the audience.**
- **The costumes are simple and representational, especially if actors have to multi-role.**
- **They may include facts and figures to educate the audience.**
- **They may have a strong message or moral running throughout.**

Drama – Terms 1 & 2

Part 1: Devising

- You devise a piece of theatre **in response** to the stimulus which demonstrates the techniques of a theatre practitioner or genre.
- You create and develop ideas to communicate meaning to an audience by:
- ☐ **Researching** and developing ideas using the techniques or characteristics of the practitioner or genre (TIE in your case).
- ☐ **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.

C1: The 3 sections of your Portfolio.

- **1** How I have **researched, created & developed ideas** in response to my chosen stimulus.
- In this part it is important that you **show how** you got from your stimulus to your final idea. You should show this creative journey- including the chopping & changing and abandoning ideas. It is important to say why you abandoned your idea; maybe the subject was too close to home, maybe the idea was too difficult to do in an epic style and kept leading you to naturalistic situations. It is really important to note the research you did, the discussions you had that led you from one thing to another and another. Say **how your research** suggested (specific, named) **improvisations/ scenes, hot seating, setting ideas, dialogue ideas, character ideas** – in the pursuit of your ***artistic intentions.***
- **2** How I have **incorporated TIE ideas** to **communicate meaning.**
- Name each of the TIE ideas and techniques you used. Give an example of where you used it, what it was, why you used it at **this particular moment** in your play- what its function was and how it helped communicate your key message aim and your chosen style.
- **3** How I have **developed amended & refined** my ideas during the **development** of my play.
- Choose one – maximum two key moments where you had a breakthrough. Go into real depth and detail about how did things/ changed things/ turned things around that led you (back) onto a good creative path and that led you to your final vision /version of your play and assisted you in realising your artistic/ political aims.

C1: Part 3 - Evaluation exam questions.

You will evaluate the final performance under supervised conditions. You indicate your chosen stimulus and chosen practitioner (TIE this occasion). 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

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).
In your final C1 Evaluation exam you will have **1 hour 30 minutes** to complete the evaluation. In this trial run, you will have **1 hour.** 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.

Remember that this a drama essay and use drama, acting and theatre vocabulary. You may submit supporting material which enhances your presentation.

C1: Evaluation exam questions.

You will evaluate the final performance under supervised conditions. You indicate your chosen stimulus and chosen practitioner (TIE this occasion). You evaluate in **3 sections**:

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Remember that this a drama essay and use drama, acting and theatre vocabulary. You may submit supporting material which enhances your presentation.

Drama – Terms 1 & 2

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.

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** Riveting **Gripping** Captivating **Engaging** vapid **vacuous** **Harrowing**

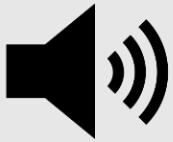
Assessment in Terms 1 & 2

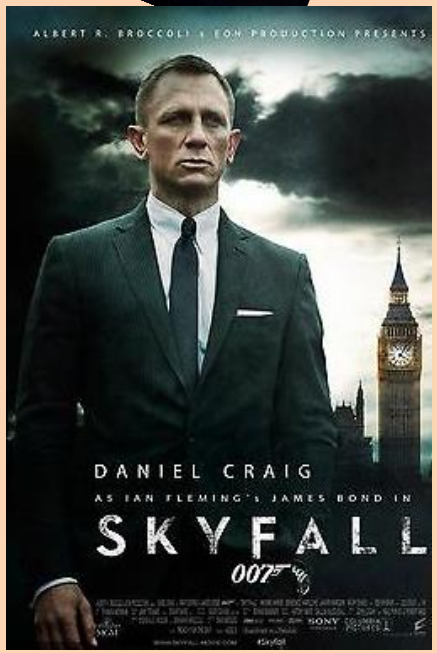
- The Component 1 examination assesses you in a wide range of skills. You will be assessed formatively to guide you in how to improve and a summative one so you get a clear and straightforward idea of where you are at in terms of expected grade.
- **Assessment Tasks include**
- The group performance of a play
- A portfolio documenting your research and artistic journey to performance.
- An extended written examination where you analyse and evaluate your contribution in the performance.
-

Homework Tasks

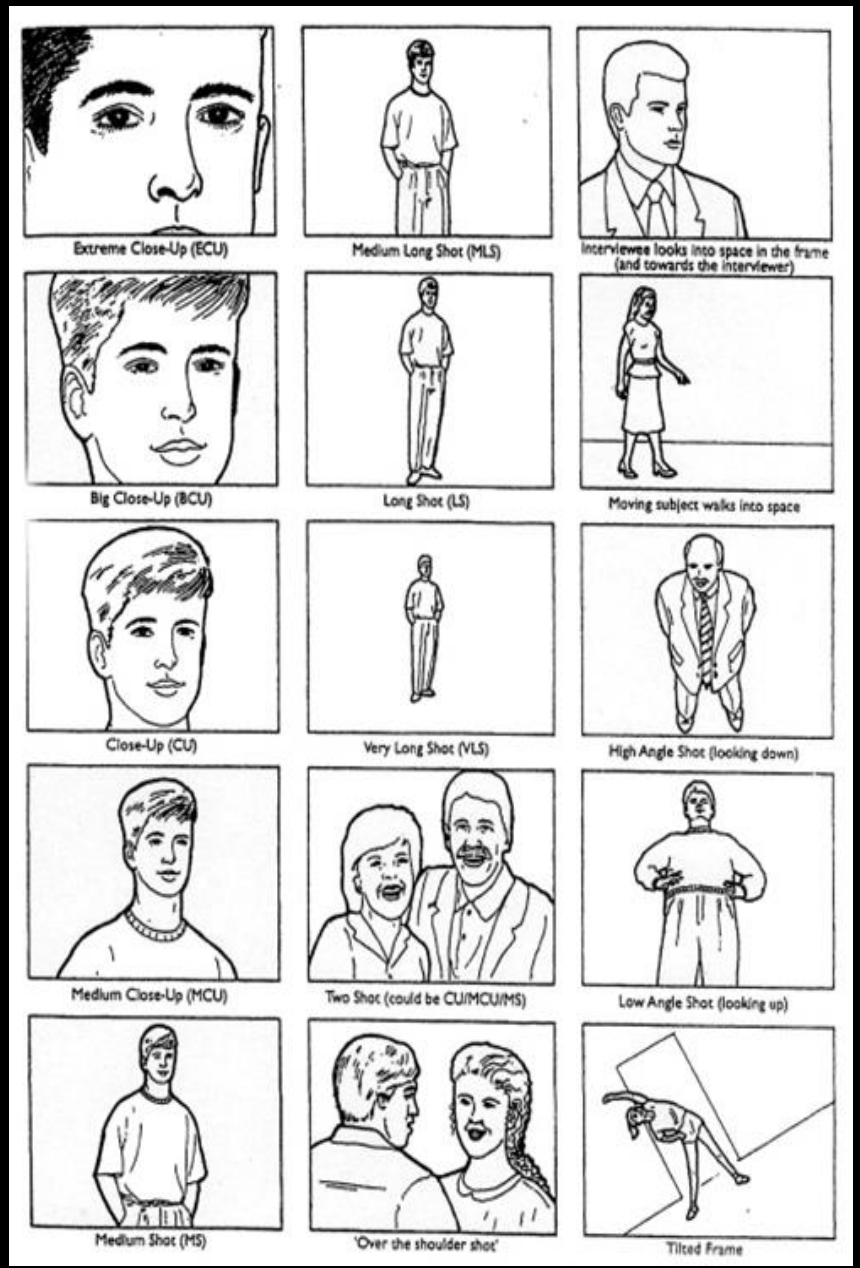
- **These may include;**
- An evaluation of a class performance using EV.
- Keeping a record of all research and learning in each lesson & rehearsal
- Lunch time and after school rehearsals as guidance permits
- Preparation of A4 notes to take into PPE Evaluation Examination
- Collation of detailed research notes into a 900 word portfolio as per guidance

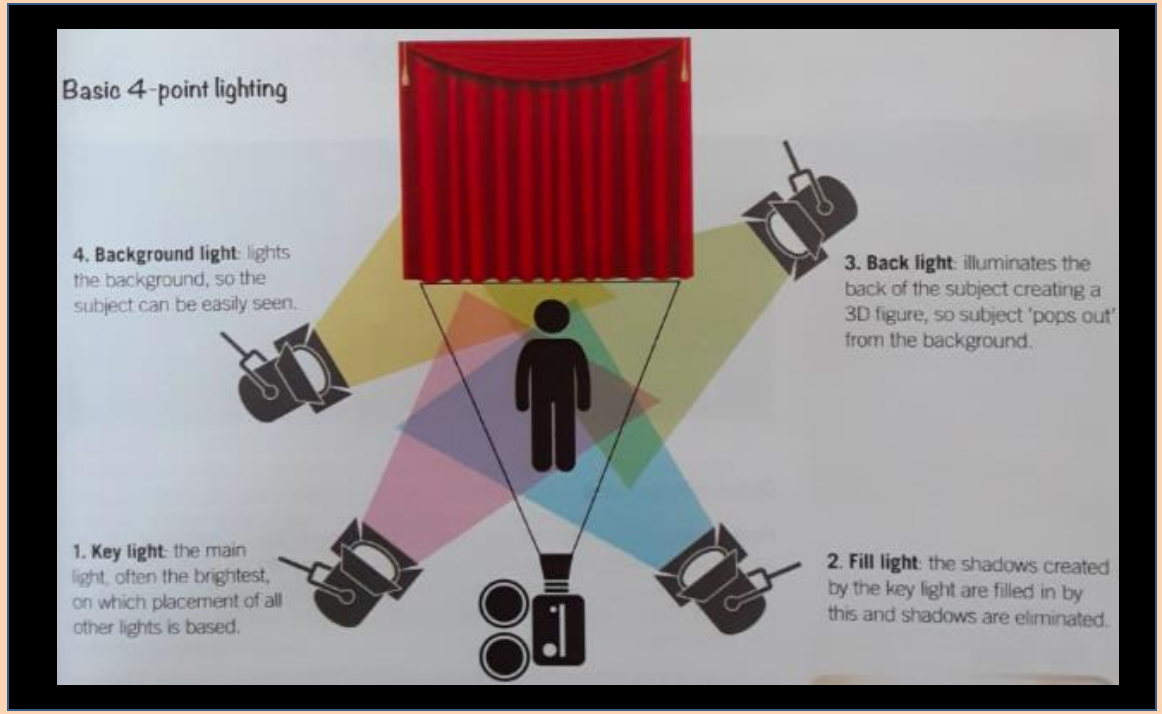
FLM STUDIES TERM 1 - INTRODUCTION TO TECHNICAL CODES

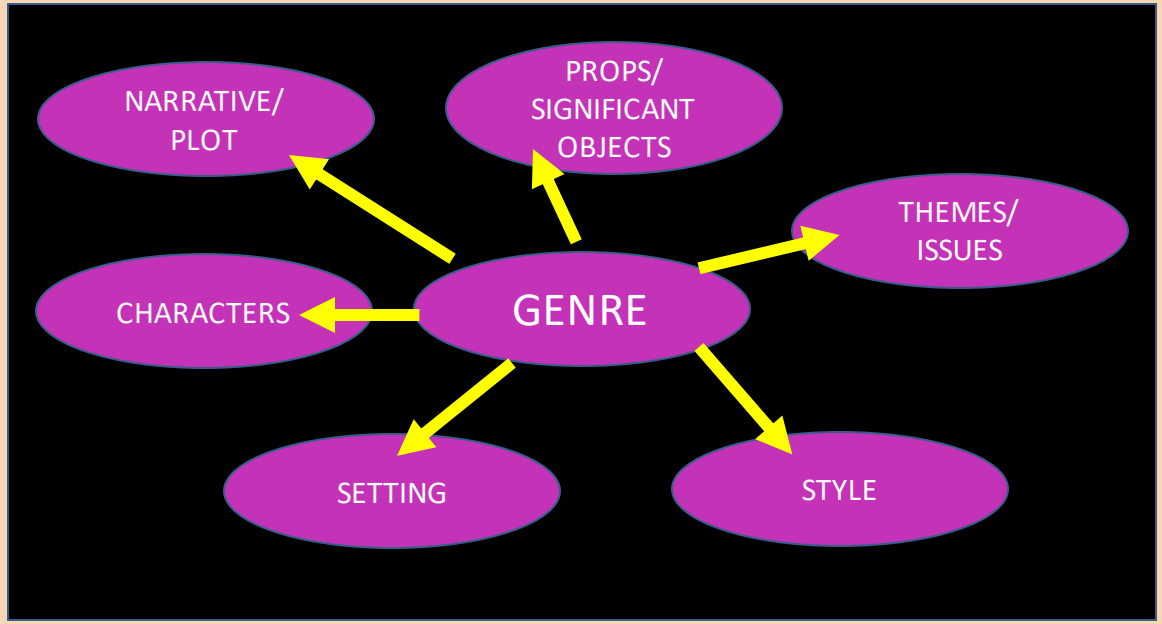
TECHNICAL CODE	TERMINOLOGY	DEFINITION
EDITING 	**STRAIGHT CUT**	Smooth cut between one shot and the next
	FADE	Where a shot gradually turns black or white
	DISSOLVE	A technique that creates gradual fade from one image to another. Often used to connect images in some way.
	WIPE	Where one shot replaces another by travelling from one side of the frame to another
LIGHTING 	**HIGH KEY**	When bright colour is created through the use of lots of filler lights – few/no shadows
	LOW KEY	When fewer filler lights are used to help create pools of shadows
	CHIAROSCURO	An Italian term usually used in art to refer to the high contrast light and dark in paintings. Used in cinema to describe the use of high and low key lighting in film noir films (lots of dark shadows, city scapes, shadowy characters)
SOUND 	**DIEGETIC**	Sound that is part of the film's world e.g. birds singing, traffic passing
	NON-DIEGETIC	Sound that is not part of the film's world e.g. musical score or voice over narration
	PARALLEL	Music that matches the action on screen
	CONTRAPUNTAL	Sound that does not seem to 'fit' with the image on screen. It often works to add another layer of meaning or irony to what we see.
	INCIDENTAL MUSIC	Music used as a background to create /emphasise an atmosphere.
	PLEONASTIC	Emphasized sound to appeal to emotions or draw attention to significant action or prop eg. taking safety off a gun
	DIALOGUE	A conversation between two or more people



FILM STUDIES TERM 1 - INTRODUCTION TO TECHNICAL CODES







FILM STUDIES TERM 1 - INTRODUCTION TO TECHNICAL CODES

KEY TERM	DEFINITION
GENRE	A style or category of art, film, music or literature
SYNOPSIS	A brief summary
BUDGET	A financial plan that is followed (mostly) when creating something. The money you are able to spend when making something.
MARKETING	How something is promoted to its target audience
SYNERGY	Where different media platforms work together to promote something. Can include duvet sets, toys, fancy dress…
MISE-EN-SCENE	The arrangement of scenery, props, costume etc on the set of a film
SPECIAL EFFECTS and CGI	These are illusions or visual tricks to portray imagined events in a story or virtual world. Can be divided in to mechanical effects and optical effects. Often use CGI (Computer Generated Imagery)
SYMBOLISM	The use of something to represent a particular idea or quality. The Houses of Parliament behind Bond in 'Skyfall' film poster suggests that Bond is there to protect the British Institutions.
ENIGMA	A puzzle or something that is difficult to understand/mysterious. Films present enigmas – questions that are then answered for the audience (keeps them watching)
COLOUR PALETTE	The choice of colours used when creating something visual. Bright colours appeal to young audience, muted appeal to a more sophisticated audience
PATHETIC FALLACY	the reflection of the mood of a character (usually the protagonist) in the weather eg. In film when something terrible is about to happen, the weather usually turns stormy with lightening etc
POLYCHROMATIC	Two or more varying colours
FILM AESTHETICS	Refers to the philosophy of film, the way that the subject of the film is shown in order to have an impact on its audience
FRANCHISE	A collection of related films in succession that share the same fictional universe or are marketed as a series eg. Fast and the Furious, Ice Age, Shrek, Star Wars…

BLOCKBUSTER	Any film that takes over 100 million dollars at the American box office. These are usually created with both huge production and marketing budgets
INDEPENDENT	An independent film is one that receives less than 50% of its funding from one of the 'big six' major film studios. Typically has a relatively small budget and the filmmaker gets to tell the story they want in the way they want.

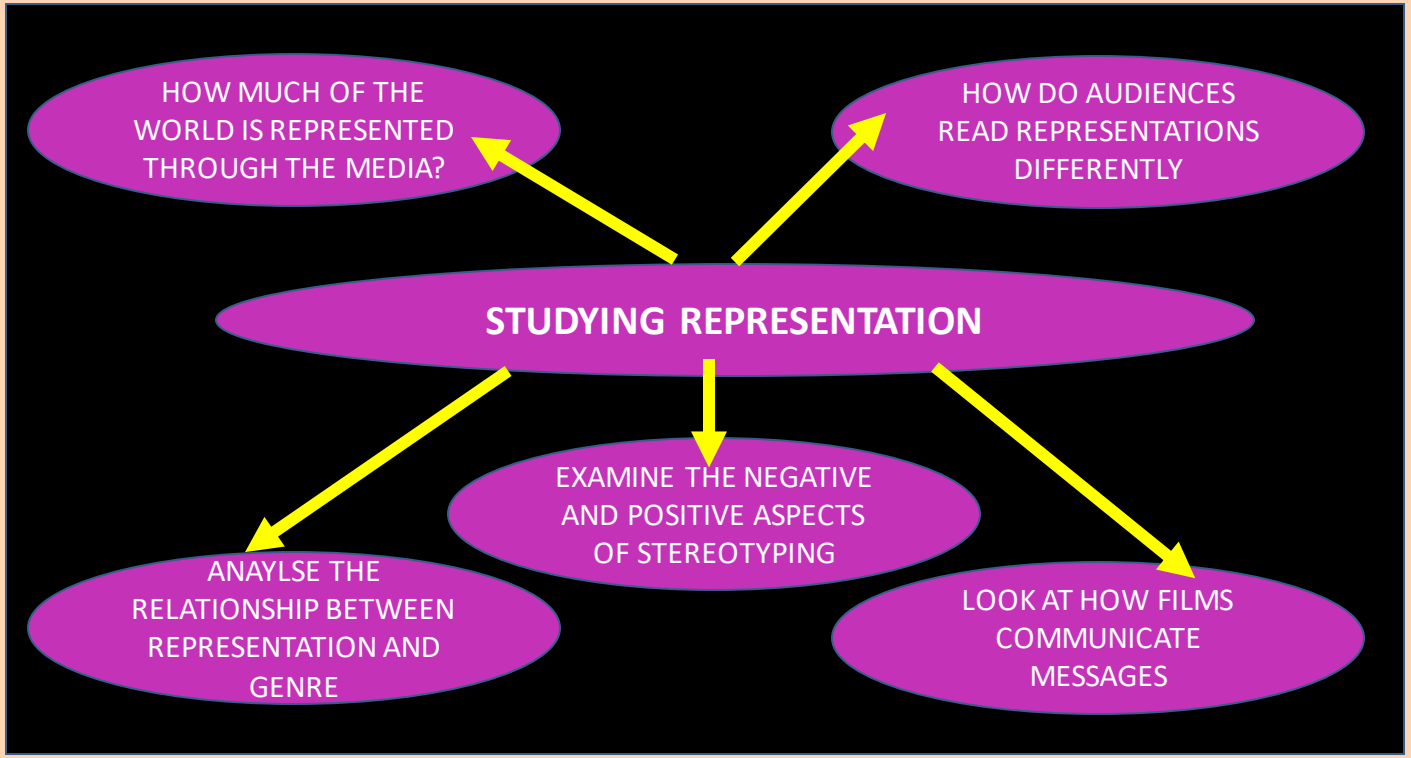
CAMERA MOVEMENTS	EXPLANATION
DUTCH ANGLE	A tilted camera angle that causes horizon to be diagonal to the bottom of the frame. Can be used to express a character's drunken state, disorientation, anxiety or mental state.
HAND HELD	When the camera does not remain still, but is shaky. Most famous example is probably "Blair Witch Project'
PANNING	The camera moves slowly from one area of the setting to another. If done quickly, known as a whip pan.
SHOT REVERSE SHOT	A good way to show dialogue between characters that gives the audience the feeling they are watching the conversation in a 'real life' way
TRACKING SHOT	The camera moves alongside the subject it is filming
ZOOM IN OR OUT	The camera shot moves closer to or further away from the subject

VERBAL CODE – everything to do with language (either written or spoken).

NON-VERBAL CODE – this is how something is communicated through body language, gestures and actions (how an actor moves, their make up, their costume)

FILM STUDIES TERM 1 - INTRODUCTION TO TECHNICAL CODES

FLM STUDIES TERM 2 - INTRODUCTION TO NARRATIVE



LEVI STRAUSS IDENTIFIED THAT SOCIETY IS BUILT UPON OPPOSITIONAL PERPSPECTIVES. FILMS TEND TO USE THIS THEORY CALLED 'BINARY OPPOSITION'

EXAMPLES OF 'OPPOSITES' THAT CAN BE SEEN REGULARLY IN FILM TEXTS INCLUDE:

- GOOD V EVIL
- HERO V VILLAIN
- MAN V NATURE
- MAN V WOMAN
- CIVIL V SAVAGERY
- EAST V WEST
- RICH V POOR
- LOVE V HATE

YOU COULD PROBABLY NAME SOME EXAMPLES ALREADY!

HOW DO WE 'READ' A TEXT?

Stuart Hall (1973) suggested that there were three main perspectives involved in the way in which an audience responds to a media product. This involves how the audience is positioned by the product and influences their response to it.

Preferred reading

This is where the audience responds to the product exactly as the producer intended. The Times will hope that many of their stories will reflect the political and ideological position of the readers.

Negotiated reading

This is where the audience accepts parts of the product and not others. In our modern media-aware world this is increasingly an issue in all newspapers from all but the most 'loyal' readers.

Oppositional or resistant readings

This can happen in newspapers as some members of the audience will consume the news from The Times even though they may disagree with it's political and ideological position.

FILM STUDIES TERM 2 - INTRODUCTION TO NARRATIVE.

TERM	DEFINITION
LINEAR NARRATIVE	Is a story that takes place in a sequential manner. Generally, starts with the beginning, moves to the middle and concludes everything at the end (with all loose ends tied up nicely).
NON-LINEAR NARRATIVE	Where events are portrayed out of chronological order or the logical order presented in a story. The pattern of events jumps around. Also known as disjointed narrative or disrupted narrative. Flashbacks a common theme.
OPEN NARRATIVE	Has no sense of ending and they can go on forever (eg a soap opera such as Eastenders of Hollyoaks. Have lots of characters
CLOSED NARRATIVE	Where a story is when story is fully told and completed by the end of the film. Generally consists of clear beginning, middle and end.
MULTI STRAND NARRATIVE	Where a story is told from the points of view of several different characters.
DENOUEMENT	The final part of a play, film or narrative in which the strands of the plot are drawn together and everything is explained or resolved. Example would be at the end of every 'Death in Paradise' episode when all suspects are gathered together, the murderer is exposed and how they committed the crime is explained.
ENIGMA CODES	Not the WW2 film. This is simply the idea that a film text (does not have to be a film) portrays a mystery to draw the audience in and keeps them interested.
NARRATIVE FUNCTION	The importance of a particular type of character to the ways the story is told and understood (we can make predictions once we have identified their character type)

NARRATIVE THEORY

TODOROV'S NARRATIVE STAGES

- **Equilibrium:** everything in the film world is normal (not necessarily good, but it is normal).
- **Disruption:** something happens (usually caused by the film's main antagonist) to disrupt normal life.
- **Recognition of disruption:** the protagonist/s realise that something is wrong in their world or discover the disruption.
- **Attempt to solve:** the main protagonist goes on a journey to solve the disruption.
- **New equilibrium:** the disruption is solved and a new normality occurs (things can never the be same as they were before the disruption, but a new 'normal life' is created).

CHARACTER THEORY

Propp's Character Theory http://foxhugh.com/literary-elements/character-theories-and-types/
Vladimir Propp developed a character theory for studying media texts and productions, which indicates that there were 7 broad character types in the 100 tales he analysed, which could be applied to other media.
1) The (magical) helper (helps the hero in the quest)
2) The dispatcher (character who makes the lack known and sends the hero off)
3) The donor (prepares the hero or gives the hero some magical object)
4) The false hero (perceived as good character in beginning but emerges as evil)
5) The hero [AKA victim/seeker/paladin/winner, reacts to the donor, weds the princess
6) The princess (person the hero marries, often sought for during the narrative)
7) The villain (struggles against the hero)

Year Ten Term One
Knowledge Organiser

Topic 1 – The Development of Music

The Baroque Era: 1600-1750

Main composers: Bach, Handel, Vivaldi, Purcell

Main features of the music:

- Use of ornaments and terraced dynamics.
- Energetic rhythmic movement.
- Major/Minor key system (diatonic).
- Orchestras are mainly strings.
- Use of harpsichord, recorders, flute and horns.
- Use of basso continuo (see AOS 2).

The Classical Era: 1750-1810

Main composers: Mozart, Beethoven, Haydn

Main features of the music:

- Four sections to the orchestra.
- Melodies less complex than Baroque.
- More variety and contrast in the music.
- Frequent changes in mood, timbre and dynamics.
- Harpsichord replaced by piano.

The Romantic Era: 1810-1910

Main composers: Chopin, Liszt, Wagner, Tchaikovsky

Main features of the music:

- Thematic ideas and use of the leitmotif (see AOS 3).
- Increased variation in dynamics.
- Use of chromatic notes and extended chords.
- Further expansion of the orchestra.
- Development of the brass section.
- Descriptive music and links to other art forms

Topic 2 – Musical Form and Structure

In GCSE music, you must be able to identify the following forms:

Binary from – A B

Ternary form – A B A

Rondo form – A B A C A

Minuet and Trio – Minuet Trio Minuet

Variation from – Theme Variation 1, 2, 3 etc

Strophic form – A A A A

Other key terms

- **Monophonic** – One unaccompanied part or voice.
- **Homophonic** – Many parts that move together. Melody and accompaniment is a type of homophonic texture.
- **Polyphonic** – 2 or more different parts that are of equal importance.
- **Unison** – All together. Could be considered monophonic if played at the same pitch.
- **Parallel motion** – Parts move in the same direction.
- **Contrary motion** – Parts move in different directions.
- **Interval** – The gap/space between 2 different notes.

Topic 3 – Devices

- **Repetition** – The exact repeat of a musical idea.
- **Contrast** – A change in the musical content.
- **Anacrusis** – A lead in. A note or beat before the first full bar of a piece.
- **Imitation** – When a musical idea is copied in another part.
- **Sequence** – The repetition of a motif (short melody) in the same part but at a different pitch.
- **Ostinato** – A musical pattern repeated many times. This is known as a riff in modern music.
- **Syncopation** – Off beat or where the weaker beats of a rhythm are emphasised.
- **Dotted rhythms** – A dot placed after a note. This increases the note by half its own value, giving a jagged effect to the rhythm.
- **Drone** – A repeated or sustained note or notes held throughout a passage of music. The drone will be diatonic and use either the Tonic or the Tonic and Dominant notes.
- **Pedal** – A held or repeated note, against which changing harmonies are heard.
- **Canon** – A device in which a melody is repeated exactly in an other part while the initial melody continues and develops.
- **Conjunct movement** – When the melody mainly moves in step.
- **Disjunct movement** – When the melody 'leaps' from one note to another.
- **Broken chord/Arpeggio** – A chord played as separate notes.
- **Alberti bass** – A type of broken chord accompaniment.
- **Regular Phrasing** – The balanced parts of melody.
- **Motif** – A short melodic or rhythmic idea that has a distinctive character.
- **Chord progressions** – A sequence or series or chords related to each other and in a particular key.
- **Modulation** – The process of changing key.

Year Ten Term Two
Knowledge Organiser

Topic 1 – Timbre, Sonority and Texture

Timbre - The tone colour or tone quality associated with a particular instrument. Refer to your instrument recognition sheet for more detail.

Sonority – The relative loudness and 'feel' of a sound when compared with other sounds.

Texture – The number of layers/parts in a piece and how they relate to each other:

- **Monophonic** – A single melodic line with no accompaniment
- **Homophonic** – Many parts that move together (same rhythm)
- **Polyphonic** – A number of different melodic lines heard independently of each other.

Unison – When 2 or more musical parts that are the same, are played together (monophonic).

Chordal – A type of texture where the parts move together producing a series of chords (homophonic).

Layered - when more parts are added on top of each other to produce a richer texture.

Melody and accompaniment – A type of homophonic texture, where the tune is the main focus and is accompanied by other parts that move together.

Countermelody – When a new melody is heard at the same time as a previous melody.

Round – A type of **canon** in which voices sing the same melody but beginning at different times. The music repeats (goes round & round).

Topic 2 – Musical Ensembles

The word ensemble applies to the number of performers in a group. If there are lots of performers in an ensemble it becomes a choir or an orchestra.

An ensemble may group together any combination of instruments from the same family or different families.

- **Duet** – 2 performers
- **Trio** – 3 performers
- **Quartet** – 4 performers
- **Quintet** – 5 performers
- **Sextet** – 6 performers
- **Septet** – 7 performers
- **Octet** – 8 performers

Topic 3 – Chamber Music

Basso Continuo – A type of accompaniment used in the Baroque era. The term means 'continuous bass' and consisted of a bass instrument and a chordal instrument.

Baroque Sonata – A piece of music that is played rather than sung.

Trio Sonata – A piece of instrumental music for 3 parts.

String quartet – One of the most popular types of ensemble with in the Classical era. It consisted of 2 violins, a viola and a cello.

Topic 4 – Musical Theatre

In musical theatre, the music helps tell and support the storyline and characterisation. The audience will see the storyline or plot unfolding through the music, the acting and the dance, supported by the accompanying orchestra/band.

Different types of musical. Can you research an example of a musical for each type?

- Musical drama
- Disney musical
- Classic musical
- Romantic musical
- Musical comedy
- Sung-through musical
- Juke box musical
- Film-to-stage musical

Topic 5 – Jazz and Blues

Jazz and Blues are styles of music that emerged at the start of the 20th century in America.

- **Pentatonic scale** – A scale consisting of 5 notes.
- **Blues scale** – A minor pentatonic scale with an extra note (flattened 5th).
- **Improvisation** – When music is spontaneously created during a performance.
- **12 Bar Blues** – A type of structure used in Jazz and Blues that consists of 12 bars.
- **Swing style** – Characteristic of Jazz, in which notes are played with a relaxed dotted feel.
- **Riff** – A short motif or pattern that is repeated.
- **Rhythm section** – Typically consists of a bass player, a drummer and someone playing chords (pianist or guitarist).
- **Standard** – A Jazz or Blues song that is really popular.

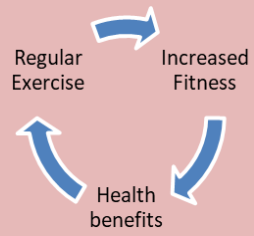
3.1 Health and Fitness

3.2 Components of Fitness

Health and fitness:
Fitness definition: 'The ability to meet the demands of the environment'
Health: 'A state of complete emotional, physical and social wellbeing ant not merely the absence of disease or infirmity'

AQA GCSE PE Paper 1 Chapter 3: Physical Training

The relationship between health and fitness:



Exercise improves fitness, an increase in fitness will improve performance
Exercise improves all aspects of health (physical, social, emotional)
If you are not healthy enough to take part in regular exercise your fitness will deteriorate causing your performance to drop. Health benefits will not be gained

Cardiovascular fitness	Muscular Endurance	Flexibility	Reaction Time	Power	Speed	Agility	Balance	Coordination	Strength
'The ability of the heart and lungs to supply oxygen to the working muscles'	'The ability of a muscle group to undergo repeated contractions, avoiding fatigue'	'The range of movement possible at a joint'	'The time taken to respond to a stimulus'	'Is the ability to do strength performances quickly' Power = Strength x Speed	'The amount of time it takes to perform a particular action or cover a particular distance'	'Is the ability to change position of the body quickly while maintaining control of the movement'	'Is the ability to retain the body's centre of mass above the base of support' static or dynamic	'Is the ability to use two or more body parts together smoothly and efficiently'	'The ability to overcome a resistance. it requires a force to be applied to a muscle or muscle group'
Explanation	Explanation	Explanation	Explanation	Explanation	Explanation	Explanation	Explanation	Explanation	Explanation
They need good cardiovascular fitness to be able to maintain a high standard of performance throughout the race/match.	They need a prolonged additional oxygen delivery to the working muscles to repeat muscle contractions over a long period of time without tiring	Performers need good flexibility to be able to get into position without getting injured and to perform complex movements	Performers need to react to a stimulus. A stimulus can include: a ball, whistle, starters gun, or an opponent	Performers need power to improve performance. Speed and strength are needed in sports where you throw jump kick and sprint	Performers need speed to get from one position to another. This may be leg speed to run or arm speed when throwing or hitting	Performers need agility to change direction quickly. This can be used to evade opponents or move around the court or pitch quickly	Performers need balance so they don't fall over. E.g. in gymnastics when performing a balance (static) or travelling across the beam (dynamic)	Performs need coordination when they are using two body parts at the same time. It can be used when aiming, or striking/hitting a ball	Performers need Strength to support weight (static) lifting a weight (maximal) punch (dynamic) throw (explosive)
Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports
Games players Long distance runners/rowers	Cyclist (legs) Boxing (punching) Swimmer (arms/legs)	Gymnasts Goal keepers Divers	Sprinters Badminton players Rugby players	Shot put Football (kicking) High jump	Sprinting Badminton Javelin thrower	Rugby side-step Tennis Badminton	Gymnastics Skiing Hammer throw	Tennis Archery Football	Weight lifting Rugby Gymnastics
									
Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test
Multi stage fitness test	Sit-up bleep test	Sit and reach	Ruler drop test	Vertical jump	30m sprint	Illinois agility run	Stork balance test	Wall toss	Grip dynamometer 1 rep max test

3.4-3.14 Fitness Tests

Agility Fitness Test

Fitness Test	Test Procedure
Illinois run	• Set up the course as shown in the picture • Lie face down on the floor, by the first cone • On 'Go' run around the course as fast as you can • Record result and compare to a rating chart

Used by performers who change direction quickly such games players

Coordination Fitness Test

Fitness Test	Test Procedure
Wall toss test	• Stand 2 meters away from a wall • Throw a tennis ball underarm against the wall • Throw with the right hand and catch with the left hand; then alternate hands • Record result and compare to a rating chart

Used by badminton and cricket players

Power Fitness Test

Fitness Test	Test Procedure
Vertical jump	• Stand side onto the wall, feet flat on the floor • Mark the highest point that the tips of your fingertips can reach • Holding a piece of chalk, jump as high as you can • Mark on the wall the top of your jump • Measure the distance between the 1st and 2nd

Used by sprinters, rugby players and long jumpers

Maximal Strength Fitness Test

Fitness Test	Test Procedure
One rep Max	• Warm up • Lift the maximum weight you can in one attempt • Record result and compare to a rating chart

Used by performers such as power lifters, rugby players and boxers

Balance Fitness Test

Fitness Test	Test Procedure
Stork test	• Place hands on your hips & foot on your knee • Raise your heel from the ground so you are balancing on your toes • Time starts when you lift your heel • Record result and compare to a rating chart

Used by gymnasts and games players

Flexibility Fitness Test

Fitness Test	Test Procedure
Sit and reach test	• Sit with your legs straight and the soles of your feet flat against the box • With palms face down, one hand on top of the other, stretch and reach as far as possible • Record result and compare to a rating chart

Used by performers such as gymnasts and divers

Reaction Time Fitness Test

Fitness Test	Test Procedure
Ruler Drop	• Stand with your hand open around the ruler, with the 0 cm mark between thumb and forefinger • The assistant holds and drops the ruler • Catch the ruler as quick as possible • Record results and compare to a rating chart

Used by basketball, rugby and badminton players

Strength Fitness Test

Fitness Test	Test Procedure
Hand grip dynamometer	• Adjust the grip to your hand • Keep your arm beside you at a right angle to your body • Squeeze the handle as hard as you can • Record result and compare to a rating chart

Used by performers such as climbers (to lift body weight)

Cardiovascular endurance test

Fitness Test	Test Procedure
Multi stage fitness test	• Measure out 20 metres • Place cones to mark the distance • Start the audio recording Run from one cone to the other until you cannot continue • Record result and compare to a rating chart

Used by badminton and cricket players

Muscular endurance Fitness Test

Fitness Test	Test Procedure
Sit-up bleep test	• Lie on a mat, knees bent, feet on the floor. your hands across your chest on shoulders • Start the audio recording • Sit up until you can no longer continue • Record results and compare to a rating chart

Used by tennis and football players

Speed Fitness Tests

Fitness Test	Test Procedure
30m sprint	• Measure and mark out 30 metres in a straight line • Place one cone at the start and one at the end • On 'Go' run as fast as you can • Record result and compare to a rating chart

Used by 100k sprinters and rugby players

Qualitative or quantitative data:
When collecting pieces of data for fitness tests they are usually quantitative meaning.
The measurements can be quantified as numbers such: Time (seconds) Distance (meters) Levels or numbers

Data can be collected qualitative meaning the measurements are based on quality rather than quantity, such as a number out of 10 for a routine. They are opinions not facts.

3.3 Fitness Testing

Reasons for fitness testing:

Before a training programme:

- To identify strengths and areas for improvement
- Identify training requirements
- To show a starting level of fitness
- To motivate and provide goals

During and after a training programme:

- To monitor improvement
- To provide variety to a training programme
- Compare results against norms of the group
- To identify whether training has been successful

Limitation of fitness testing:

- Tests are often general and not sport specific
- The movement required in the test is not the same as in the actual activity
- Tests do not have competitive conditions required in sports
- Some tests do not use direct measuring and are an estimate or are submaximal
- Some tests need motivation, because they are exhausting to complete
- Some tests questionable reliability

3.15 Principles of Training

Specificity: Training must match the requirements of the activity so that the right muscles and body systems are adapted

Progression Overload: Gradually increasing the amount of working training so that fitness gains occur, but without the risk of injury

Reversibility: Just as fitness improves with training it can decline if you stop training

Tedium: This is the boredom that can occur when you train the same way every time. A variety of training methods are needed to keep motivated to carry on without giving up

Applying overload using the F.I.T.T principle:

Frequency: How often you train (should be gradually increased) Week 1 = train once per week - Week 2 = train twice per week

Intensity: How hard you train (should be gradually increased)

Week 1 = 1 set of 5 repetitions of a 5 kg weight - Week 2 = 2 sets of 5 repetitions of a 5 kg weight

Time: How long you train (should be gradually increased) Week 1 = 20-minute session - Week 2 = 25-minute session

Type: Relates to specificity. training should closely match the activity. E.g. A marathon runner should use continuous training

Training intensities:

Max Heart rate = 220 - age

Aerobic target zone: 60% - 80% of MHR

Anaerobic training zone: 80% - 90% of MHR

Strength/Power

high weight/low reps above 70% of 1 rep max (3 sets of 4/8 reps)

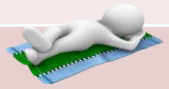
Muscular endurance

low weight/high res below 70% of 1 rep max (3 sets of 12-15 reps)

3.17 Types of Training

Continuous Training	Fartlek Training	Circuit Training	Interval Training	Plyometric Training	Weight Training	Static Stretching
Is sub-maximal aerobic exercise that has no breaks or rest. It lasts for a minimum of 20 minutes and can improve cardiovascular & muscular endurance	Form of continuous training that varies in pace and terrain. It is both aerobic & anaerobic and can improve cardiovascular & muscular endurance	Contains stations organised in a circuit, they can be skill or fitness based, aerobic or anaerobic Intensity is measure by circuits, time or repetitions. Can be adapted to improve all types of fitness	High intense exercise followed by periods of rest to recover Usually anaerobic can be used in a variety of locations Improves speed but can improve strength and cardiovascular	Maximal intensity involving jumping/bounding. It involves an eccentric contraction (muscle lengthens) immediately followed by a concentric (muscle shortens) Improves power (speed & strength)	Form of interval training which involves reps and sets. The weight provides the resistance. Can be done using free or fixed weights. It improves strength, power and muscular endurance	Stretch as far as you can. The stretch is held (isometric) for up to 30 seconds. It Can be done on your own, with apparatus or with a partner. Improves flexibility
Advantages	Advantages	Advantages	Advantages	Advantages	Advantages	Advantages
No equipment or facilities Has many health benefits (CHD) Can be done on your own	No equipment or facilities Change of pace can be more interesting Can be done on your own	Variety of stations generates interest Can be skill or fitness Can easily be adapted	Can be used to improve health and fitness (aerobic & anaerobic) No equipment needed	Develops power quickly No equipment	Can target specific areas of the body	Develops flexibility
Disadvantages	Disadvantages	Disadvantages	Disadvantages	Disadvantages	Disadvantages	Disadvantages
Boring No change of pace Can cause impact injuries	High intensity can be avoided A safe route may be hard to find	Equipment can be costly Can be time consuming to set up	Can be repetitive and boring Need to plan and keep track of sets	Can cause injury due to high intensity	Can cause injury with poor technique a spotter needed with free weights Can be expensive	Not as effective as other stretchng metrhods and can take alog time to go through all muscle groups
Sports	Sports	Sports	Sports	Sports	Sports	Sports
Marathon running Cycling Swimming	Fotball Rugby Netball	Can be adapted to suit all sports	Usually for speed It can be adapted to other sports	Basketball Long jump Hurdles	Weight lifting, tennis (muscular endurance)	Most sports and activities benefit from static stretching

3.18 Preventing Injury

Complete a warm up	**A warm up should be completed to: increase the temperature in the muscles, tendons and ligaments. This increases the elasticity which will help prevent muscle pulls and strains**	
Avoid overstretching	Stretching should be completed carefully without overstretching or bouncing as this can result in a muscle strain	
Avoid overtraining	If you train too hard adaptations will not take place e.g. lifting too heavy weight can cause an injury such as a strain	
Take adequate rest	Training programmes should include rest days. Make sure you have enough resting between sessions to allow for recovery	
Use taping or bracing	When necessary taping and bracing can be used to provide additional support to joints and muscles. E.g. an ankle support can reduce the chance of a twisted ankle (sprain)	
Remain hydrated	Maintain an appropriate level of hydration by drinking water. If you don't maintain your hydration levels you can become dehydrated, this can lead to dizziness and nausea	
Wear appropriate clothing and footwear	This may included non-slip footwear such as boots to prevent ankle injures Gum shield in rugby to protect the teeth in boxing and rugby Shin pads to reduce impact on the shins in football and hockey.	
Use correct technique	When completing any activity, using correct technique will lead to better results. Help avoid injury by using the correct technique when lifting weight or throwing the javelin	

3.17 High Altitude Training

High Altitude training as a form of aerobic training:

- **There are fewer air molecules at altitude. This means there is less oxygen available to take into our body. This means there is less oxygen available to get to the working muscles. The body's oxygen carrying capacity is reduced at high altitude.**
- **When an athlete first tries altitude training their performance will be worse. However, after several weeks of training at high altitude their body will adapt:**
- **Increasing red blood cells**
- **Increasing haemoglobin**
- **When they return to sea level, they will have an advantage because their oxygen carrying capacity will have increased**

Benefits of high-altitude training:

- Increased red blood cell production
- Increased oxygen carrying capacity
- A greater amount of oxygen being transported to the working muscles once athletes return to sea level
- These benefits are particularly helpful to endurance athletes who rely on aerobic energy production for example marathon runners and triathletes

Limitations of high-altitude training:

- Adaptations take time
- Expensive to live away from home
- Timing of training for competition needs careful planning
- Altitude sickness (nausea caused by training at altitude)
- Limited to aerobic activities (no effect on anaerobic events)
- Can make it harder to train at high intensities need for anaerobic activities

3.19 Training Seasons

Pre-season (preparation phase):

This is the period up to competition.

Training includes:

- **Develop techniques specific to the sport**
- **General fitness training such as continuous, fartlek or interval training sessions to increase aerobic fitness**
- **Weight training to build up strength and muscular endurance**

Benefits:

- **Fitness and skill lost during post season can be regained**
- **Skills and techniques can be improved. This means matches at the start of the season are more successful**

Competitive-season (peak):

This is the playing season
Training includes:
Taking part in matches every week
Maintenance of fitness related to activity
Limited training, as it may cause fatigue which would decrease performance
Concentration on skills, set plays and tactics to improve performance
Benefits:
Fitness levels and quality of performance can be maintained throughout the season

Post-season (transition phase):
This is the period of rest, active recovery and light aerobic work after the competitive season
Training includes:
Rest to recover from the competitive season
Light aerobic exercise, to maintain a level of general fitness
Benefits:
Athletes are fully rested, ready for pre-season
Not too much fitness is lost

July
Pre-season
(Preparation phase)

June
Post-season
(Transition phase)

August – May
Competitive season
(peak)

3.20 Warming up and Cooling down

Warm-up

A warm-up has three phases:

Phase 1 Pulse raiser
To raise the heart rate and speed up oxygen delivery to the working muscles. E.g. jogging a lap of the pitch

Phase 2 Stretching
Stretching the muscles and soft tissues you are about to use increases their elasticity and range of movement

Phase 3 Drills
These are more intense practices relating to the main session, such as dribbling if you are playing basketball

Benefits of a warm-up	To physical and mentally prepare for exercise	To increase oxygen delivery to the working muscles	Increase temperature of muscles, tendons, and ligament. Reducing the chance of injury	Increase the range of movement at a joint which will aid performance

Cool-down

A cool-down has two phases:

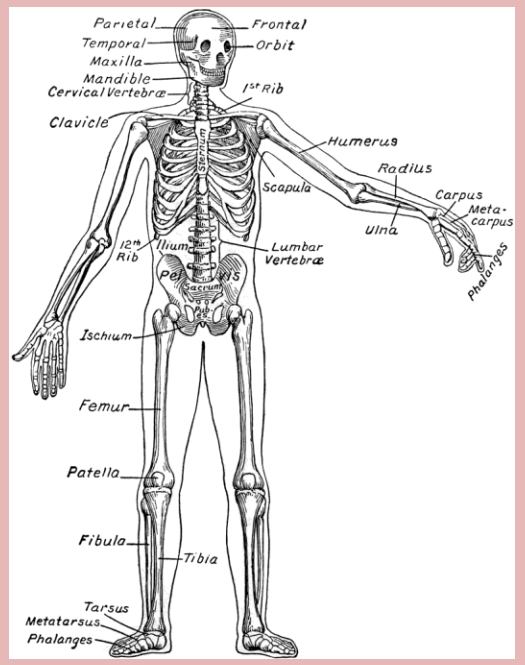
Phase 1 Light exercise
e.g. slow jogging at a much lower intensity you have been working

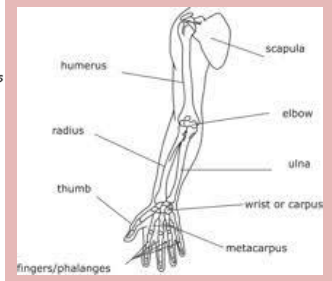
Phase 2 Stretching
Stretch the muscles you have used in the main activity

Why we cool down	The removal of lactic acid and CO_2	Prevents muscle soreness DOMS	Bring heart and breathing rate slowly back to resting	Helps avoid dizziness due to blood pooling	Improves flexibility

1.1 Skeletal System

AQA GCSE PE
Paper 1
Chapter 1:
Applied Anatomy and Physiology





Types of freely moveable joints

Ball and socket joints: can move away from the body, back towards the body and can also rotate

Hinge joints: can only move in one direction, towards and away from each other

Functions:

- ***Support***: for muscles and vital organs
- ***Shape and Structure***: maintains the basic form of the body
- ***Protection of the vital organs***: cranium protects the bone
- ***Movement***: occurs at joints when muscles contract and pull on bones
- ***Mineral storage***: essential for major body functions.
- ***Blood cell production***: takes place in the bone marrow (red blood cells, white blood cells, platelets)

Features of a synovial joint:

- ***Tendon***: very strong, elastic cords that join muscle to bone
- ***Bursae***: a sac filled with liquid, floating inside the joint, to reduce friction between tendon and bone.
- ***Cartilage***: a tough but flexible tissue that acts as a buffer between bones rubbing together and causing friction.
- ***Joint capsule***: tissue that stops synovial fluid from escaping and encloses, supports and holds the bones together.
- ***Synovial membrane***: the lining inside the joint capsules that secretes synovial fluid
- ***Synovial fluid***: a clear and slippery liquid that lubricates the joint and stops the bones rubbing together
- ***Ligaments***: bands of elastic fibre that attach bone to bone, keeping the joints stable by restricting movement.

Joint	Bones @ the joint	Type of joint	Movement
Shoulder	Scapula, Clavicle, Humerus	Ball and Socket	Flexion, Extension, Abduction, Adduction, Rotation, Circumduction
Elbow	Humerus, Radius, Ulna	Hinge	Flexion, Extension
Hip	Pelvis, Femur	Ball and Socket	Flexion, Extension, Abduction, Adduction, Rotation, Circumduction
Knee	Femur, Patella, Tibia, Fibula	Hinge	Flexion, Extension
Ankle	Tibia, Fibula, Talus	Hinge	Dorsiflexion, Plantarflexion

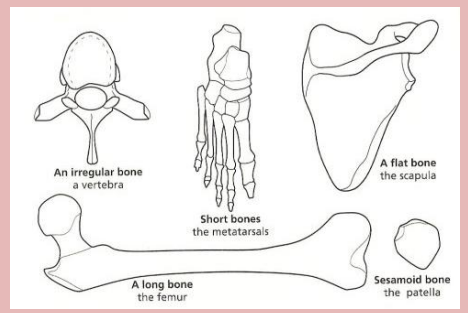
Type of Bones:

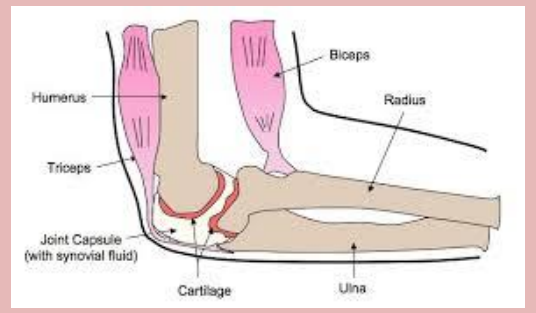
Short: fine, controlled movements

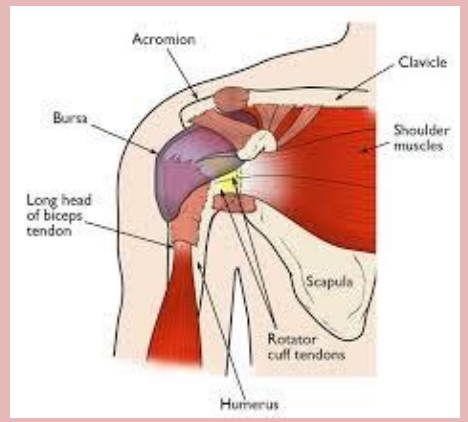
Long: gross, large movements

Flat :quite large and usually protect vital organs

Irregular: Specifically shaped to protect



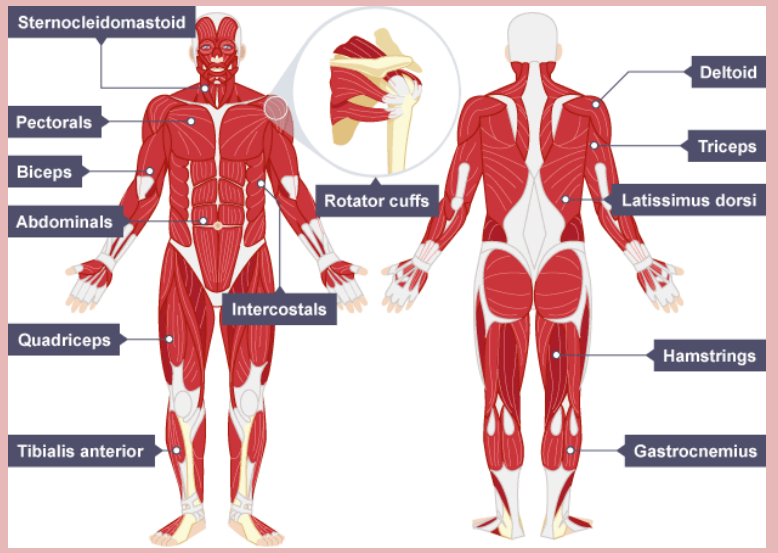




Muscle	Movement	Sporting example
Latissimus dorsi	Extension, adduction or rotation at the shoulder	Butterfly stroke
Deltoid	Flexion, extension, abduction or overarm rotation at the shoulder	Front crawl
Rotator cuff	Rotation and abduction at the shoulder	Bowling in cricket
Pectorals	Adduction and horizontal flexion at the shoulder	Forehand drive in tennis
Biceps	Flexion at the elbow	Upward phase of a bicep curl
Triceps	Extension at the elbow	During a jump shot in basketball
Abdominals	Flexion at the waist	During a sit up
Hip flexors	Flexion of the leg at the hip	Lifting the knee when sprinting
Gluteals	Extension, rotation and abduction of the leg at the hip	Pushing the body forward when running
Hamstrings	Flexion at the knee	Bringing the foot back before kicking a football
Quadriceps	Extension at the knee	When performing a drop kick in rugby
Gastrocnemius	Plantar flexion at the ankle	Standing on your toes in ballet pointe work
Tibialis anterior	Dorsiflexion at the ankle	Bringing the toes up towards the shin when extending the legs in the long jump

1.1 Muscular System

Joint	Muscles
Shoulder	Deltoid, trapezius, pectorals, latissimus dorsi, biceps, triceps, rotator cuff
Elbow	Biceps, triceps
Hip	Gluteals, hip flexors
Knee	Quadriceps, Hamstrings
Ankle	Gastrocnemius, Tibialis anterior



Muscle contraction

Muscles transfer force to bones through tendons. They move our bones and associated body parts by pulling on them – this process is called muscle contraction.

Muscle Contractions:

Isotonic muscle contraction – results in movement

- Concentric muscle contraction – muscle shortens
- Eccentric muscle contraction – muscle lengthens

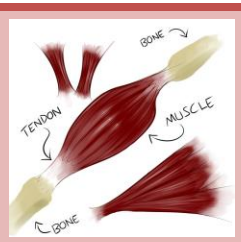
Isometric muscle contraction – muscle contracts but no visible movement

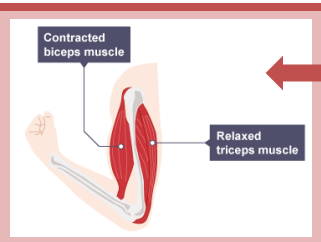
Antagonistic muscle action:

Muscles work in 'antagonistic muscle pairs'. One muscle of the pair contracts to move the body part, the other muscle in the pair then contracts to return the body part back to the original position. Muscles that work like this are called antagonistic pairs.

In an antagonistic muscle pair as one muscle contracts the other muscle relaxes or lengthens. The muscle that is contracting is called the agonist and the muscle that is relaxing or lengthening is called the antagonist.

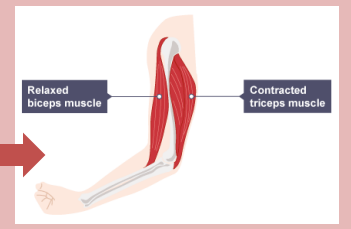
When you perform a bicep curl, the biceps will be the agonist as it contracts to produce the movement, while the triceps will be the antagonist as it relaxes to allow the movement to occur.





The biceps contracts and raises the forearm as the triceps relaxes.

The triceps contracts and lowers the forearm as the biceps relaxes.



RO41 Reducing the Risk of Sports Injuries:

LO1 Factors that influence the risk of injury

Extrinsic Factors: TCEES

TYPE of activity	E.g. contact sports present different injury risks like from gymnastic activity
Coaching/supervision	-Poor/incorrect coaching techniques, lack of knowledge -Ineffective communication skills, techniques -Importance of following the rules and regulations-not encouraging foul/aggressive play
Environmental factors	-Weather/climate/sun/rain/Snow/ice e.g. wet pitch causing players to slip or fall - Playing surfaces/potholes/ surrounding area e.g. falling on astro turf or colliding with advertising boards -Other participants- e.g. being tackled in hockey -Litter/(sharp) objects/Glass/Stones/wet leaves -Equipment in the environment e.g. goal posts or being hit in the face by the ball
Equipment	-Protective equipment (must link to sport), i.e. shin pads in football, gum shield in boxing, helmet in cycling, goggles in skiing, pads/box in cricket, elbow/knee pads for mountain biking, American football shoulder pads, hockey goalie chest pads, Football goalie gloves, Rugby post protectors -Performance equipment-hockey stick, cricket ball, rock climbing harness -Clothing/footwear suitable for playing surface/weather conditions/specific sport or activity
Safety Hazards	Risk Assessments -minimise risks of injuries occurring/make equipment and performer safer -Identify potential hazards/ risks/ dangers -Helps you plan alternative safer sport -Identify if risks are low medium or high -Check whether game is safe to go ahead Safety Checks-boots, equipment, pitch Emergency Action plans 1.Emergency personnel/first aider 2.Emergency communication/contact numbers/999 3.Emergency equipment-first aid kit/evacuation chair

Intrinsic Factors: PIPPS

RO41 Reducing the Risk of Sports Injuries: LO1 Factors that influence the risk of injury

Physical preparation	Training: Have you sufficient training to do the activity? Warm up: Fully warming up before activity/poor warm up increases chance of injury Cool down: A cool down reduces the chance of injury and stiffness and improves recovery Fitness levels: The fitter you are, the less chance of injury (particularly towards the end of the game) Overuse: If you use a muscle group/joint too much it increases the chance of injury Muscle imbalance: Poor training techniques/programmes can lead to imbalances in muscle groups which increase chance of injury
Individual variables	Gender: Males generally stronger than females and less prone to injury Age: Older people are weaker/more prone to injury Flexibility: Increased flexibility decreases the chance of injury Nutrition: Drinking enough water to prevent dehydration/eat enough food to prevent fatigue Sleep: Important we get enough sleep so not tired and focused. Previous/recurring injuries: Pulled hamstrings that become weak/increased chance of pulling again
Posture	Causes of poor posture: -poor stance/gait/sitting positions (e.g. bending your knees or hunching your shoulders when standing and slumping/slouching on the sofa) -lack of exercise (e.g. lack of core muscle strength means less support, being overweight puts strain on posture) -fatigue (e.g. tired muscles will be unable to support the skeleton properly) -emotional factors (e.g. having low self-esteem/lack of confidence can influence posture) -clothing/footwear (e.g. wearing shoes with high heels can affect posture) -genetic predisposition
Psychological factors	Motivation: Poor motivation could lead to performer not committing themselves enough-when competing at a high level could lead to injury e.g. boxing. Over motivation/get carried away (over arousal) can result in too much commitment to competition and cause injury Aggression: Being aggressive in some sports can cause others to retaliate/ be aggressive in return. Can foul or hurt/harm opponent. Can result in poor technique and in turn lead to injury. Can cause a lack of control Arousal/anxiety levels: Too stressed/worried/nervous to perform well. May be too committed/example of aggression Lack confidence/too soft/pull out of tackles. May not be able to concentrate or focus/make wrong decisions.
Sports injuries related to poor posture	Round shoulder-One way to tell if you've got rounded shoulders is to stand in front of a mirror and let your arms hang naturally by your sides. If your knuckles face forward, it may indicate that you have a tight chest and a weak upper back, giving the appearance of rounded shoulders. Scoliosis-sideways curvature of the spine Kyphosis-excessive outward curvature of the spine, causing hunching of the back. Lordosis-excessive inward curvature of the spine. Pelvic tilt is the orientation of the pelvis in respect to the thighbones and the rest of the body. The pelvis can tilt towards the front, back, or either side of the body

RO41 Reducing the Risk of Sports Injuries:

LO2 Understand how warm ups and cool downs prevent injury

Physical benefits of a warm up

- Warming up muscles/preparing the body for physical activity
- Increase in body temperature
- Increase in heart rate
- Increase in flexibility (range of motion) of muscles and joints
- Increase in pliability of ligaments and tendons
- Increase in blood flow and oxygen to muscles
- Increase in the speed of muscle contraction
- Release adrenalin(helping delivery of oxygen to muscles)
- Delay onset of lactic acid/fatigue
- Reduce risk of injury/muscle strain
- Improve performance/technique/practice/rehearse skills

Physical benefits of a cool down:

Reduce/Remove/Lower/Circulate

- Helps the body's transition back to a resting state
- Gradually lowers heart rate
- Gradually lowers temperature
- Circulates blood and oxygen
- Gradually reduces breathing rate
- Removes waste products such as lactic acid
- Reduces the risk of muscle soreness and stiffness
- Aids recovery by stretching muscles, i.e. lengthening and strengthening muscles for next work-out/use
- Reduces risk of blood pooling
- Reduces risk of joint damage

Key components of a cool down

Pulse lowering, i.e. exercises which gradually lower heart rate and reduce temperature (e.g. easy movements, light running, stretching)
Stretching, i.e. maintenance stretches, static stretches (e.g. hamstring stretches
*Ice bath (not considered a formal part but can be used)

Key components of a warm up: PMDSS

Pre **M**atch **D**ictates **S**porting **S**uccess

- **P**ulse raising, i.e. exercises that slowly increase heart rate and body temperature (e.g. jogging, cycling, skipping)
- **M**obility, i.e. exercises that take the joints through their full range of movement (ROM) (e.g. arm swings, hip circles)
- **D**ynamic movements (e.g. change of speed and direction)
- **S**tretching (e.g. developmental stretches, dynamic stretches linked to sport – 'open and close the gate' groin walk) Lengthens muscles in preparation for exercise
- **S**kill rehearsal phase, i.e. rehearsing common movement patterns and skills which will be used in the activity to prepare muscle groups and joints (e.g. dribbling drills for football, passing drills for netball)

Psychological benefits of a warm-up

- Heighten or control arousal levels (e.g. 'get in the zone' or settle nerves)
- Improve concentration/focus (selective attention) right frame of mind
- Increase motivation/drive (motivational talk/getting up for it/incentive to win)
- Mental rehearsal (thinking through/visualising/imagining each element of routine to increase focus and concentration and ignore distractions eg Gymnastics, High Jump)
- Increase confidence
- Reduce reaction time

Specific needs which a warm up and cool down must consider:

- Characteristics of the individual/group, i.e.

-Size of group
-Age of participants
-Experience of participants
-Individual fitness levels
-Any medical conditions participants may have

- Suitability as preparation for a particular activity/sport
- Environmental factors (e.g. weather/ temperature if outdoors, available facilities, space).
- Time available

RO41 Reducing the Risk of Sports Injuries:

LO3 Know how to respond to injuries within a sporting context

What do you need to know?	Types of Injury	Causes of injury	Symptoms of injury	Treatment of injury

Sport Injury	Description
Tendonitis	Inflammation of a tendon
Broken bone	A break in the continuity of the bone is caused by high force impact
Torn ligament	A tear in the fibrous tissue that connects one bone to another
Jumper's knee	An aching in the inferior patella region, common in athletes
Shin Splits	Pain in the lower part of the leg due to repeated trauma to the connective muscle tissue surrounding the tibia
Stress facture	Commonly occurring in weight bearing bones such as the tibia due to repeated stress and/or continuous heavy weight
Dislocation	An abnormal separation in the joint where two of more bones meet
Tennis elbow	An overuse injury causing pain in the lateral part of the elbow
Golfers elbow	A painful inflammation of the muscles on the inside of the forearm
Bruised muscles (contusions)	Trauma causing blood to collect around muscle tissues causing pain
Strains	An injury to a muscle or tendon in which the muscle fibres tear as a result of overstretching
Sprains	An injury in a joint caused by the ligament being stretched too far
Concussion	An injury to the brain caused by trauma and resulting in a temporary loss or impairment of function
Abrasions	A cut or scraped area on the skin resulting from injury or irritation
Cramp	A sudden involuntary, spasmodic muscular contraction causing severe pain

Different types of treatment	Example injury
Massaging	Cramp or for muscle rehab
Heat (Heat) pads , (Deep heat) cream, Hot water bottles , (Heat) lamps, (Heat) blankets (can be used to treat hypothermia), Massage/friction can be used as a heat treatment (to improve rehabilitation), Hot tub / hot bath.	Chronic injuries or late stage acute injuries Post injury rehab Pre-activity treatment e.g. deep heat
Splints/Slings/Taping/Plaster (pot)	Broken bones/dislocations
Bandaging/Plasters/ creams	Abrasions (cuts and grazes)/blisters
RICE---Rest, Ice, Compression, Elevation	Muscle strain/pull/tear/ bruise (dead leg) Sprain-ligament, tendon injuries Overuse injuries like tennis elbow Concussion

RO41 Reducing the Risk of Sports Injuries:

LO3: Know how to respond to injuries within a sporting context

Chronic injuries
Also known as overuse injuries
Are a result of continuous stress on an area
These injuries tend to develop gradually over a period of time
e.g. Achilles tendonitis, shin splints or tennis elbow

Acute Injuries
Caused as a result of a sudden trauma to the body
Result in immediate pain
Usually some swelling
Loss of function
e.g. hard rugby tackle, being hit by a ball

S	See play if a player goes down.
A	Ask the player what happened and how they feel. Check facial expressions, and posture (position either standing or lying down).
L	Look at injured limbs for obvious signs of injury: bleeding, bruising, swelling, deformity. Take the player off if there are significant signs of injury.
T	Touch the injured site if the player will let you. Gently palpate to find source of pain. If you are unsure, don't touch or move the limb until a qualified person can assess the player.
A	Active movement: Can the player move the limb, with or without pain? If unable to move – take the player off.
P	Passive movement: If A applies, move the limb/joint to full extent and note reaction.
S	Strength testing (and play on): Is the player up and running or rather trying to "run-it-off"? Whatever the case, keep a close eye and take the player off if in doubt.

Sports Science

RO42 – Applying the Principles of Training

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

Frequency	How often training takes place.	*Increase training from once a week to two*
Intensity	How hard the exercise is.	*Increase resistance from 10kg to 15kg or increase incline on the treadmill.*
Time	The length of the session.	*Increase training session from 45 minutes to 55 minutes.*
Type	The method of training used.	*Change to from interval training to Fartlek training.*
Adherence	Being motivated to stick to the training programme	*Include a variety of training methods and progressive exercises*

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.

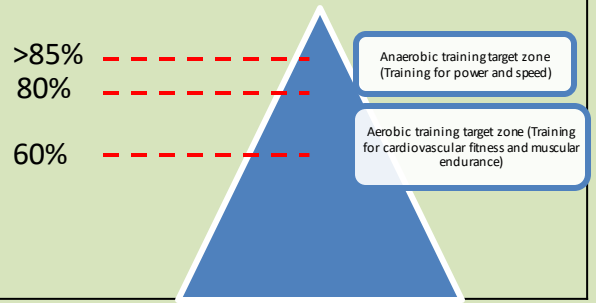
Specificity
Training showed be **matched** to the requirements of the sport or position the performer is involved in.
Training must be specifically designed to develop the right:
- Muscles
- Type of fitness
- Skills

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	**Aerobic target zone: 60–80% of MHR (60% = x 0.6 / 80% = x 0.8)**	**Anaerobic target zone: > 85% MHR (85% = x 0.85)**



Sports Science

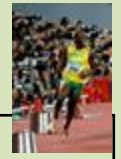
RO42 – Applying the Principles of Training

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
•Ideal for beginners •Highly effective for long distance athletes	• Can be extremely boring as repetitive

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
• Quick and easy to set up. • Can mix aerobic and anaerobic exercise which replicates team games.	• It can be hard to keep going when you start to fatigue (high motivation and self discipline needed) • Over training can occur if sufficient rest is not allowed between sessions (48 hours)

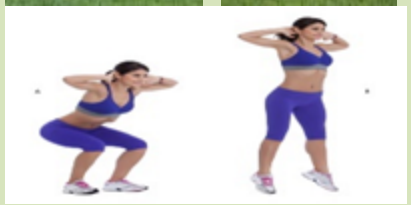
Fartlek training – Referred to as **'speed play'**
This is a form interval training but without rest. Involves a variety of changing intensities over different distances and terrains.
i.e. 1 lap at 50% max, 1 lap walking, 1 lap at 80% (aerobic and anaerobic used)
Used by **games players – Hockey players**

Advantages	Disadvantages
• More enjoyable than interval and continuous training • Good for sports which require changes in speed • Easily adapted to suit the individuals level of fitness and sport.	• Performer must be well motivated particularly when intensity is high • Difficult to assess whether performer is performing at the correct intensity

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
• Easy to set up requiring little or no equipment • Hugely effective in developing power

Disadvantages
• Can result in injury if not fully warmed up. • Can place a great stress on joints and muscles.



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
•Variety of equipment to prevent boredom •Strengthens the whole body or the muscle groups targeted. •Can be adapted easily to suit different sports	• Requires expensive equipment • If exercises are not completed with the correct technique it can cause injury to the performer

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
• Quick and easy to set up • Easy to complete with large groups • Can be adjusted to be made specific for certain sports. *i.e. netball specific circuit*	• Technique can be affected by fatigue and can increase risk of injury • Must have motivation and drive to complete the set amount of repetitions and sets.

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
•Variety avoids boredom •Instructor will challenge & motivate •Great way to meet new people	• Gym membership can be expensive. • Group classes are not tailored to individual needs.

Sports Science

RO42 – Applying the Principles of Training

Components of Fitness

Health Related Component of Fitness	Definition	Sporting Example	
Cardio-Vascular Endurance	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.		**Marathon runners** require excellent cardiovascular fitness to be able to run for the entire **duration of the race without getting tired.**
Muscular Endurance	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		**Boxers** require good muscular endurance to be able **to repeatedly contract their muscles** when **throwing punches** many times without getting tired.
Muscular Strength	The amount of force a muscle can generate when it contracts to overcome resistance.		**Powerlifters** require excellent muscular strength to be able to generate large amounts of force when **lifting heavy weights.**
Flexibility	The ability of your joints to move through their full range of movement.		**Gymnasts** require large amounts of flexibility to be able to **move their joints through their full range of motion** when performing moves and routines.

Sports Science

RO42 – Applying the Principles of Training

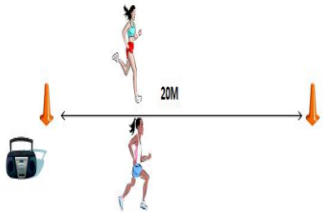
Components of Fitness

Skill Related Component of Fitness	Definition	Sporting Example	
Agility	A measure of how quickly you can change the position of your body, while keeping your entire body under control.		**Footballers** require high levels of agility to be able to **change direction** at speed when running with the ball to get **around their opponents**.
Balance	The ability to keep your body mass or centre of mass over a base of support.		**Dancers** require large amounts of balance to ensure that they **maintain control** when in a **static position**, such as **standing on one leg.**
Co-ordination	The ability to move two or more body parts together, accurately and smoothly.		**Tennis players** require excellent levels of coordination to be able make contact with the **ball and racket at the same time** when performing shots.
Power	The ability to combine strength with speed to perform a strong muscular contraction very quickly.		**Long jumpers** require great amounts of power to be able to **push off the ground** to **propel** themselves into the air in order to **travel a long distance in their jump.**
Reaction Time	The amount of time it takes you to respond to a stimulus.		**Sprinters** require excellent levels of reaction time to be able to get **out of their starting blocks as quickly as possible** at the beginning of a race.
Speed	The rate at which your body, or part of your body, is able to perform a movement.		**Rugby players**, particularly **wingers**, require high levels of speed to be able to **travel down the wing** at a fast pace to be able to **score a try**.

Sports Science

RO42 – Applying the Principles of Training

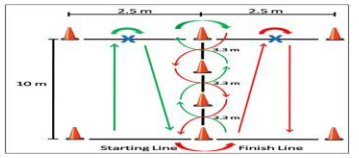
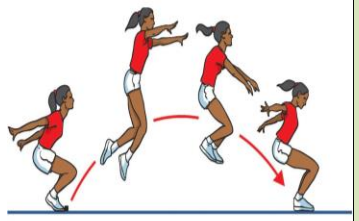
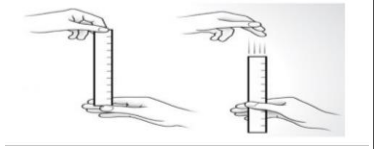
Testing Components of Fitness

Health Related Component of Fitness	Test(s)	Advantages	Disadvantages	
Cardio-Vascular Endurance	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.	
Muscular Endurance	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	
Muscular Strength	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.	
Flexibility	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.	

Sports Science

RO42 – Applying the Principles of Training

Testing Components of Fitness

Skill Related Component of Fitness	Test	Advantages	Disadvantages	
Agility	Illinois Agility Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
Balance	Stork Balance Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
Co-ordination	Alternate Hand Wall Toss Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test. Human error with timing.	
Power	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.	
Reaction Time	Ruler Drop Test	Minimal equipment needed. Can be performed anywhere.	Assistant required to administer the test.	
Speed	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.	

Sports Science

RO42 – Applying the Principles of Training

Conducting Fitness Tests

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

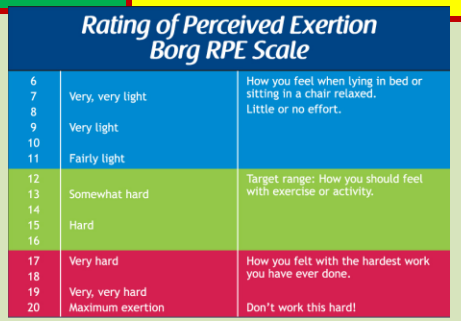
Maximal

Performer works at maximum effort or is tested to exhaustion
(e.g. 12 min cooper run)

Sub-Maximal

Performer works below maximum effort

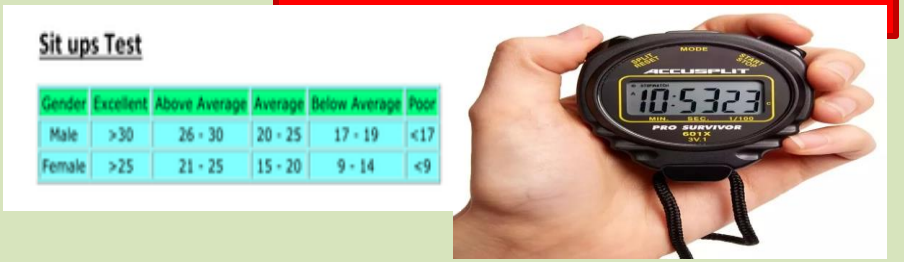
(e.g. Harvard step test)



Interpreting Results

Compared to normative data – how do outcomes compare to average results?

Before and after comparison – measure an individual's progress over time.



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?

Sports Science

RO42 – Applying the Principles of Training

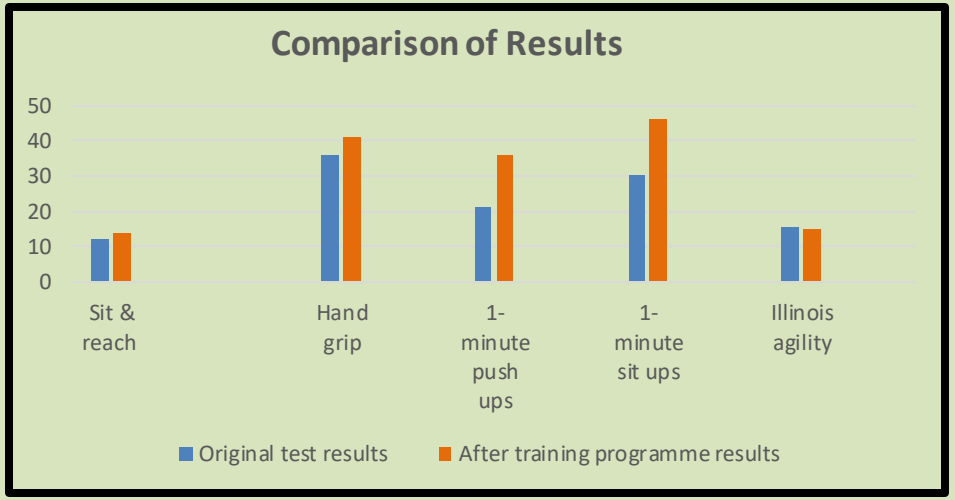
Developing and Evaluating a Training Programme

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)

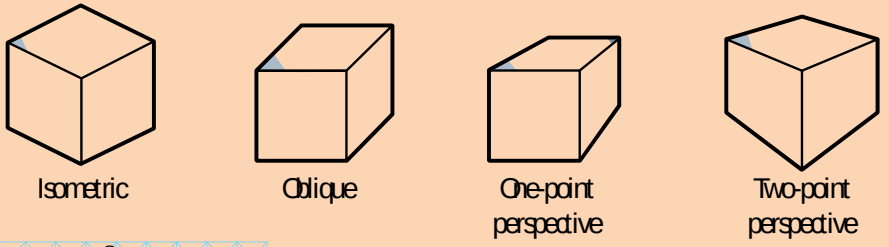
Fitness Programme Evaluation

- 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?

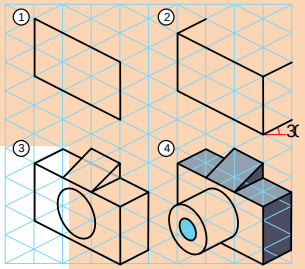


D&T - Timbers: Term 1 & 2

How to creatively and effectively communicate your design ideas.

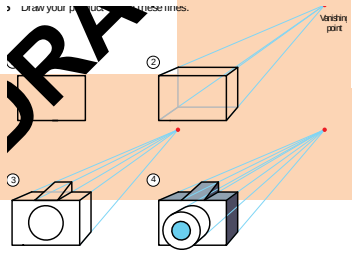


Isometric

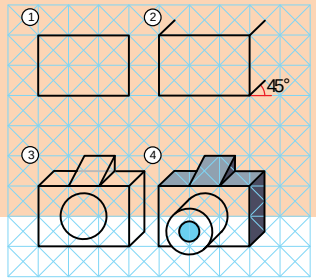


Isometric drawings look more realistic than oblique ones and are based on 30-degree lines. For support, use isometric grid paper to guide your angles:

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:

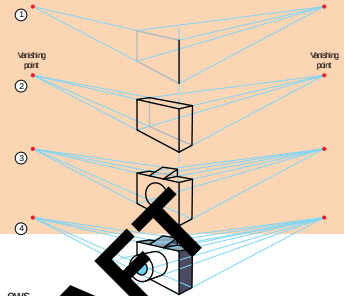
1 Draw the front view in 2D.
2 From each corner, draw construction lines projecting out at 45 degrees.
3 On the construction lines, measure half the true length.
4 Draw the back of the product to complete the product.

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.

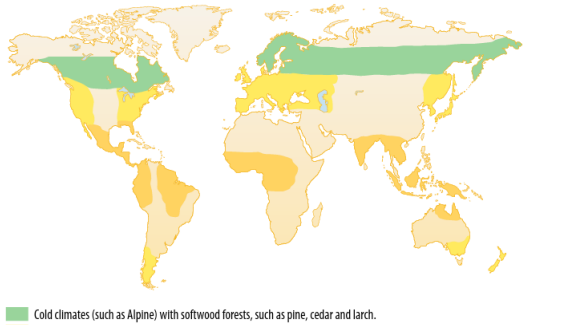
D&T - Timbers: Term 1 & 2

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.

Type	Description	Advantages	Disadvantages	Common uses
Oak		• Strong and durable • Has an attractive grain when well finished	• Expensive • Becoming rarer • Harder to work with than some woods • Corrodes iron and steel	• Used a lot for building houses and boats in the past • Now used for high-end furniture and wine and whisky barrels
Mahogany		• Has a very attractive finish • Quite easy to work	• Expensive • Environmental problems with sourcing from tropical forests • Oils in the wood can give some people a skin rash or breathing problems	• High-quality furniture, jewellery boxes, windows
Beech		• A tough wood • Does not crack or splinter easily • Hard	• Expensive • Not very resistant to moisture • Not suitable for exterior use	• Toys, cooking implements, solid and laminated furniture
Balsa		• Very lightweight • Easy to cut	• Much too soft and weak for most products	• Model making, primary school projects, surf board cores • Used for rafts in ancient times
Jelutong		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
Birch		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
Ash		Strong, tough, flexible and finishes well	Low resistance to rot and insect attack	Handles for tools, sports equipment, ladders



Cold climates (such as Alpine) with softwood forests, such as pine, cedar and larch.
Temperate climates (such as European) with a mix of softwoods and temperate hardwoods, such as oak, beech, ash and birch.
Tropical climates (such as Amazonian) with rainforests of tropical hardwoods, such as mahogany and jelutong.

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
Regular sections	• 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 • Designers can use the standard sizes when designing products	 Commonly available sizes and shapes of timber
Mouldings	• Lengths of timber cut into decorative shapes • There are lots of shapes available for different purposes, such as skirting boards or decorative edging • Saves time but can be relatively expensive	 Common moulding shapes
Dowels	• Wooden rods that are round in cross-section • Have a variety of uses, from model making to furniture construction – can be used to strengthen simple joints • Short lengths of dowel are used to join pieces of wood with a dowel joint • Requires accurate drilling of holes	 Different-sized dowels
Sheets	• Manufactured boards come in standard-sized sheets in a range of thicknesses • Available in large sizes but large sheets are relatively difficult to cut and edges may splinter	 A stack of manufactured boards in a warehouse

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
Pine		• Very durable • Easy to work • Quite cheap as it grows quickly enough to be forested • Reasonably strong, lightweight and easy to work with	• Can warp, crack and splinter more than some other woods	• House construction, for roof joists and floorboards • Furniture, doors, interior woodwork
Cedar		• Natural oils make it resistant to water and fungal growth	• More expensive than pine and not as strong	• Outdoor furniture, fences, sheds, boats
Larch		• Tough, durable and resistant to water • It can be used outside untreated, and fades to a silvery grey	Costs more than some other softwoods	Small boats, yachts, exterior cladding on buildings

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.

Key term

Veneer: a thin slice of wood, about 1 mm thick. Used as a decorative surface and to make plywood.

Type	Description	Advantages	Disadvantages	Common uses
Plywood	• A tree trunk is sliced into thin layers called veneer • These layers are glued together with the grain lines going in alternate directions	• Flat and structurally strong • Surface looks like wood • Resistant to warping, cracking and twisting	• Quite expensive • Edges can look rather rough • Susceptible to water damage if wrong grade is used	• Building and furniture panels that need some strength
Medium density fibreboard (MDF)	• Wood dust and fibres are mixed with a glue and pressed into flat sheets under extreme heat and pressure	• Cheap (made from waste wood) • Smooth ungrained surface is good for painting or staining • Easy to machine	• Does not look good, so needs coating • Weak compared to real wood or plywood • Tools blunt quickly due to the glue	• Cheap flat-pack furniture, wall panels, display cabinets, storage units
Chipboard	Wood chips are mixed with glue and pressed into flat sheets	Uses waste materials so is cheap to produce	• Not much structural strength, especially in damp conditions • Surface is very rough, so usually plastic coated	Desktops, kitchen worktops, cheap flatpack furniture

D&T - Timbers: Term 1 & 2

The types, properties, structure and uses of the main natural and manufactured 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 manufactured 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.

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.

FSC®

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 l and 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: Term 1 & 2

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.

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.

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.

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.

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.

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?

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 bandsaw: the blade is one long band with teeth that can make straight and curved cuts in timber. What's wrong in this photo?

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 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.

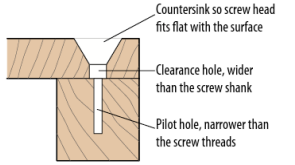
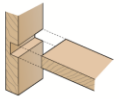
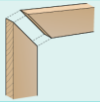
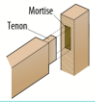


Figure 7.7.3 Drilling timber parts ready for a countersunk screw

Scale	Description	Advantages	Disadvantages
One-off	One product made at a time, either for a specialist product or to test an idea	• No set-up cost • Made with existing equipment • Product can be customised to the user's needs	Slow, so expensive to make several
Batch	Several copies of the same product are made at the same time	• Jigs, templates and moulds speed up the process and can be kept for future use • Special machinery is not needed, so set-up cost is not high	• Labour intensive, so it is quite expensive per product • Takes time to make jigs, moulds and templates
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

Name	Appearance	Advantages	Disadvantages
Butt		Easy to make, it is just square ends glued together	• Weak: there is no mechanical strength, just the glue • Not aesthetically pleasing
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		• Holds a shelf or divider securely in the middle of a carcass (frame) • Pairs well with corner lap joints	• Can be tricky to cut neatly on a wide board • Very accurate marking out and cutting required to ensure a shelf is exactly level
Mitre		• Looks good because no end grain shows • Good for picture frames	Weak, it is only a butt joint at 45°
Mortise and tenon		• A strong joint • Good for joining a table or chair frame to legs	Time consuming to cut by hand
Dovetail		• A very strong joint – the dovetails lock together securely • Good for a drawer front that will get pulled hard	Very tricky to cut accurately by hand

Name	Appearance	Use	Advantages	Disadvantages
Butt hinge		Used to fit doors	Hidden from sight when door is closed	Hard to fit as an accurate slot needs to be cut on both sides
Flush hinge		Used for small cupboard doors	Easy to fit as no slots to cut	Leaves a gap between the door and frame
Butterfly hinge		Screws onto the surface, often a decorative shape	Easy to fit, as it screws onto the surface with the parts lined up	The whole hinge shows on the surface
T hinge		Used for gates and shed doors	Long bar good for supporting the weight of a gate	Sits on the surface, so shows on the front of the gate or door

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.

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.

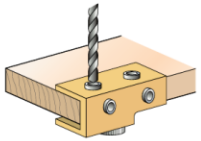


Figure 7.6.2 A drilling jig that has been clamped to the corner of the workpiece to get the holes in the correct place

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 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.

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	• Blade can bend, so it's important to saw straight • Harder work than a power saw
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	• Thin blade can go around curves • Blade can be taken out and put through a hole to cut internal shapes	• Blade snaps quite easily • Small teeth saw slowly
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		• The blade goes up and down • Used to cut large thin pieces of wood clamped to a bench	• Can cut quite quickly • Thin blade can cut curved shapes	• Difficult to cut straight lines • Blade can wander in thicker materials

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 woodwork 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.

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

Shaping

Drilling

A drill makes a round hole in material. There are different types which all have their advantages and disadvantages.

Name	Appearance	Use	Advantages	Disadvantages
Twist drill		• Drilling smaller-sized holes in most materials • The flutes lift the swarf out of the hole	Readily available in a wide range of sizes from very small up	• Usually only up to 13 mm diameter • Deep holes can block up the flutes
Flat bit		Drilling larger holes in wood	• Centre spur gives an accurate starting point • Drills quickly	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	• Only good for quite thin materials • Limited range of sizes available

	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

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		• Large individual teeth • Available in different shapes, usually flat, half-round and round	• Big teeth cut soft woods quickly • Good for rough shaping	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	• Good for rough shaping of soft materials • Blade can be removed from frame and replaced	• Leaves a rough surface • Hard work on harder woods

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.

AQA Design & Technology 8552
Materials and Working Properties Textiles

Fabrics

Natural Fabrics

Cotton	Soft, good absorbency, prints well, machine washable, strong breathable	Origins from the Cotton Plant.	Uses: Jeans, towels, Shirts, dresses, underwear
Wool	High UV protection, flameproof, breathable, durable insulating	Origins from Sheep.	Uses: Jumpers, Coat, blankets
Silk	Smooth, Soft, Strong	Origins from the silk worm.	Uses: Wedding dresses, lingerie.
Linen	Strong, cool in hot weather	Origins from the flax plant	Uses: Trousers, tops.
Leather/Suede	Strong, hardwearing, durable.	Origins from the skin of animals, mainly cows.	Uses: Jackets, Trousers, Shoes.

Synthetic fabrics

Polyester	Durable, wrinkle resistant, stain resistant	Uses: Shirts, jackets. Also used in safety belts, conveyor belts and tyre reinforcement.
Polyamide (Nylon)	Durable, high abrasion resistance	Uses: Sportswear, carpets.
Elastane (Lycra)	Stretchy, durable, high stain resistance	Uses: Sportswear, Swimwear, tights.
Viscose	Soft, comfortable, absorbent, easily dyed.	Uses: Dresses, linings, shorts, shirts, coats, jackets and outerwear.
Acrylic	Absorbent, retains shape after washing, easily dyed, resistance to sunlight.	Uses: Jumpers, tracksuits, linings in boots.

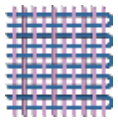
Blended and mixed Fabrics

These fabrics take on the positive characteristics of their combinations

Cotton/Polyester	Easy care and crease resistant	Uses: School shirts.

2. Fabric Construction

Woven

Plain Weave	Extremely strong and hard wearing	
Twill Weave	Extremely high strength and abrasion resistant.	

Knitted

Knitted fabrics	Stretchy, soft and comfortable.	

Non-Woven

Bonded Fabrics	These are webs of fibres held together by glue or stitches.	
Felted Fabrics	Felt is made by combining pressure, moisture and heart to interlock a mat of wool fibres.	

Care Labels


Machine wash. It will usually have a max. temp number included


Hand Wash only


Do not wring out


Line Dry


Iron on low heat. The more dots the higher the heat setting

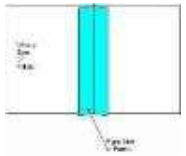
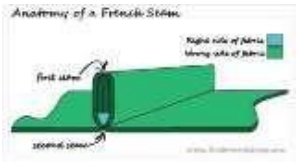
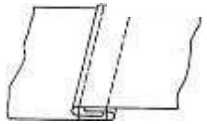

Tumble Dry


Do not bleach


Dry Clean

AQA Design & Technology 8552
Working with textile based Materials and Fixings

Construction Techniques

Open seam	This is used as the main method for constructing textile products. It is normally finished with overlocking to neaten the edges and prevent fraying.	
French Seam	This seam is used on delicate fabrics that can not be overlocked. It is generally used within lingerie.	
Flat Fell Seam	Very strong double stitched seam for heavy fabrics. Commonly used on jeans.	
Overlocking	Used to neaten seams to prevent fraying. Generally hidden on the inside of a product.	
Binding	Used to finish a curved edge on a product, where overlocking is not suitable.	

Decorative Techniques

Applique

Patchwork

Tie Dye

Beads & Sequins

Batik

Hand Embroidery

Gathers

Darts

Pleats

Tucks

Equipment

Sewing Machine

Overlocker

Sewing threads

Iron

Ironing Board

Quick unpick

Pins

Tape Measure

Needle

Embroidery Scissors

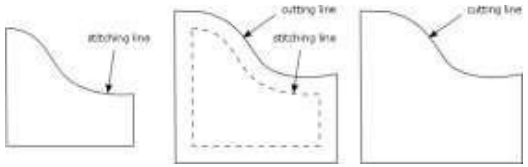
Fabric Shears

Pinking Shears

Construction Terminology

Pattern
This is the term given to a paper template to aid in the cutting out of fabric for accurate construction.

Seam Allowance
This is usually a 1cm 'boarder' around your pattern to allow for construction to be the correct size.



Right Side
This is the 'correct' side of the fabric that you wish to see.

Wrong Side
This is the side of the fabric that you do not wish to see.

Pressing
This is the term given when ironing your product; e.g. press your seams open, would refer to when an open seam is sewn and they need to pressed outwards to give a flat finish.

AQA Design & Technology 8552 Making Principles
Specialist tools, equipment, techniques and processes

Tool Selection

Specialist material areas often require tools that perform only one function, others can be adaptable and perform multiple tasks. E.g. A Tenon saw is used to cut straight or angles in wood, a pillar drill can be used to drill into a variety of materials.

Safety for Yourself and Others

Once your equipment has been selected you must consider health and safety. Some machinery has age restrictions and/or training requirements see the equipment/machinery **data sheets** and **risk assessments** for information. Basic requirements for all projects are **PPE** (**Personal Protective Equipment**).

Other areas to think about are:

Extraction (to remove dust/fumes)
Cleaning up spillages immediately
Carrying tools correctly.
Visual checks for damage/maintenance

Golden rule – if in doubt check it out

Outsourcing

Some companies may not have the skills for specialist tasks such as cutting and finishing toughened glass. Getting another company to do this them is called **outsourcing**.

Data Sheets and Instructive Manuals

Data sheets are usually provided by a material manufacturer that are considered to be hazardous. This could be because they need to be handled in a particular way or because they give off harmful gasses. Some equipment and machinery is also considered hazardous and may have a safety data sheet or safety information in the instruction manual for example a laser cutter.

Risk Assessment

Risk assessments must be produced as they are specific to individual workshops, the hazards in one workshop are not necessarily the same as another. A risk assessment is carried out to identify whether or not it is safe to carry out a particular task in that environment. A risk assessment looks for potential risks of a process, tool, material or piece of equipment.

There are 5 stages to a risk assessment: 1. Individual risk factors
2. Identify who is at risk
3. Decide the likelihood of the severity
4. Record findings and implement control measures
5. Monitor and review the risk assessment

Risk assessment: Soldering Iron / Soldering

What are the hazards?	Who might be harmed and how?	What are you already doing?	Do you need to do anything else to manage this risk?	Risk Level H—High M—Medium L– Low	Action by whom?	Action by when?	Done
Handling soldering iron while soldering	The operator of the soldering iron. If the soldering iron is not held using the handle burns to the hands is likely. If the operator does not store the soldering iron in the stand provided burning to the contact area will result. If the operator of the soldering iron does not pay attention to who is around them and makes contact with them this will result in burning	Soldering is undertaken in a specific area in S2 and S3. Strict guidance is given to operators and unsafe behaviour will result in immediate removal of the operator from the task	No	M	HCLIPRO	Ongoing	
Burning through electric wire	The operator because the soldering is not being stored correctly and attention to safe storage of the soldering iron is not being observed	Clear guidance on the safe use of the soldering is given with specific instructions on storing the iron when in use. The electric supply is not protected	A safety sheet required to remind operators of the correct way to use and make aware of possible hazards	L	HCLIPRO	Nov 2013	
Fumes	The operator could possibly inhale the fumes and also possible eye irritation could occur	Operators are required to wear goggles. This is supported through the smaller allocation of operators soldering to minimise the generation of fumes. Observation and monitoring by the session member of staff	No	L			

- This risk assessment and proposed actions have been discussed with staff and students (where appropriate)
- The risk assessment will reviewed annually as it might no longer be valid or if there are any significant changes to the hazards in the workplace, such as new equipment or work activities. A review date has been set.
- Operator refers to all persons carrying out an activity using a process, a series of processes using equipment within the department. An operator may be a member of staff, student or visitor.

AQA Design & Technology 8552
New and emerging Production Systems and Methods

CAD – Computer Aided Design

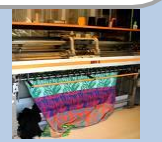
Advantages of CAD	Disadvantages of CAD
Designs can be created, saved and edited easily, saving time	CAD software is complex to learn
Designs or parts of designs can be easily copied or repeated	Software can be very expensive
Designs can be worked on by remote teams simultaneously	Compatibility issues with software
Designs can be rendered to look photo-realistic to gather public opinion in a range of finishes	Security issues - Risk of data being corrupted or hacked
CAD is very accurate	CAD Software
CAD software can process complex stress testing	

CAM – Computer Aided Manufacture

Advantages of CAM	Disadvantages of CAM
Quick – Speed of production can be increased.	Training is required to operate CAM.
Consistency – All parts manufactures are all the same.	High initial outlay for machines.
Accuracy – Accuracy can be greatly improved using CAM.	Production stoppage – If the machines break down, the production would stop.
Less Mistakes – There is no human error unless pre programmed.	Social issues . Areas can decline as human jobs are taken.
Cost Savings – Workforce can be reduced.	


Laser Cutter


Digital jet printer


Digital Knitting machine

Production Methods

Flexible Manufacturing Systems (FMS) : involves an assembly of automated machines commonly used on short-run batch production lines where the products frequently change.

Lean Manufacturing: It aims to manufacture products just before they are required to eliminate areas of waste including:

- Overproduction
- Waiting
- Transportation
- Inappropriate processing
- Excessive inventory
- Unnecessary motion
- Defects

Just In Time (JIT) : Items are created as they are demanded. No surplus stock of raw material, component or finished parts are kept.

Advantages of JIT	Disadvantages of JIT
No warehousing costs	Reliant on a high quality supply chain
Ordered secured before outlay on parts is required	Stock is not available immediately off-the-shelf
Stock does not become obsolete, damaged or deteriorated	Fewer benefits from bulk purchasing

Scales of Production

<u>One off/Bespoke</u>: when you make a unique item.

<u>Batch</u>: when a limited number of the same product is made.

<u>Mass</u>: when a large quantity of the same product are made over a long period of time. This typically uses a production line.

<u>Just-In-Time</u>: a form of stock control when goods are delivered 'just in time' to use on the production line.

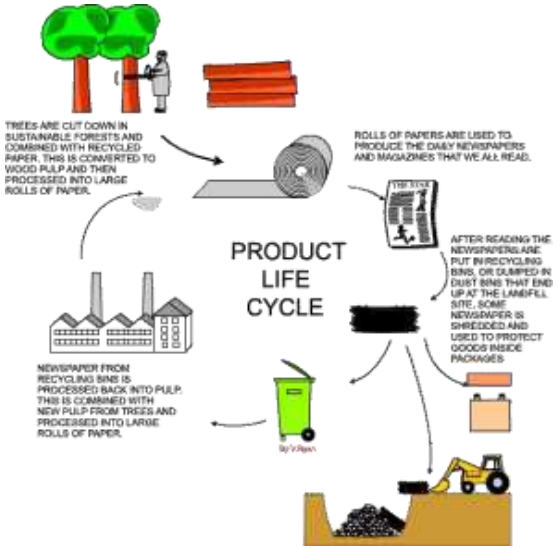
Informing Design Decisions

1. Planned obsolescence - Planned obsolescence is when a product is deliberately designed to have a specific life span. This is usually a shortened life span.

2. Design for maintenance - Products are often designed to be thrown away when they fail… This can be achieved by designing products that can be repaired and maintained.

3. Disposability – Some products are designed to be disposable.

4. Product Lifecycle -




AGV – Automated Guided Vehicle



Robots Barcode Scanner

CNC	Computer Numerical Control
EPOS	Electronic Point Of Sale (Barcodes)

AQA Design & Technology 8552
New and emerging Technologies – Industry and Enterprise

New and Emerging Technologies

New technologies are those that are currently being developed or will be developed in the next 5 to 10 years, and which will alter the business and social environment.
Examples:

Fuel-cell vehicles
Zero-emission cars that run on hydrogen

Additive manufacturing
The future of making things, from printable organs to intelligent clothes

Enterprise

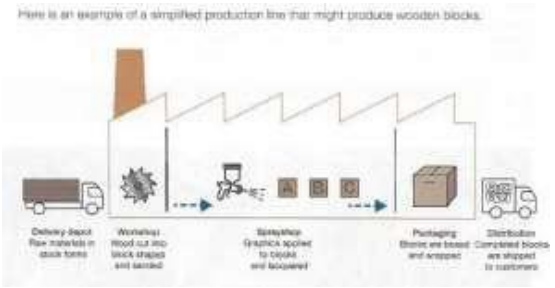
An idea that is developed into a business proposal for a product that has commercial viability.
Products developed in this way require a patent to protect the idea so that other companies cannot use it without permission this is called a registered trademark.

Industry – Automation and the use of Robots

As industry has grown new and emerging technologies have changed the way designers, architects and engineers work.
Intelligent machines and robotics have replace machine operators and engineers.
The development of work now almost always involves the use of **Computer Aided Design (CAD)**.
This software can carry out complex tasks such as virtual stress testing this is called **Computer Aided Testing (CAT)**.
Designs can be produced to look 3D so customers ca give opinions before **prototyping** begins.

Buildings and the place of work

The development of the internet has changed how data is transferred. This has lead to people being able to work together remotely (from different buildings or countries).
Projects can be sent to machines using **computer aided manufacturing (CAD)** techniques including **computer numerical control (CNC)** machines such as laser cutters and rapid prototyping (RPT) machines such as 3D printers.
Physical layout of buildings for production should be logical to increase efficiency. This will reduce unproductive time, movement and waste materials.



Co-operatives

A farm, business, or other organization which is owned and run jointly by its members, who share the profits or benefits.

Crowdfunding

Funding a project or venture by raising money from a large number of people who each contribute a relatively small amount, typically via the Internet.

Virtual Marketing and Retail

Virtual marketing the use of search engines positioning and ranking, banner advertising, e-mail marketing and social media in order to reach a wider audience to promote a product.

Fairtrade

A farm, business, or other organization which is owned and run jointly by its members, who share the profits or benefits.
Trade between companies in developed countries and producers in developing countries in which fair prices are paid to the producers.

AQA Design & Technology 8552
New and emerging Technologies – People, Culture and Society

People

Consumer Choice

Growth of global manufacturing has lead to a wider variety of products being available, prices of products are kept low because of the wider competition.

Technology Push

Advances in technology and science lead to the development of new products. Research and Development (R&D) Departments are used within large companies to ensure they can create new and exciting products.

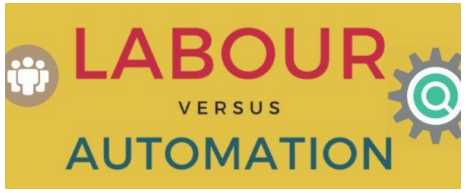
Advances in touchscreen technology

Market Pull

The demand for new products from the consumer market. Market Pull is the pressure put on a company to improve or redevelop their products by consumers to meet the consumers changing needs.

Changing Job Roles

The development of new technologies and automation has meant there is less reliance on manual labour. Workers need to be 'skilled up' and be more flexible.



Society

Companies putting the environment and people before profit.
Examples:

- Carbon Neutral Products
- Use of renewable materials
- Reduction of carbon emissions/greenhouse gasses
- Use of recycled materials
- Products designed to be 100% recyclable
- Promotion of Fairtrade
- Reduction of transportation
- Non profit organisations that reinvest money to support good causes
- Consideration to designing products for the elderly or disabled
- Consideration to different religious groups

4 main ways to consider the population when designing

Type of Production	Example
One size fits all	Door Frames Baths
A range of sizes to cover all	Shoes Clothes
Adjustability to allow use by all	Car Seats Shower head height
Adaptability to support location or user	Children's booster seats Car roof bars

Culture

A combination of ideas, beliefs, customs and social behaviours of a society or group of people.

Fashion and Trends

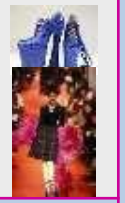
Designers developing products that are influenced by 'the latest thing'.

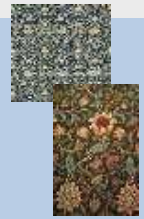
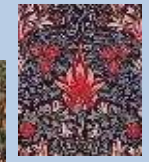
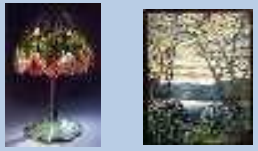
Faiths and Beliefs

Designers being responsible for the impact their design choices may have on a community.

AQA Design & Technology 8552

Designing Principles - The work of others

Designer Name	Facts	Logo	Examples
Coco Chanel	**Gabrielle Bonheur "Coco" Chanel** (19 August 1883 – 10 January 1971) was a French fashion designer and businesswoman. She was the founder and namesake of the Chanel brand.	CHANEL	 
Alexander McQueen	**Lee Alexander McQueen**, CBE (17 March 1969 – 11 February 2010), known professionally as **Alexander McQueen**, was a British fashion designer and couturier. He is known for having worked as chief designer at Givenchy from 1996 to 2001 and for founding his own Alexander McQueen label.		  
Vivienne Westwood	**Dame Vivienne Isabel Westwood** DBE RDI (born 8 April 1941) is a British fashion designer and businesswoman, largely responsible for bringing modern punk and new wave fashions into the mainstream.	Vivienne Westwood	 
Harry Beck	**Henry Charles Beck** (4 June 1902 – 18 September 1974), known as **Harry Beck**, was an English technical draughtsman best known for creating the present London Underground Tube map in 1931.	HARRY BECK 1902 - 1974	
Norman Foster	**Norman Robert Foster, Baron Foster of Thames Bank**, OM, HonFREng (born 1 June 1935) is a British architect whose company, Foster + Partners, maintains an international design practice famous for high- tech architecture.	NORMAN FOSTER	  

Designer Name	Facts	Logo	Examples
Marcel Breuer	**Marcel Lajos Breuer** (22 May 1902 – 1 July 1981) was a Hungarian-born modernist, architect, and furniture designer. Breuer extended the sculptural vocabulary he had developed in the carpentry shop at the Bauhaus into a personal architecture		
Sir Alec Issigonis	**Sir Alexander Arnold Constantine Issigonis**; 18 November 1906 – 2 October 1988) was a British-Greek designer of cars, widely noted for the ground-breaking and influential development of the Mini, launched by the British Motor Corporation (BMC) in 1959.		
William Morris	**William Morris** (24 March 1834 – 3 October 1896) was an English textile designer, poet, novelist, translator, and socialist activist. Associated with the British Arts and Crafts Movement, he was a major contributor to the revival of traditional British textile arts and methods of production.	MORRIS & Co	 
Mary Quant	**Dame Barbara Mary Quant, Mrs Plunket Greene**, (born 11 February 1934) is a Welsh fashion designer and British fashion icon She became an instrumental figure in the 1960s London-based Mod and youth fashion movements.	MARY QUANT	
Louis Comfort Tiffany	**Louis Comfort Tiffany** (February 18, 1848 – January 17, 1933) was an American artist and designer who worked in the decorative arts. He is best known for his work in stained glass.	TIFFANY	
Philippe Starck	**Philippe Starck** (born January 18,. 1949) is a French designer known since the start of his career in the 1980s for his interior, product, industrial and architectural design including furniture	S+ARCK	 

AQA Design & Technology 8552
Designing Principles - The work of others: Product & Industrial Design

Name	Facts	Logo	Examples
Raymond Templier	**RAYMOND TEMPLIER** (1891 - 1968) like many of his contemporaries in jewelry, was born to a family with a long tradition as jewelers.		
Gerrit Rietveld	**Gerrit Thomas Rietveld**; 24 June 1888 – 25 June 1964) was a Dutch furniture designer and architect. One of the principal members of the Dutch artistic movement called De Stijl, Rietveld is famous for his Red and Blue Chair.		 
Charles Rennie Macintosh	**Charles Rennie Mackintosh** (7 June 1868 – 10 December 1928) was a Scottish architect, designer, water colourist and artist. His artistic approach had much in common with European Symbolism. His work was influential on European design movements such as Art Nouveau and Secessionism.		  
Aldo Rossi	**Aldo Rossi** (3 May 1931 – 4 September 1997) was an Italian architect and designer who achieved international recognition in four distinct areas: theory, drawing, architecture and product design. He was the first Italian to receive the Pritzker Prize for architecture.		 
Ettore Sottsass	**Ettore Sottsass** (14 September 1917 – 31 December 2007) was an Italian architect and designer during the 20th century. His work induded furniture, jewellery, glass, lighting, home objects and office machine design, as well as many buildings and interiors.		

Name	Facts	Logo	Examples
Alessi	**Alessi** is a housewares and kitchen utensil company in Italy, producing everyday items from plastic and metal, created by famous designers.		 
Apple	**Apple Inc.** is an American multinational technology company headquartered in Cupertino, California that designs, develops, and sells consumer electronics, computer software, and online services.		  
Braun	**Braun GmbH** formerly **Braun AG**, is a German consumer products company based in Kronberg. From 1984 until 2007, Braun was a wholly owned subsidiary of The Gillette Company, which had purchased a controlling interest in the company in 1967.		 
Dyson	**Dyson Ltd.** is a British technology company established by James Dyson in 1987. It designs and manufactures household appliances such as vacuum cleaners, hand dryers, bladeless fans, heaters and hair dryers.		 
GAP	**The Gap, Inc.** commonly known as **Gap Inc.** or **Gap**, (stylized as **GAP**) is an American worldwide clothing and accessories retailer.		 
Primark	**Primark** known as **Penneys** in the Republic of Ireland) is an Irish clothing and accessories company which is a subsidiary of AB Foods, and is headquartered in Dublin.		
Under Armour	**Under Armour, Inc.** is an American company that manufactures sports and casual apparel and footwear.		
Zara	**Zara** is a Spanish clothing and accessories retailer based in Arteixo, Galicia. It is the main brand of the Inditex group, the world's largest apparel retailer.		

Design: The ability to communicate with the consumer in an interesting and affective way.

2D Design: Two –dimensional design is better for plan views and for expressing size and adding dimensions. It can also help explain mechanical and electrical concepts clearly.
3D Design: Three-dimensional design is better for conveying the overall shape of a design and for visually explaining aesthetic properties.

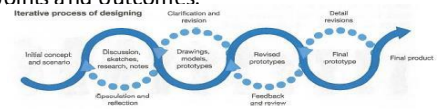
Design Brief: A design brief can be as simple as an intent to design and make a certain product. A good design brief will set a clear context for why the product is required, as well as understanding any possible constraint's

Specification:
Using research and testing, a set of objectives for the product can be produced. This is called a **manufacturing specification**.
A thorough manufacturing specification should include:
> Detailed points relating to the product's form and function.
> Any known constraints, such as exact timescale for product and maximum budget.
It is vital that as many points as possible as measureable, so the product can be tested against these criteria.

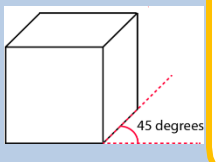
The 3D sketch of the bottles allows the viewer to imagine how they might feel in the hand, whereas the 2D version gives a technical profile that could be measured more accurately.

Design Fixation: Is a common condition for designers. It simply means that they become stuck in a rut and can only produce a range of similar designs, blinkered or blind to alternative ideas available.
Factors that can make design fixation worse include the fear of making mistakes, playing safe and not taking risks. Don't assume your first idea is best and allow enough time to explore other routes.
The most common strategies used to avoid design fixation are as follows:
>Work with others– use collaborative design techniques, even just having a quick exchange of ideas with another person can break the gridlock.
>Accept and understand the design fixation and force yourself to use a new starting point.
> Stop drawing and start making– model something in 3D from a chosen medium.
>Get some failures out the way– do not be afraid to get it wrong a few times and move on quickly. It is widely believed that the more you fail the better you become.

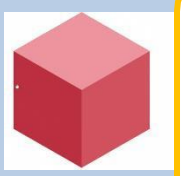
Iterative design: The iterative approach to designing is a flexible way of designing by working through ideas with sketches and notes and developing models when they are needed. It is a journey that could have a number of different starting points and outcomes.



The iterative approach gives the designer the freedom to follow an idea in the direction that feels best for that idea. The designer's tools of sketching, modelling, testing and evaluating may be used in any order as long as they support rather than hinder the flow of ideas.

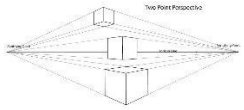


Oblique Drawing: Uses a 45-degree angle to draw lines that represent the depth of the side (end) and top (plan) of the drawing. The length of the line to represent the end is half of the measurement required; i.e. if the length should be 4cm the drawn length is 2cm.



Isometric Drawing: Uses a 30-degree angle and is much more realistic. For a basic cuboid, all of the height, width and depth lines follow the 30-degree isometric grid lines. Dimensioning can be done accurately and, by simple techniques, complex shapes can be constructed or carved out of a simple cuboid.

Prototypes: Prototype modelling can be constructed to test different elements of a design to help work out how viable it is likely to be. Modelling can involve creating a whole scaled up or down product or it may just be needed to help work through an important element of the design.



Two Point Perspective: Uses two **vanishing points** that are set to the outer edges of the page. The main construction lines create the width and depth are all projected back to the two vanishing points. Two point perspective gives the most realistic view as it emulates the way the viewers eye sees perspective, meaning that things get smaller the further away they are. It is a great technique to give a realistic view of what a product might look like.

Evaluation: When a prototype is completed it is still not ready for full scale production. It needs to be critically analysed, tested an devaluated to see what works well and what needs further improvement.

To make sure that your design becomes a high-quality prototype, you should follow this advice:
>**Satisfying the clients design brief:** Make sure that the clients needs and wants are fully addressed.
>**Innovation:** Imagination, creativity and innovation are three traits that are looked for throughout the design and development of a prototype or product. This doesn't always mean that a totally new concept or 'design' needs to be 'invented'
>**Functionality:** Make sure that a prototype performs its task effectively. Consider its performance under 'worst case scenario' situations.
>**Aesthetics:** The aim is to produce a prototype that looks good enough to sell. This means that throughout the iterative design process, clients' views will have been considered and acted upon.
> **Marketability:** A prototype is a preliminary version of a product; it should look good and be fully functioning. The proposed product should be aesthetically pleasing, functional and appeal to the target market.

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 patissier* - 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 legumier* - 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	**Plate:** Pre-plated meals from the kitchen. Can be a basic plated meal or a decorated nouveau cuisine style
	Family: Dishes are put on the table where spoons are provided and the customers swerve themselves. Suited to ethnic restaurants such as Indian, Chinese and Spanish tapas
	Silver: Food is served by the staff using spoon and fork
	Gueridon: 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
COUNTER SERIVCE	**Cafeteria:** A single long display counter but can sometimes be multiple counters
	Buffet: 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
	Fast Food: Takeaway with eat-in areas where customers collect food from one small counter
PERSONAL SERIVCE	**Tray or Trolley:** An assembled meal provided or a choice of food and drink from a trolley
	Vending: Sold from a machine
	Home Delivery: Delivered to house individually or on a round

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	Minimum Wage
Hotel manager	21-24 £7.70 p/h
Barmen/maids	18-20 £6.15 p/h
Supervisor	16-17 £4.35 p/h
Waiter/waitress	Under 19 £3.90 p/h
Housekeeper	
Chambermaid	
Receptionist	
Porter	
Concierge	

Permanent (Over 36hrs a week) 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	**Part time (4-36 hrs)** 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 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	**Casual** 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

LO1 The environment in which hospitality and catering providers operate

Ratings

Michelin guide
Anonymous inspectors visit establishments and have a meal and write a review of the establishment can award stars for excellence.

AA guide
Inspectors visit restaurants or hotels and write a review of the establishment -award rosettes for restaurants, stars for hotels.

Good food guide
Members of the general public who have visited the establishment fill in a review which is compiled into a guide. Award points for excellence .

Online and written reviews
There are a number of online review sites where anyone can post their reviews of an establishment. with a large number of reviews, a restaurant's average score is likely to be reasonably accurate

Success Factors

Economy
Do people have the spare money to spend on luxuries such as eating or staying out

Costs
Rent, stock, gas & electricity, council tax, staff wages, new equipment

Environment
3 R's, packaging, food waste, global warming, carbon footprint, clean eating

Cooking techniques
sous vide, clean eating, steaming, new restaurants

Competition
Other places nearby, prices, delivery companies, new restaurants

Technology
Delivery and stock control – touch screen customer ordering, systems, stock management, apps for delivery services

Political factors
Increasing regulations – from government due to health issues. Brexit, use of migrant labour, migrants – ethnic foods

Customer service
If people aren't happy they won't come back. They will also spread word.

Media
Social media, online reviews, newspaper/TV coverage, celebrity endorsement.

Trends
Keeping up with what is fashionable: vegan food, whole food, healthy fast food etc.

Key questions to check your learning for Learning Objective 1:

1. *Racap what makes a business successful e.g. social media, prices of food, customer service and the atmosphere of the restaurant*
2. *What are the different salaries for jobs in the H&C industry?*
3. *What are the different types of service available?*
4. *What is the difference between commercial and non commercial?*

Hospitality and Catering

Hospitality and Catering

Documentation

	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
Kitchen						
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

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


Sous Vide


Blender


Oven

LO2 Understand how hospitality and catering provisions operate


Hot plate


Bain Marie


Fryers


Blast Chiller

Customer needs

Local Residents	Business Customers	Leisure Customers
• Value for money • Good standard of customer service so they return • Catering for local needs (culture, religion) • Consistent dishes served • Loyalty schemes • Recognised by staff- feel welcome • Menu specials • Theme nights • OAP discount day • Child friendly • Entertainment • Mailing list or email for special offers	• Dedicated corporate (business) contact at establishment • Discounted rates • Meeting rooms • Water, juice on tables • Presentation equipment, projector, tv, • Office facilities- printer, phone, fax, internet,stationery • Tea and coffee for breaks • Lunch or other meals- buffet or restaurant • Accommodation if attendees are from a long distance • Quick service for lunch meetings	• Value for money • Good facilities • Families want child menus, play area, child friendly • Tourists want local food, easy to communicate • Older people may want more formal service • Good customer service • Varied choice of menu • Dietary needs eg allergies, intolerances, vegetarian catered for without having to ask for special foods • Facilities for physically impaired customers

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


POS Till Point


Grill


Perculator

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:
1. Chemicals including cleaning chemicals
2. Micro-organisms
3. Dusts
4. Medicines, pesticides, gases
5. HSE list (Health and safety executive)

Employees must:
1. Use control measures and facilities provided by the employer
2. Ensure equipment is returned and stored properly
3. Report defects in control measures
4. Wear and store personal protective equipment (PPE)
5. Removing PPE that could cause contamination before eating or drinking
6. Proper use of washing, showering facilities when required
7. Maintaining a high level of personal hygiene
8. 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 protectiv 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.

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 difuse 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.

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

1. *HASAWA*
2. *COSHH*
3. *RIDDOR*
4. *Manual handling operations*
5. *PPER*
6. *What is a risk assessment?*
7. *What are security hazards?*

Hospitality and Catering

LO4 Know how food can cause ill health.

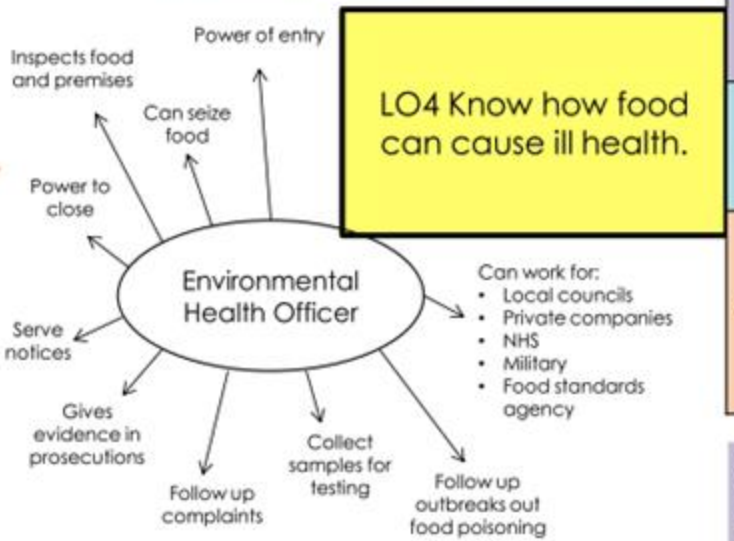
Allergies
A food allergy is a rapid and potentially serious response to a food by your immune system. It can trigger classic allergy symptoms such as a rash, wheezing and itching. Anaphylaxis is most commonly caused by food allergies, but can also be caused by other things, such as insect bites and drug 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

Coeliac 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



	Found In	Symptoms	Onset	Du
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?*