The Trafalgar School at Downton

Knowledge Organiser

Year 10: Terms 3 and 4

2024/2025

Contents

Name……House……

Being Trafalgar

At the end of your time at the school your knowledge organisers will provide you with lots of help and support when your prepare for your GCSE exams.

To help yourself you should:

- Keep your Knowledge Organisers as tidy as possible
- Highlight parts of them as you go through learning lessons or add in post-it notes etc. to help you learn key knowledge
- Keep your used Knowledge Organisers safe at home. If you have used them since Year 7 you will end up at the end of Year 11 with 14 Knowledge Organisers. Line them up on your shelf at home and keep coming back to them for your revision, homework and learning
- Show them to your parents and talk through with them the facts and knowledge you have learned about in lessons – help them to learn new things too!
- Take your Knowledge Organiser for the term you are in to school every day and use it in every lesson you can!

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.

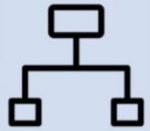
Why is a Knowledge Organiser important?
GCSE specifications require students to memorise more facts, equations, quotations and information than ever before and there are things you will learn right from the start of year 7 that you will need to know in year 11 when you sit your GCSE exams – the Knowledge 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.

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.

Here are some useful methods to use that will help commit the information to your long-term memory

The Trafalgar School AT DOWNTON

How to use a knowledge organiser – step by step guide

	Look, Cover, Write, Check	Definitions to Key Words	Flash Cards	Self Quizzing	Mind Maps	Paired Retrieval
Step 1	Look at and study a specific area of your knowledge organiser 	Write down the key words and definitions 	Use your knowledge organiser to condense and write down the facts and or information on flash cards 	Use your knowledge organiser to create a mini quiz. 	Create a mind map with all the information you can remember from your knowledge organiser. 	Ask a partner or family member to have the knowledge organiser in their hands, read out what you remember. 
Step 2	Cover or flip the knowledge organiser over and write down everything you remember. 	Try not to use your knowledge organiser to help you 	Add pictures to help support. Then quiz yourself using the flash cards. You can write questions on one side and answers on the other. 	Answer the questions and remember to use full sentences 	Check your knowledge organiser to see if there were any mistakes with the information you have made. 	They can test you by asking you questions on different sections of your knowledge organiser. 
Step 3	Check what you have written down. Correct any mistakes in green pen and add anything you missed. Repeat. 	Use a different coloured pen to check and correct your work. 	Use a parent/carer or friend to help quiz you on the knowledge. 	You can also use family to quiz you. Keep self-quizzing until you get all questions correct. 	Try to make connections that link information together. 	Write down your answers. 

Language Methods to Practise in your Fortnightly Writing Challenge and Examine in your Reading

alliteration:	the repetition of a consonant sound to begin a series of words.
anecdote:	a short story to prove a point e.g. a dad, talking to his children about the dangers of running in the house, a dad might include an anecdote about falling in his home as a boy and breaking his arm.
antithesis:	putting two opposite ideas together to highlight contrasts.
emotive language:	words and phrases that are used to make the reader feel a particular emotion.
extended metaphor:	a version of metaphor that extends over the course of multiple lines, paragraphs, or stanzas of prose or poetry.
foreshadowing:	the writer hints at an event that will happen later in his story/poem/play/writing.
imperative verbs:	instructional/command words that give the action the speaker/writer wants you to do.
metaphor:	like a simile, but instead of using 'like' or 'as' it compares two things by suggesting that something is something else.
modal verbs:	help show the level of possibility, ability, obligation or permission of the main verb/action e.g. might, can, must, may …
pathetic fallacy:	the projection of human emotions/mood onto non-human objects found in nature e.g. the weather.
sensory description:	employing the five senses in writing to evoke a mental image and/or sensation for the reader.
simile:	a comparison which finds similar characteristics in two objects and compares them, always by using the words 'like' or 'as'.
statistics:	factual data used in a persuasive way.
superlative:	an adjective or adverb that shows the highest or lowest degree of comparison e.g. best, worst, finest, most, etc.
onomatopoeia:	using words that sound like the noise they represent.
personification:	a type of figurative language that gives an object human characteristics (emotions, sensations, speech, physical movements).
rhetorical question:	a question asked for a purpose other than to obtain the information the question asks e.g. create a dramatic effect; emphasise a point; make you think about/eager to learn the answer.

The verb *lay* means to place something down (it requires an object to act upon):

I will *lay* the bone here.
I *laid* the bone down.
I'm *laying* all of my bones down here.

The verb *lie* indicates the act of reclining (something moving on its own or already in position):

I am going for a *lie* down.
I think I will *lay* down.
I have *lain* here all day.
I'm still *lying* in bed!

There is no such thing as should of, could of, would of, might of:

THE CORRECT EXPRESSIONS ARE

- "should've"
- "could've"
- "would've"
- "might've"

AND THEY ARE CONTRACTIONS OF

- "should have"
- "could have"
- "would have"
- "might have"

Fortnightly Writing Challenge Year 10

Use fronted adverbials:

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

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

Use a two and then three word sentence:

It hurt. I was dying!

Snow fell. Flakes floated precariously.

Use anaphora:

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

Use epiphora (epistrophe)

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

Use a range of sentence structures:

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

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

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

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

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

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

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

Use a tricolon (tripartite list):

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

Snap! Crackle! Pop! **(Rice Krispies slogan)**

Use a conditional sentence:

When people smoke cigarettes, their health suffers.

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

Use paired adjectives to describe a noun:

Take a look at this bright red spider.

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

Use anadiplosis (yoked sentence):

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

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

Use different sentence types:
The wind is blowing. **(declarative)**

Put your pen down. **(imperative)**

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

Pollution is killing us! **(exclamation)**

Use discourse markers to begin paragraphs and start/link some sentences:
First of all, To begin with, Firstly,

Therefore, Consequently, Hence, As a result,

Furthermore, In addition, Additionally, Moreover,

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

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

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

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

PUNCTUATION PIT STOP

Full Stop

Full stops are used to:

1) **mark the end of a sentence.**

Carefully, he kicked the ball into the goal.

2) show when a word has been abbreviated.

Saint Peter's Road is on the High Street.

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

COMMAS

Commas are used to separate:

1) items in a list .

Bert, Ernie and Elmo are my three pet rats.

2) dependent clauses and phrases.

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

Quotation Marks

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

'Don't be late!' shouted Mrs Smith.

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

Question Mark

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

What is your favourite food?

How do you feel today?

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

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

Exclamation Mark

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

Don't buy that car! Stop telling me what to do! I'm free! You're late! She actually won!

They're also used for most interjections:

'Hi! What's new?' 'Ouch! That hurt.'

'Oh! When are you going?'

Semi-colon

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

It was winter; the snow was falling heavily.

They can also be used to separate items in a list made of longer phrases. I have been to Newcastle, Carlisle, and York in the North; Bristol, Exeter, and Portsmouth in the South; and Cromer, Norwich, and Lincoln in the East.

Colon

Colons are used to:

1) **begin a list.**

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

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

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

Apostrophe

An apostrophe is used to show:

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

does not → doesn't I am →I'm

2) possession – when some thing/one owns something. Thankfully, they played Susan's game. Interestingly, David's house has no garden, but Susan's ~~house~~ does.

Dash –

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

Last year, they roasted the winning brisket — the size of a pillow — in a mighty clay oven. Paul felt hungry – more hungry than he'd ever been.

Brackets

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

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

Tigers are carnivores (meat eaters)!

Ellipsis ...

Ellipsis is used to:

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

I don't know … I'm not sure.

2) build tension or show that something is unfinished.

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

Writing the text for a Leaflet/Guide

Stay Safe and Sound Online — clear/apt/original title

Manage your online reputation — subtitles

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

Privacy Matters

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

effectively/fluently sequenced paragraphs

....

Remember:

- make sure you know how to block abusive comments and report worrying content;
- don't arrange to meet people in real life that you've only talked to online;
- use secure and legal sites to download music and games;
- when using the internet for homework, use information appropriately and explain things in your own words rather than copying.

bullet points

Text for a Speech/Talk

'Address to Nation on the Challenger' by Ronald Regan (28th January, 1986)

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

a clear address to an audience

...

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

rhetorical indicators that an audience is being addressed throughout

...

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

Thank you.

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

Writing Forms

Article

Andy Murray's Appliance of Science — clear/apt/original title

By Jim White — by-line

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

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

Sample Check — sub-headings

Today, before he even steps out on to the Centre Court for his Wimbledon semi-final against the huge-hitting Pole Jerzy Janowicz, Murray will [illegible] have been subject to several of these. He does [illegible] time he pops to the lavatory. The osmolality check is conducted by one of his staff, its purpose to gauge the percentage of water and minerals in his urine, to show whether his body is correctly hydrated. The fact is, if Murray wins [illegible] may be thanks to the bloke who inspects his wee.

introductory (overview) paragraph

fluently sequenced paragraphs

fluently sequenced paragraphs

Daily Diet

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

Writing to Review

clear, engaging title

Feeling Icy About Frozen?

effective introduction

Last weekend I **was forced to endure** a new DVD that has been added to **my little sister's** ever-growing Disney collection: Frozen 2. For those of you who have been living on a different planet for the last few years, the Frozen franchise is particularly big business for girls under the age of around 7 or 8.

At first, **I have to be honest**, I was pretty reluctant to watch it. The first version of Frozen followed the usual Disney drama of: boy meets girl, dramas occur, friends are made, and annoyingly catchy songs are sung. There were the conventional talking animals too and (**I have to admit it**), a cute little snowman. In hope of reacquainting myself with the humour of this cold, carrot-nosed cutie – **I gave up the fight**, and decided **I'd try to grin and bear it** through the sequel...!

use topic specific language

use your tone to make the reader feel like you are sharing personal information and advice.

Surprisingly, having sat through the whole of the movie, **I'm willing to confess**: it actually wasn't too bad. The music is slightly better than the first one. In Frozen 2, there are some instrumental versions of songs and the riffs are well pitched and engaging. This was a definite **positive for me**, although I was a little annoyed when **I started humming the tune** on the school bus yesterday morning!

...

effectively/fluently linked paragraphs to sequence a range of ideas (no room to produce the other paragraphs/conclusion here).

As for the characters... Elsa and Anna are still the leading ladies, with Sven, Olaf, and the talking reindeer, (whose name I can't actually remember). Elsa is still a little too overly heroic as she constantly runs off to try and fix things with the customary 'we know it's going to end badly' music tinkering away in the background...

Writing a formal letter

writer's address

35 Hibiscus Crescent
Andover
Hants
SP10 3WE

221B Bakers Street
London
NW1 6XE

reader's address

date

20th February, 2020

Dear Sir or Madam

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

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

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

fluently sequenced paragraphs

Furthermore, …

Yours faithfully
Boris Johnson

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

Writing a Report

Fundraising at Frecklewood

clear title

The Frecklewood Donkey Sanctuary is a charity that cares for rescued and unwanted donkeys. The sanctuary is based a mile away from Frecklewood Academy and the school has a long history of partnership, having sent many year 10 students there for work experience week. The charity is currently in need of funds, having seen a 12% dip in charitable giving during the past few years….

introductory paragraph outlining aims

Benefits of fundraising

subheadings

As part of this investigation we have spoken with school leaders at the five state secondary schools in the Dansfire area about the fundraising activities that they undertake. Collectively they raise funds for numerous causes, including Shelter (a charity that tackles homelessness), Stonewall (a charity that promotes equality for lesbian, gay, bi and trans people) and Young Dementia UK (who provide support for people whose lives are affected by young onset dementia).

…

Formal tone

One team leader said 'Some of our students have pursued careers in the charity sector as a result of their fundraising work at school.' …

Suggestions for activities

subheadings

As Frecklewood has a student …

clear conclusion addressing task and recommendations

Ultimately the benefits of fundraising events are huge. Whichever approach Frecklewood Academy takes, the charity, students and staff are all set to benefit.

Dystopian Narrative: *The Machine Stops* by E.M. Forster

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

"Kuno!"

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

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

His image faded.

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

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

Writing a Narrative: extract is from The Silent Land, by Graham Joyce.

It was snowing again. Gentle six-pointed flakes from a picture book were settling on her jacket sleeve. The mountain air prickled with ice and the smell of pine resin. Several hundred metres below lay the dark outline of Saint-Bernard-en-Haut, their Pyrenean resort village; across to the west, the irregular peaks of the mountain range.

…

If there are few moments in life that come as clear and as pure as ice, when the mountain breathed back at her, Zoe knew that she had trapped one such moment and that it could never be taken away. Everywhere was snow and silence. Snow and silence; the complete arrest of life; a rehearsal and a pre-echo of death. She pointed her skis down the hill. They looked like weird talons of brilliant red and gold in the powder snow as she waited, ready to swoop. I am alive. I am an eagle.

…

The noise itself filled her ears and muffled everything, and then there was silence, and the total whiteness faded to grey, and then to black!

Climax (turning point, height of action/problem at its worst):

- use exciting adverbs and verbs;
- accelerate pace and heighten tension using lots of shorter sentences.

Fail to Plan
Plan to Fail!

Rising Action (build towards conflict):

- build on character, setting, plot;
- introduce a complication/problem;
- build tension/ excitement;
- use interesting adjectives, sensory description, figurative language etc.

Freytag's Pyramid/ the Story Mountain is the best for planning narratives (stories).

Falling action (turning point, height of action/problem at its worst):

- what events happen to solve the problem?

Exposition (Introduction):

- use an opening hook to grab attention e.g. mysterious atmosphere, in medias res, etc.
- use descriptive vocabulary to set the scene and describe the main character/setting;
- foreshadow what is to come.

Dénouement/Resolution (ending):

- link back to the start (circular);
- what has the character learned?
- how are things different now?
- is there an exciting twist or cliff-hanger ending?

Conclusion: To conclude, repeat RQ, Quite simply, yes!

Yours Sincerely

Intro: My address right hand side, + date, school address left,
Dear Mr Cole
Should we consider discontinuing wearing a school uniform, you've asked? Quite simply, yes! Within this letter, you will find several arguments setting out precisely why we should make this change.

Counter reason: old-fashioned tradition, so easier to continue
Argument reason: other traditions - burnt witches, slept on straw, walked barefoot – now discontinued so …
Supporting example: anecdote, use experts

P1

Form: Letter
Audience: Headmaster
Purpose: Argue change uniform

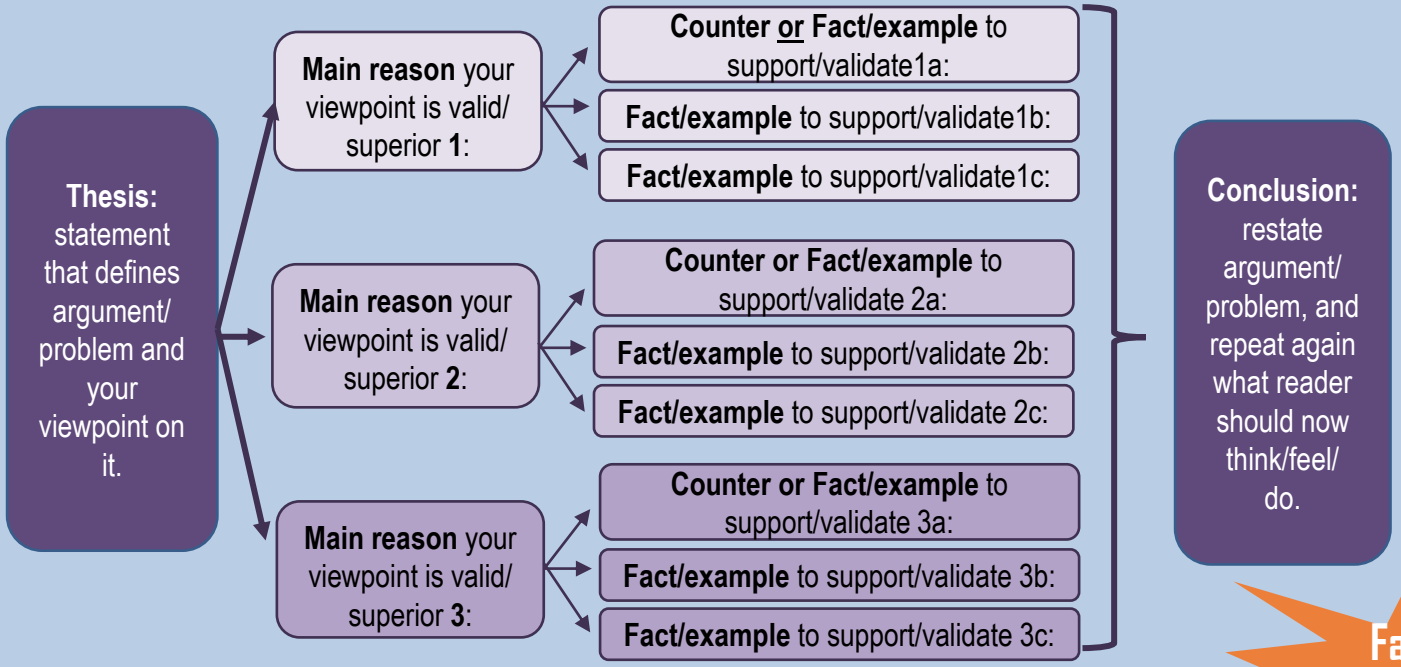
Counter reason: all look same so no prejudice/bullying over clothes,
Argument reason: no individualism, learning who we are
Supporting example: RQ +triple
Isn't part of our learning at school about learning how to dress appropriately, learning who we are, learning how to judge people on what is inside, not what wear?

P2

P3

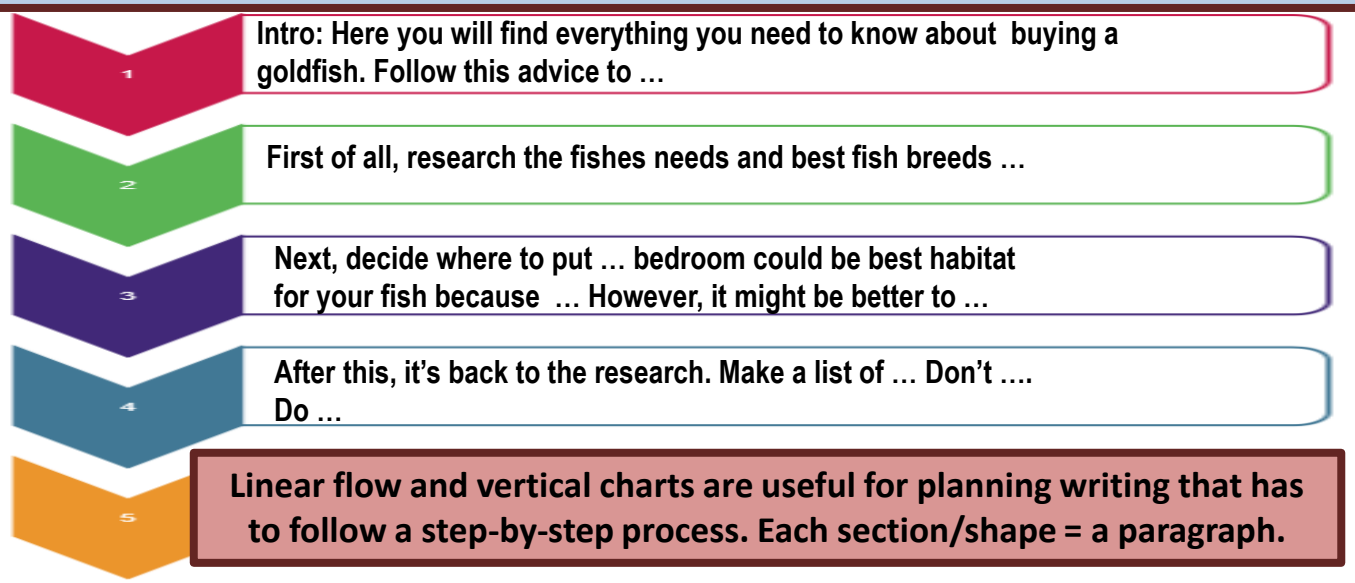
Counter reason: cost cheaper as not designer or from shops making huge profit
Argument reason: cost of blazers, trousers and skirts from school uni shop expensive as no competition, own clothes mix 'n' match so fewer outfits needed, wear weekends so more use,
Supporting example: emotive language: force poorer families to go without, statistics

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



Plan non-fiction writing (include a counter-argument for writing to argue) using a graphic organiser.

Fail to Plan
Plan to Fail!



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

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

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

Writing Purposes	Key Language/Structural methods	Chocolate Model!
Inform: tell the reader what they want/need to know.	➢ **Use interesting facts details;** ➢ **use brackets to explain technical terms.**	**Interestingly, chocolate** is actually made from the seeds of a cacao tree. After fermentation, the beans are dried, cleaned, and roasted. The shell is then removed to produce cacao nibs **(unadulterated chocolate in rough form).**
Explain: tell the reader how and why.	➢ **Use connectives: 'as a result', 'because', 'so that', when;** ➢ **use sequence discourse markers: Eventually, Another, Furthermore.**	**Often, when** in need of comfort or reassurance, or in stressful situations, people crave chocolate. Primarily, this is **because** dopamine is released into your brain **when** you eat chocolate, and **as a result** it can lower levels of anxiety ...
Describe: help the reader to picture it and imagine the experience.	➢ **Use similes, metaphors, personification, interesting adjectives/verbs, sensory description.**	**Enticingly,** the **dome** of **dark** chocolate**, flecked sporadically** with **lime slivers, remained encased** in its **fluted carapace. Around** the outside of it **cleaved** the **diminutive remains** of its **neighbour:** a **praline** long ago eaten**! Velvety smooth,** this **solitary bead** of **ganache glistened, revelling** in its **escape**, yet **mourning** its **rejection.**
Narrate: tell the reader a tale that will have them hanging on your every word.	➢ **Use the mountain/ pyramid structure;** ➢ **use some description;** ➢ **use a few lines of direct speech.**	**Suddenly**, she was aware she had arrived at her destination! On the door in front of her, a **scarlet square of shiny plastic printed** with the words 'Chocolate Laboratory' stood out on its **splintering wood**. **Why she was standing on this doorstep, though, and what, or who, had led her here in the first place?**
Persuade: try to get the reader to do as you ask/agree with you.	➢ **Use APE FOR REST: anecdote, personal pronouns, emotive language, fact, opinion, rhetorical questions, repetition, experts, statistics, triples.**	**One of** the **world's greatest comfort** foods, Chocolate, is **the unrivalled 'go-to'** when **life takes a bad turn**, an **easy gift** to **thrill** just about **everyone,** and a **tasty treat** that will **uplift even the most melancholy of moods.**
Argue: present two sides, but ensure your side appears strongest so reader agrees with you.	➢ **Use sequence discourse markers;** ➢ **use 'Some believe ..', 'However, most people would agree that';** ➢ **use APE FOR REST (above).**	**First of all, some believe that as chocolate** is high in calories, it is bad for you. **However, scientific experts have proven** that chocolate, as it contains high levels of antioxidants, could **lower cholesterol levels, improve mood and prevent memory decline**!
Advise: help warn and guide reader, but reassure with carefully considered advice.	➢ **Use imperative verbs (stop, do, don't, wait etc.), and modal verbs (if, could, might, should).** ➢ **use second person (you, your).**	**Most importantly, if you** are feeling bored and craving chocolate, **don't** give in to your yearning. Instead, **you could go** for a walk, **run** errands, **call** a friend or **read** a book. **If you** can take your mind off food for a short time, the craving **may** pass.

Most Often Mis~~s~~pelled words

acceptable	gauge
acquire	guarantee
anarchy	humorous
anguish	indispensable
apparent	languish
appearance	manoeuvre
bureaucracy	occasionally
committed	particularly
conscientious	plausible
contentious	queue
deceit	reference
embarrass	schedule
exhilarate	successful
fluorescent	separate
futile	unnecessary

Comparison: **Assessment Objective (A03):** *Compare writers' ideas and perspectives, as well as how these are conveyed, across two or more texts.*

Comparison questions test a reader's ability to:

- compare two texts
- consider the similarities and differences between the texts
- sustain a focus on the question and stated area for comparison.

Before answering:

1. This is the final reading question. Make sure you have left yourself enough **time**. Practise this!
2. Underline the key words in the question. You are likely to be asked to compare with a **specific** focus in mind – what is it?
3. Be sure that you understand the **focus** of the question.
4. Go through the different texts and highlight any evidence that you will use in your answer.
5. **Revisit** the question. Make sure your evidence and points will provide a clear answer to **focus**.

Useful compare and contrast connectives:

on the other hand
similarly
both
unlike
whereas
instead
however
conversely
like
yet
although
in contrast
likewise
as well as
alternatively
while

When writing your answer:

- be clear about which text you are referring to;
- support all points with evidence from the text;
- keep the **focus** of the question firmly in mind – reuse the words of the question to frame your answer if you need something to help you stay on track;
- keep an eye on your timing – this will be a higher tariff question so make sure you have left enough time for completion;
- you may not have the same amount to say about each text but make sure you try to give reasonably even consideration to both texts.

TOP TIP: Use the Question

1. Use the **bullet points**. These are deliberately given to help you. **Organise** your answer with these in mind.
2. The second bullet point tells you to look at **how** the writers get their ideas across. You must compare the ways the writers do this.

Checklist for improving your answer:

- Have you used evidence to support your answer?
- Have you responded to the focus of the question?
- Have you considered points from both texts?
- Have you made it clear which text you are referring to?

Some examples of previous comparison questions

Both of these texts are about **tightrope walkers crossing Niagara Falls**. Compare:

- **what** Blondin and Nik Wallenda **did** during their crossings of Niagara Falls;
- **how** the writers try to convey the **dangers** of crossing Niagara Falls. [10]

Both of these texts are about **volcanoes that have erupted**. Compare:

- **what** the writers **could see and hear** of the erupting volcanoes;
- **how** they get their experiences across to their readers. [10]

Both of these texts give an account **of a mining rescue**.
Compare:

- **what** the writers tell us about what happened on the **day** when the miners were rescued;
- **how** the writers try to show the **drama** of the **day** of the rescues. [10]

These questions are usually accompanied by an instruction such as:

You must use the text to support your comments and make it clear which text you are referring to.

This information is intended to help you so ensure you read it carefully.

Evaluation: **Assessment Objective (A04):** *Evaluate texts critically and support this with appropriate textual references.*

Evaluation questions test a reader's ability to:

- give considered personal judgement
- use the text wisely to support judgements given
- demonstrate clear focus on the question
- provide critical overview of what has been read.

Before answering:

1. Read the statement/view in the question carefully.
2. Underline the part of the statement/view that shows the **focus** of the question.
3. Think about whether you agree/partly agree/ disagree with the statement/view. You might find that you agree and disagree for different reasons.
4. Highlight the text to show which evidence you are going to use to support your opinions.
5. **Look again** at the question. Make sure your evidence and points will provide a clear focused answer.

Timing is key:

This question is worth **10 marks**.

You need to leave yourself around **15 minutes** to answer it.

Useful Sentence Openings and Key Vocabulary:

I agree/disagree with this view/statement... This is reinforced by...
To some extent... Furthermore...

This...
suggests... creates... demonstrates... uses... reiterates... reinforces... implies... indicates... convinces... highlights...

When writing your answer:

- keep the focus of the question firmly in mind – reuse the words of the question to show that your opinions are on task;
- make sure you are offering clear opinions in response to the statement/view given in the question and take a coherent stance;
- support all points with precisely chosen evidence from the text;
- track through the text to gain a clear range of evidence and help you to organise yourself in a coherent way;
- think about how the writer has shaped your opinion (what methods/techniques/ language have been used).

TOP TIP: Use evidence wisely

1. Any opinions you offer must be supported with evidence.
2. Avoid unsupported opinions or assertions – make your opinions relevant using what you have read to prove them.
3. Look at the text and pinpoint what it is that a writer says that makes you think as you do. Use that evidence to accompany your points.

Checklist for improving your answer:

- ☑ Have you responded to the focus of the question?
- ☑ Have you used specific and precise evidence to support your opinions?
- ☑ Have you made a range of points?
- ☑ Have you drawn upon evidence from the whole of the text?
- ☑ Have you given consideration to HOW the writer shaped your opinions?
- ☑ Have you given an overview statement to respond to the question?

Some examples of previous evaluation questions

Component 1: Q5

"The writer shows that life for immigrants such as the Hamiltons was very hard."
How far do you agree with this view?
You should write about:

- your thoughts and feelings about how the life of the Hamiltons is presented in the passage as a whole;
- how the writer has created these thoughts and feelings. [10]

"The writer uses the walk to Wreck Island to show a change in both Emma and Robbie."
How far do you agree with this view?
You should write about:

- your thoughts and feelings about how Emma and Robbie are presented in these lines and in the passage as a whole;
- how the writer has created these thoughts and feelings. [10]

"The writer presents Jonathan as a failure as a father and a husband."
How far do you agree with this view?
You should write about:

- your thoughts and feelings about Jonathan and how he is presented in these lines and in the passage as a whole;
- how the writer has created these thoughts and feelings. [10]

Component 2: Q4

"In the first three paragraphs of the account, the writer gives the impression that the accident was **so serious that the trapped miners would not be found alive**." How far do you agree with this statement?
You should comment on:

- what he says;
- how he says it. [10]

"In this extract, George Banks presents Blondin in **a very positive way**." How far do you agree with this view?
You should comment on:

- what he says;
- how he says it. [10]

"Pieter Sandrick gets across his feelings **of increasing terror really well**." How far do you agree with this statement?
You should comment on:

- what he says;
- how he says it. [10]

These questions are accompanied by the instruction:
You must use the text to support your comments.
This states you MUST use evidence to support your answer.

Non-fiction Writing:

Assessment Objectives:

AO5 Communicate clearly 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 Use a range of vocabulary and sentence structure for clarity, purpose and effect, with accurate spelling and punctuation.

Component 2 Exam facts:

- Two writing tasks
- 20 marks each
- 5 minutes to plan
- 25 minutes to write
- Write 300-400 words per task

Before Starting:

1. Read each task carefully (remember you *have to* do both).
2. Highlight the keywords in the task that suggest audience, content, purpose, style, structure and so on.
3. Try to step back from the task – sometimes you are asked to give your views – try to consider how you feel or what your immediate reaction is.
4. Use the planning time to form a clear plan.

Planning:

Why plan?

Planning helps you to capture your immediate reactions and views about a task.

- Planning allows you to jot down useful vocabulary.
- Planning allows you to consider the structure of your work.
- Planning will save you time in the long run.

Things to consider:

- The content of your writing – what angle will allow you to write in sufficient detail?
- Words, phrases and ideas that are suited to the topic and will enhance your writing.
- Structure – how will you present your work. Have you been asked for a specific structure (e.g. a formal letter)?
- Remember to write in full sentences and paragraphs.
- How will you begin your work, how will your ideas develop and how will you conclude your work?
- Once you have written down your ideas in a plan, remember to give some consideration to the order that you will write.

Work out in advance what kind of planning works best for you. Do you prefer to plan using a mind map, a spider diagram, a flow chart or a different style?

Top tips:

- Remember to use a range of appropriate and well selected details to develop and support your points
- Always leave enough time to proofread your work.

Examples of previous Component 2 Writing questions:

Write a lively article for your school/college magazine with the heading:
A Teenager's Guide to Managing Parents.

Write your article.

You have been asked to give a talk to your class with the title:
The person I'd most like to spend a day with.

Write down what you would say in your talk.

Write a review for a teenage magazine of a book, film or TV programme/series you have enjoyed in the last year and why it might appeal to others of your age.

Write your review.

Your headteacher has decided that there should not be an end of year celebration such as a school prom or party. The headteacher believes it would just be an excuse for students to show off in an expensive way.

Write a letter to your headteacher giving your opinions on this.

How will my work be marked?:

Your writing in both Component 1 and Component 2 is marked using very specific criteria. You are awarded marks for AO5 Communication and organisation and AO6 Vocabulary, sentence structure, spelling and punctuation.

In Component 2, AO5 is marked out of 12 and AO6 is marked out of 8. During your revision, you should have a look at the mark scheme that the examiners will use, this will help you to see exactly what they are looking for.

Remember, getting the basics (full stops and capital letters) is just as important as trying to include some more complex sentences. Aim to include an accurate range of sentence types and vocabulary.

Checklist for improving your writing:

- ☑ Have you planned your work carefully?
- ☑ Have you included sufficient detail?
- ☑ Have you considered the language you use?
- ☑ Have you structured your work carefully?
- ☑ Have you varied your punctuation for effect?
- ☑ Have you proof-read your work for errors?

Retrieval of explicit and implicit information:

Assessment Objective (A01 Strand 1): *Identify and interpret explicit and implicit information and ideas.*

Information retrieval questions test a reader's ability to:

- identify the explicit information or ideas needed to answer the question
- isolate key details
- interpret the meaning of implicit ideas and information
- clearly refer to evidence in the text.

Before answering:

1. Make sure you are looking at the **correct** text and the **right** part of the text.
2. Be aware of how many marks the question is worth. E.g. if it is a 5-mark question you will probably be asked for 5 details.
3. Read the question **at least twice** to make sure you know exactly what you are looking for.
4. Use skimming and scanning techniques to find the detail(s) you need quickly.
5. Think about how much time you should dedicate to the question – don't be tempted to spend too long on this question and reduce the time you have available elsewhere.

When writing your answer:

- double check that you have read and understood the question and the instructions at the start of the question;
- identify relevant words or phrases from the text to answer the question – be specific.
- your answer may be brief but make sure you have provided enough detail to answer the question;
- track through the section of the text carefully – reading chronologically will help to make sure you don't miss anything.

Bullet points are fine for information retrieval questions but make sure your answer makes sense!

Skimming

This is when you do not read every word but try to take in the overall meaning of a piece of writing by moving your eyes throughout the text. Headings and opening sentences are useful for directing this technique...

Scanning

This is useful if you are looking for a particular word or piece of information. For example, in the second C2 Q1 example below you could begin by scanning the text for the word 'crater'.

Checklist for improving your answer:

- Have you answered the question?
- Have you retrieved sufficient information?
- Have you checked that you copied the information down correctly?
- Have you checked how many marks the question is worth?

TOP TIPS:

1. Use **short** relevant quotations.
2. **Check** the details of the question carefully.
3. If you are told to look at **specific lines** use your pen and **mark them** off on the exam paper so that you don't lose focus.

Some examples of previous information retrieval questions:

Component 1: Q1

Read lines 1-6.

List **five** things you learn about Emma in these lines. [5]

List **five** things you learn about Jonathan in lines 1–17. [5]

Read lines 1-16.

List **five** things you learn about Brian Faulkner in these lines. [5]

Component 2: Q1

Read the newspaper article 'Miners Rescued from Chilean Mine' in the separate Resource Material.

a. What was the nickname of the rescue capsule? [1]
b. How did the miners let the rescuers know they were still alive? [1]
c. Where were the men taken once they had been brought to the surface? [1]

Read the newspaper article 'Iceland's erupting volcano' in the separate Resource Material

a. When did the Eyjakull volcano last erupt? [1]
b. How close did Tom Robbins get to the crater of Eyjakull? [1]
c. How wide is the crater of Katia? [1]

Read the newspaper article 'Inside America's Toughest Prison' in the separate Resource Material.

a. Give one example from the article of how the worst prisoners were punished in the past? [1]
b. At the time the article was written, how many prisoners were in Florence Prison? [1]
c. Give one example of the privileges that prisoners may earn for good behaviour? [1]

Component 2: Q3

To answer the following questions you will need to read the account in 'The Penny Review' magazine.

a. What caused the coal mine to collapse? [1]
b. What detail does the writer give that shows the rescue attempt never slowed or stopped? [1]
c. What gave the rescuers hope that the miners were still alive? [1]

To answer the following questions you will need to read Pieter Sandrick's account of the Krakatoa volcano explosion on the opposite page.

a. On which day of the week did the Krakatoa volcano start to erupt? [1]
b. How far away was Krakatoa from the town of Anjer? [1]
c. How did Pieter Sandrick survive when the 'wall of water' hit the coast? [1]

To answer the following questions you will need to read the extract on the opposite page by Charles Dickens.

a. When Charles Dickens visited the Eastern Penitentiary prison, what did he describe as awful? [1]
b. Give two details from the text that suggest prisoners are in the Eastern Penitentiary prison for a long time. [2]

Synthesising information:

Assessment Objective (A01):

Select and synthesise evidence from different texts.

This question will be found in your Component 2 examination.

Synthesis questions aim to test a reader's ability to:

- show their understanding of key information, themes or ideas
- effectively collate key details from two texts
- identify common areas/ themes or ideas across two texts.

Before answering:

1. Read the question carefully. It is vital that you understand what you are being asked to synthesise.
2. Think about the focus of the question by stepping back from the texts. Try to get a clear understanding of the texts and task before you start to write.
3. Underline a couple of relevant key words from each text as these will help you to remain focused.

Definition:

Synthesis is the skill of bringing together materials from more than one text to create new material. The skill of summary is useful here as it encourages a brief and focused response.

When synthesising two texts:

consider the following:

- Re-read the question.
- Look at the words or phrases you have highlighted.
- Consider how you will collate the ideas from across both texts (do any of the points link up or are the points all different?) How will you present your response?
- Always refer to both texts in your responses or you will *only* be awarded a mark in Band 1.
- Check the mark tariff – this question is worth 4 marks and will only need 4 brief points.

Examples of previous synthesis questions:

The following questions all had the following introduction:
To answer the following questions, you must use both texts.

Using information from both texts, explain briefly in your own words what happened when news of the mining accidents became known. [4]

Using information from both texts, explain briefly in your own words what happened as a result of the volcanoes erupting in Anjer and Iceland. [4]

Using information from both texts, explain briefly in your own words, how the spectators reacted to Blondin and Wallenda. [4]

Using information from both texts, explain briefly in your own words how whales were hunted in 1850 and are now hunted in the Faroe Islands. [4]

TOP TIP: things you NEVER do in a synthesis response:

- **Never** give extra details or reasons, a synthesis does not require you to include these.
- **Never** try to expand on the details you have been given from the text. This should be a brief and focused answer.
- Quotation is acceptable but you should **never** copy large, unselective chunks directly from the text.
- **Never** spend much more than around 5 minutes on this type of question.

Checklist for improving your answers:

- A synthesis checks understanding – is your answer clear?
- Does your synthesis response reflect the focus of the question?
- Have you included sufficient different points to access ALL marks?
- While there is no preferred style when completing a synthesis, most candidates perform best when dealing with one text at a time.
- Have you made it clear which text you are referring to?

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
The Manhunt	Explores the physical and mental effects of living with war injuries. The wife is searching for the husband she used to know so well.	Images of broken body parts (grazed heart, broken ribs) and of delicate materials (porcelain, silk) suggest the vulnerability of the soldier. 'Foetus of metal' and 'unexploded mine' are metaphors for his permanent scarring.	Initially the couplets rhyme. The rhyme breaks down to reflect the relationship breaking down. Enjambment also reflects the fractures in the relationship between the soldier and his wife.	The poem was inspired by a soldier who suffered Post Traumatic Stress Disorder after being shot in Bosnia. The writer is raising awareness and sympathy towards this condition.	War, Relationships, Love, Suffering
Sonnet 43	The poet expresses her intense love for Robert Browning. She attempts to define her love. The poem feels like an intimate conversation between the lovers.	Comparisons to show her love is comprehensive 'depth, breadth' Replaced faith in god with love for husband 'lost saints' Ending 'I love thee better after death' suggests love is eternal	A sonnet is a traditional form often used to express love. This is not a perfect rhyming sonnet to reflect the relationship is unconventional. The repetition 'I love thee' almost sounds like a prayer.	The poet rebelled against her over-protective father to marry Robert Browning showing how important love was to her.	Love, Relationships, Death
London	The narrator is describing a walk around London and how he is saddened by the sights and sounds of poverty and the abuse of power by the rich. He also expresses disappointment at the passive acceptance of the masses towards the government.	Criticises the powerful: 'chartered street' and how they oppress the poor/ 'Mind-forged manacles': metaphor to show they are trapped in poverty. Rhetorical devices are used to persuade: repetition ('In every..'); emotive language ('infant's cry of fear').	A dramatic monologue. Narrator observes what he sees. Simple ABAB rhyme scheme: reflects the unrelenting misery of the city, and perhaps the rhythm of his feet as he trudges around the city.	Published in 1794 in a time of great poverty in London. Blake believed in social and racial equality. He also questioned the teachings of the Church and the decisions of Government.	Loss, Abuse of Power, Injustice, Anger, London

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
The Soldier	This patriotic love poem to England glorifies dying for your country and praises England for its beauty. Others could argue the tone is mawkish and that it uses propaganda to simplify the issue of war.	Nature imagery suggests the beauty of England 'suns of home' Religious imagery suggests death brings peace 'under an English heaven'. Acceptance he may die 'If I should die'.	Traditional sonnet form used to express his love for his country.	The poet was a soldier during WW1 who died of sepsis and was buried in a 'foreign field' in Greece. He was known for his idealistic sonnets.	Impact of War, Pride, Patriotism
She walks in beauty	A poem celebrating female beauty. The speaker describes both her external appearance and her inner goodness. She almost seems to be unobtainable so we may sympathise with the poet's sense of longing.	Simile to compare woman's beauty to nature 'like the night'. 'raven' suggests danger is alluring Contrast of 'dark' and 'bright' imagery to show woman is romantic, mysterious and balanced.	Simple and regular ABABAB structure reflects the woman's perfection. Enjambment suggests the poet's eagerness to describe her beauty.	Byron was a Romantic who believed in the power of nature and liked to break conventions. He was known for his relationships with different women.	Relationships , Love, Light and Dark
Living Space	The poem describes slums in India where living spaces are created out of found materials. The poet is celebrating the continued existence of these living spaces as a miracle to be admired.	Irony of title as there isn't space 'crookedly, leans dangerously' suggest the place is unsafe Image of 'eggs' suggests fragility 'thin walls of faith' suggests it is a miracle these places exist	Enjambment reflects how the structures lean over each other. The poem begins with sarcasm towards the negative views of slums. However the tone changes and ends with admiration for those who live in the slums.	Born in Pakistan but raised in Scotland, the poet has an interest in representing different cultures.	Love, Relationships , Living Conditions
As imperceptibly as grief	This poem is about the poet's fear of death and the feeling that she is being tricked by time passing away. It also speaks of happiness disappearing.	'imperceptibly' suggests no-one noticed her pain 'Perfidy' suggests she feels tricked 'Twilight' suggests she feels trapped between dark and light 'dusk' suggests darkness is drawing closer	Dashes are used to create a hesitant and disjointed pace reflecting her fractured state of mind. The poem ends positively with the word 'beautiful' to suggest she is ready to move to heaven.	The poet was a recluse who did not leave the house very often. This poem was written after several friends and family member had died.	Death, Time Passing, Nature, Light and Dark

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
Cozy Apologia	Waiting for a storm to hit allows the speaker time to reflect on her relationship with her husband. The title suggests she is defending her relationship from those who claim it is boring.	Cliched image 'chain mail glinting' creates affectionate tone 'lamp' could suggest he is the happiness in her life 'stolen time' suggests she is grateful to have time to sit and think	First person. Regular rhyme scheme breaks up in Stanza 2 to reflect the disruption of the oncoming storm. Enjambment reflects a thoughtful and relaxed voice.	The poem is set against the arrival of Hurricane Floyd which hit USA in 1999. The poet is married to the 'Fred' mentioned in the poem.	Relationships, Love
Valentine	The poet is searching for a more meaningful way to express love and explores why an onion is a more powerful and realistic gift of love than clichéd gifts such as red roses.	The onion metaphor has many layers to show the complexity of love 'Promises light' = truth, hope, 'moon' = romance 'cling, possessive' = controlling; 'fierce kiss, lethal' = violent	Unpredictable structure with unequal lines and stanzas reflect how unpredictable relationships are. Tone starts off positive but becomes negative later in the poem.	Duffy's likes to break conventions and criticise the materialistic view of Valentine's Day. She is also known for a feminist approach.	Love, Relationships, Violence
A Wife in London	A wife is waiting at home for news of her husband who is fighting in South Africa. The fact the poem is in two halves could suggest how her life is destroyed by the tragic news he has 'fallen'.	'fallen' is a euphemism to soften harsh reality of his death Pathetic fallacy 'fog hangs thicker' shows her grief is settling in Irony 'new love that they would learn' heightens tragedy because he was looking forward to returning	Structured in two halves 'The Tragedy' and 'The Irony' like chapters in a tragic story. Present tense gives sense of immediacy. Clear rhyme scheme creates sense the tragedy was inevitable.	The poem was related to The Boer War but the fact she is a 'a' wife universalises the poem so it can reflect how many lives were lost during many wars.	War, Relationships, Death, London
Death of a Naturalist	: A child sees nature up-close with a sense their intrigue and excitement. Then the speaker sees the darker side of nature and feels threatened and frightened. The 'death' is a metaphorical death of the child's innocence.	Onomatopoeia 'bubbled gargled delicately' shows calmness Personification 'punishing sun' suggests summer is harsh Simile 'poised like mud grenades' suggests violence of nature	Stanza 1 is enthusiastic for nature. Stanza 2 is more negative as he becomes more aware of the dangers in the world. Enjambment creates	Poets brother died aged 4. As a result, his poems often deal with a loss of innocence. Heaney grew up on a farm and many of his poems explore the theme of nature.	Loss of Innocence, Childhood, Passing of Time

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
Hawk Roosting	The hawk is a bird of prey, known for its intelligence and incredibly sharp eyesight. Metaphorically it is about politicians being hawk-like, which means being aggressive towards other countries.	Language suggests arrogance 'I hold creation in my foot'. Hawk is god-like 'it is all mine' Power of hawk to control nature 'I am going to keep things like this' 'roosting' suggests meditation.	This poem has a strong, regular form to reflect the strength and control of the hawk. Stanzas: 1-2 – hawk's physical superiority, 3-4 – power over nature, 5-6 – Justification for his actions	The portrait of the hawk links to ideas of Nazism and Fascism at the time Hughes was writing. Hughes often explored the power of nature.	Power, Nature,
To Autumn	The speaker in the poem seems to be an observer actually addressing the season as if it were a person. The poet is celebrating the season and the changes that take place.	Mellow fruitfulness' = calmness. Personification 'Thee sitting careless' =autumn is thoughtless. 'fume of poppies' = autumn is intoxicating. Last line 'gathering swallows twitter' could suggest the circle of life	**Stanza 1**: Autumn and the sun are like best friends plotting how to make fruit grow **Stanza 2:** He describes the period after the harvest, when autumn just hangs out around **Stanza 3** The music of spring is a distant memory, but autumn's music is a symphony	Keats was a Romantic poet who wrote about nature and the natural world. He died aged 25 and was worried he would leave no lasting impression on the world – this poem could be his attempt to be remembered.	Nature, Ripeness, Time Passing
Afternoons	It is about the end of youth and the onset of middle-age. The poet observes a group of mothers 'setting free' their children at a playground. The setting of autumn matches the theme of loss.	"Summer is fading" immediately evokes a sense of loss 'Their beauty has thickened' suggests aging and passing of time "Something is pushing them / To the side of their own lives". They have now become spectators in life.	The poem is set out in three unrhymed stanzas of eight lines each. The repetitive structure reflects the dullness of their lives.	The poem was written in the 1950s – a time of austerity and rationing in Britain. Larkin's poem is timeless as it reflects the unsatisfactoriness of all our lives after youth has gone.	Loss, Passing of Time, Motherhood, Youth

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
Dulce et Decorum Est	The terrible consequences of a gas attack to present the unglamorous reality of trench life.	Similes show fatigue 'coughing like hags' 'like old beggars'. Verbs show panic 'yelling, stumbling, drowning' Gruesome imagery shows horror of war 'obscene as cancer'	Slow pace in Stanza 1 reflects the exhaustion of the soldiers. Tone speeds up in Stanza 2 to reflect the panic after the gas attack Pace slows again in the final stanza to reflect the feeling that war is never ending. ABAB rhyme scheme gives form to chaotic events.	The poet was killed in action in 1918 one week before the end of the WW1. He wanted to expose the true horrors of war and was critical of those who recruited young lads to join the war.	Impact of war, Patriotism, Death
Ozymandias	A decayed statue of a once powerful leader is found in the desert. It serves to highlight how human power is temporary and cannot escape the power of nature. The poet appears to be mocking the arrogance of Ozymandias.	'Sneer of cold command' shows arrogance of Ozymandias. Oxymoron 'Colossal wreck' shows the great statue is now decayed. Irony 'Look on my works… and despair' as the statue is now ruined.	The sonnet rhyme scheme is irregular, perhaps symbolic of the broken statue itself, no longer perfect.	Shelley was a romantic poet who believed in the power of nature. He disliked the oppression of ordinary people by powerful rules. It acts as a warning to anyone who thinks they are immortal that power won't last.	Power, Nature, Decay, Pride
Mametz Wood	Buried soldiers from WW1 are rediscovered by farmers which forces us to commemorate their deaths. Unearthing the soldiers has given them a voice.	Imagery evokes horror of war 'socketed heads tilted back'. 'china plate, mosaic of bone' suggests fragility and vulnerability 'their absent tongues' suggests soldiers have finally found a voice after being forgotten for so long.	Regular 3 line stanzas reflect the regular pattern of the ploughed field. At times the regular rhythm breaks to reflect the 'chits of bone' rising out of the ground and disrupting attempts to forget the past.	The Battle of the Somme was one of the bloodiest battles in WW1. The 38th Welsh Division lost 4,000 men. The Welsh poet wanted their bravery to be acknowledged. The writer's purpose is to highlight this issue.	Impact of war, Patriotism, Fragility of Life

EDUQAS	MAIN IDEAS	LANGUAGE	STRUCTURE	CONTEXT	THEMES
Prelude	Describes children's joy as they skate on a frosty day. The poet looks back on his childhood experiences with an appreciation of the beauty of nature.	Verbs show rapid movement and enjoyment: 'wheel'd, hiss'd, flew' Contrast of warm and cold imagery: 'frosty' versus 'blaz'd, sun' and sound imagery 'bellowing' versus 'alien sound of melancholy' to mark the shift from childhood joy to adult understanding.	Regular rhythm gives effect of natural speech. Caesura and enjambment help to convey the poet's excitement.	Wordsworth was a Romantic poet who explored thoughts about childhood and intense feelings of delight caused by nature.	Nature, Passing of Time, Childhood

POETRY DEVICES – FORM	
Auto-biographical	About the poet
Ballad	Story poems– often 4 lines stanzas
Blank verse	Verse with no rhyme – usually 10 syllables
Dramatic monologue	A character speaks to the reader
Epic	Tragic/heroic story poems
Free verse	No regular rhyme/rhythm
Lyrical	Emotional and beautiful
Narrative	**A story**
Ode	Lyrical poem often addressed to one person
Phonetic spelling	Written like it sounds
Sonnet	14 lines, ababcdcdefefgg, Often love poem

POETRY DEVICES – STRUCTURE (DEVICES IN BOLD = PASS. OTHER DEVICES WILL SET YOU ON THE PATH FOR A STRONGER PASS)	
Chronological	**In order of time**
Caesura	A big break in the middle of a line
Enjambment	**A sentence runs over more than one line**
Iambic pentameter	5 sets of weak/strong beats in a line
Juxtaposition	Two opposites
Layout	Position of lines/words on the page
Anaphora	Repeated first few words at start of lines
Oxymoron	Two opposite words next to each other
Rhyme scheme	The organisation of the rhyme
Rhyming couplet	Two lines that rhyme next to each other
Rhythm	The beat
Stanza/Verse	A paragraph in a poem
Volta	The turning point of a poem
Repetition	**Something repeated**

Sequences

A sequence is a series of numbers (or pictures) that follows a pattern or rule.

Each number or item in a sequence is called a **term**.

Term-to-Term rule – the "rule" that gets you from one number in a sequence to the next.

Position-to-Term – the "rule" that enables you to calculate the **value** of a term **at any given position** or place in the sequence. It is sometimes called the **general rule** or, most commonly, the **n^{th} term** rule.

"n" is the **position of a term** in the sequence it must **ALWAYS** be an **integer**

Types of sequence:

Sparx Maths: GCSE U213,U206, U680, U958

There are different types of sequence each of which is identified by how their pattern continues:

- **Linear (or arithmetic) sequences**
- **Quadratic sequences**
- **Geometric sequences**

Common special sequences include:

Fibonacci – type sequences

Sequence of **Squares** (quadratic)

Sequence of **triangular numbers** (quadratic)

Examples:

Linear 2, 4, 6, 8, 10, 12, 14

Quadratic 1, 4, 9, 16, 25, 36

Geometric 2, 6, 18, 54, 162

Fibonacci 1, 1, 2, 3, 5, 8, 13, 21, 34, 55

LINEAR /ARITHMETIC SEQUENCE

Key property: linear sequences increase or decrease by the same amount each term.
So to get from one term to the next you will **add or subtract the same amount.**
All the multiplication times-tables are linear sequences.

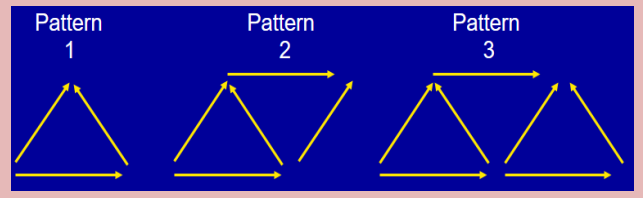
To find nth term rule of a linear sequence:

1) Find the **common difference** ("**d**") – the same amount added or subtracted each time.
2) This is the base times-table – so the nth term rule will include "**dn**"
3) Adjust to the sequence you want: what do you need to add or subtract from **1d** to get the starting number?

eg **3, 5, 7, 9** => adjustment 1x2 = 2 so must +1 => **2n + 1** and **7, 5, 3, 1** => adjustment 1x(-2) = -2 so must +9 => **-2n + 9 (or 9 -2n)**

UNDERSTANDING PICTURE PATTERNS

Reduce a picture pattern to numbers
– use a table of values to help you e.g.



Pattern Number (n=…	1	2	3	4
Total arrows (Sequence=…	3	5	7	?!
nth term rule => 2n + 1				

USING THE Nth term RULE

What is the difference between the 6th and 8th term of the sequence 5n -2?

Remember: for linear sequences (**d**) (difference) is always the same:– here **d=5** as sequence is based on the 5x table.
There are two "jumps" from 6th to 8th term so difference between their values will be **2x5 = 10**

A sequence has a rule: 5n -2
Is the term 72 in the sequence?

Remember: for **any** sequence "**n**" represents a term's position and **MUST be an integer**.
Form and solve an equation ie.:
Here n is **not an integer** so 72 is **not a term**

5n-2 = 72 (+2)
5n = 74 (÷5)
n = 14.8

QUADRATIC SEQUENCES

Key property: quadratic sequences increase or decrease by a different amount each term – but the difference between the differences is always the same….so to get from one term to the next you will **add or subtract the previous difference plus a same extra amount** each time.

The "base" quadratic sequence is the sequence of square numbers: 1, 4, 9, 16…..

Sparx Maths: GCSE U206, U530

To find nth term rule of a linear sequence:

1) Find 1st and then 2nd differences between the terms
   - **if the 2nd difference is the same the sequence is quadratic and rule will include n^2**
3) Half the 2nd difference to get coefficient (number) of n^2
4) Subtract each term of the new n^2 sequence from the original
5) Find the nth term rule of the adjustment
6) Combine both elements for final rule

Example: **Foundation**

Find the nth term rule of the sequence: 2, 5, 10, 17 26…..

Original	2	5	10	17	26
1st difference	+3	+5	+7	+9	
2nd difference		+2	+2	+2	
2nd difference is same so sequence is quadratic (n^2) Half of second difference is 1: rule must include $1n^2$					
n^2	1	4	9	16	25
Adjustment (Original – new)	+1	+1	+1	+1	+1

The nth term of the original sequence must be $n^2 + 1$

Example: **Foundation / Higher Crossover**

Find the nth term rule of the sequence: 0, 6, 16, 30, 48….

Original	0	6	16	30	48
1st difference	+6	+10	+14	+18	
2nd difference		+4	+4	+4	
2nd difference is same so sequence is quadratic (n^2) Half of second difference is 1: rule must include $2n^2$					
$2n^2$	2	8	18	32	50
Adjustment (Original – new)	-2	-2	-2	-2	-2

The nth term of the original sequence must be $2n^2 - 2$

Example: **Higher**

Find the nth term rule of the sequence: 0, 6, 16, 30, 48….

Find the nth term rule for this adjustment as for any linear sequence: 3n - 1

Original	3	9	17	27	39
1st difference	+6	+8	+10	+12	
2nd difference		+2	+2	+2	
2nd difference is same so sequence is quadratic (n^2) Half of second difference is 1: rule must include $1n^2$					
$1n^2$	1	4	9	16	25
Adjustment (Original – new)	+2	+5	+8	+11	+14

The nth term of the original sequence must be $n^2 + 3n - 1$

GEOMETRIC SEQUENCES

Sparx Maths: GCSE U958

Key property: geometric sequences increase or decrease by the scale factor each term

So to get from one term to the next you will **multiply (or divide) by the same amount.**

This value is called the **common ratio** and found by dividing one term by the term before

$ar^{(n-1)}$ is the general rule of **all** geometric sequences

Where **a** is value of the first term of the sequence

r is the common ratio between each term

and **n** is (as ever) the position of a term

As such geometric sequence growth is **exponential**

To find nth term rule of a geometric sequence:

1) Identify the first term
2) Find common ratio between terms **- divide the value of a term by term before.**
3) Substitute into the general form $ar^{(n-1)}$ **- simplify as needed**

Understanding the nth term rule:

Example: Starting at 1 create a sequence where each term is 3 times more than the last:

Position (n = …	**1**	**2**	**3**	**4**	**5**
Starting term (a =	1				
Common ratio (r =	x3	x3	x3	x3	
Sequence:	1	3	9	27	81

So to calculate the 5th term, you would have to start with 1 then multiply by 3 4 times in total i.e.$1x3^4$… and whatever term you want to calculate you need to apply the "r" 1 less times than its position i.e. $1 \times 3^{(n-1)}$

FIBONACCI-style SEQUENCES

Sparx Maths: GCSE U680

Key property: add the previous 2 terms to get the next term.

The classic Fibonacci sequence is 1, 1, 2 ,3, 5, 8, 13, 21 ….. i.e. 1, 1, (1+1=2), (2+1=3), (3+2=5), etc

Fibonacci-style sequences are based on this term-to-term rule but may start at different points:

e.g. starting at 4,5 ⇨ 4, 5, 9, 14, 23, 37 ….

So for any starting point a and b ⇨ a, b, (a+b), (a+2b), (2a+3b), (3a+5b), etc…

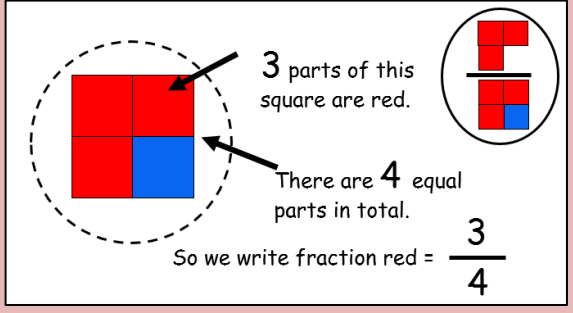
Year 10 Maths Term 3 & 4 – Ratio, Proportion and Proportionality

What do I need to be able to do?

- Use fractions and percentages to describe a proportion of an amount
- Calculate percentage increases and decreases using multiplication
- Solve problems involving percentage change including repeated proportional change
- Find the original value of a quantity after a percentage increase or decrease
- Set up solve and interpret growth and decay problems including compound interest
- Divide a quantity in a given ratio and reduce a ratio to its simplest form
- Calculate unit ratios and recognise scale factors and maps scales as a unit ratio
- Understand direct proportion in "real life" scenarios such as recipes, best buys, maps scales and compound measures and use proportionality to solve problems
- Use scale factor to convert between lengths on maps and scale diagrams and distances they represent
- Use, calculate convert between standard units of measure and compound units
- Solve direct and indirect proportion problems
- Describe direct and indirect proportion relationships using equations
- Recognise graphs showing direct and indirect proportion

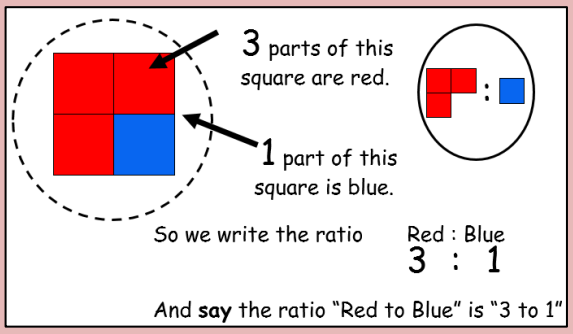
Key terms:

Proportion: a proportion of an amount can be expressed as a **fraction**, **decimal** or **percentage**. A proportion compares the parts into which an object is divided with total parts ie the whole

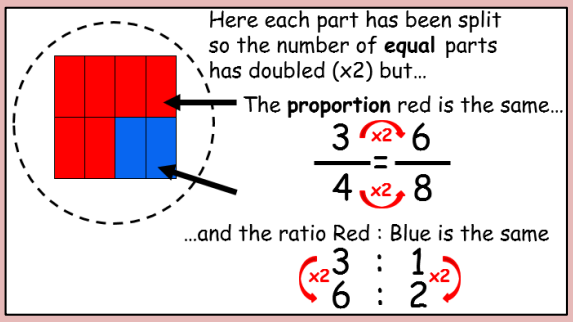


Previous learning: Year 9 KO Term 1&2 Fractions decimals and percentages

Ratio: a ratio shows the relationship between the **parts** into which an object has been divided.
A ratio compares **part to part** (note: ratios are written with a colon (part : part) which is said as the "to")
Since the ratio only gives information about the relationship between the parts, the total number of equal parts can be calculated by adding these parts together.



Proportionality – pairs of values are **in proportion** if the **multiplicative relationship** between them is the same.
Multiplicative relationships are only the same if **all elements have been multiplied by the same factor.** (Scale factors are most correctly given as a **multiplier** but as multiplying and dividing are inverse operations, dividing by the same number will also mean values are in proportion)
Equivalent fractions and ratios can be calculated like this.



Direct Proportion Two sets of values are in direct proportion when they **increase (or decrease) by the same ratio (multiplier)**. Direct proportion relationships are commonly used in every day life – for instance calculating the cost of buying multiple single items; scaling up a recipe, calculating distances from maps scales; and using compound measures

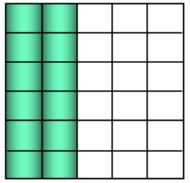
Indirect or Inverse Proportion Two sets of values are in indirect proportion if as **one increases, the other decreases** by the opposite proportion so if 2 people build a wall in 5 days, it will take 4 people 2½ days (double workers half the time) but 1 person 10 days (half workers double time)

Express a quantity as a proportion of another

Key fact: fractions show part "out of" a whole – so start by rewriting any quantity comparison as a fraction…

Sparx GCSE U163

Example 1: What proportion of this diagram is shaded?



Give your answer as a percentage

Answer $\frac{12}{30} = 40\%$

Step 1 : Consider proportion: 12 parts out of 30 total

Step 2 : Write as a fraction: $\frac{12}{30}$ and simplify $\frac{12}{30}\ ^{(\div 3)}_{(\div 3)} = \frac{4}{10}$

Step 3 : Calculate as a percentage

either rewrite "out of 100" => $\frac{4}{10}\ ^{(\times 10)}_{(\times 10)} = \frac{40}{100}$

or find proportion of 100% => $\frac{4}{10} \times 100\%$

Remember: Units of measure **must be the same** when writing one quantity as a proportion of another

Example 2: What proportion of 12metres is 150cm?

Step 1 : write as values **with the same units**

so use values either in metres: 12m and 1.5m

or in centimetres: 1200cm and 150cm

Step 2: Write as a fraction and simplify (to correct form)

either $\frac{1.5}{12}\ ^{(\times 10)}_{(\times 10)}$ or $\frac{150}{1200}\ ^{(\div 10)}_{(\div 10)}$ => $\frac{15}{120}\ ^{(\div 15)}_{(\div 15)} = \frac{1}{8}$

Check: You have the values correctly written in the fraction: (numerator) compared to or as a proportion of (denominator)

Example 3: Chris earns £320 per week. Rudy earns £400

What proportion of Rudy's wages does Chris earn?

"of Rudy's" means Rudy is denominator: $\frac{320}{400}\ ^{(\div 4)}_{(\div 4)} = \frac{80}{100} = 80\%$

What proportion of Chris's wages does Rudy earn?

"of Chris's" means Chris is denominator: $\frac{400}{320}\ ^{(\div 80)}_{(\div 80)} = \frac{5}{4} = 125\%$

(When comparing quantities percentages can be more than 100% - it just shows that a quantity is bigger than the original)

Finding the change in proportion – finding profit or loss

Sparx GCSE U278

$\frac{\text{Change in value}}{\text{Original value}} \times 100\%$ or simply $\frac{\text{NEW}}{\text{OLD}} \times 100\%$

Key fact: this is in effect the same as expressing a value as a proportion of another. Most care needs to be taken over what value is to be written as a proportion of what.

Example 1: Sam buys a picture for £1300 and sells it the following year for £1650. What is his percentage profit (to 2 sig fig)?

Change in value 1650 -1300 = £350;

ORIGINAL value £1300

Percentage change = $\frac{350}{1300} \times 100\% = 27\%$ (2sf)

Example 2: Sam buys a car for £15750 and sells it five years later £10000. What is the percentage change in value of the car?

Change in value 15750 -10000 = £5750;

ORIGINAL value £15750

Percentage change = $\frac{5750}{15750} \times 100\% = 38\%$ (2sf)

Finding a proportion of an amount

Remember: **"finding a proportion of" = multiply by proportion**

See Previous learning: Year 9 KO Term 1&2 Fractions decimals & percentages

Example 1: Find $\frac{3}{4}$ of £320

Method 1 – find $\frac{1}{4}$ of amount then scale up (x3)

$\frac{1}{4}$ ➲ ÷ 4 ➔ 320 ÷ 4 = £80

$\frac{3}{4}$ ➲ 3 x $\frac{1}{4}$ ➔ 80 x 3 = £240

Method 2 – (cancel and) multiply fraction

$\frac{3}{1} \times \frac{320^{80}}{1} = £240$

Method 3 – Calculator: find and use the fraction button and multiply

Example 2: Find 60% of £320

Method 1 – **Non-calculator**

combine values for "easy" percentages

10% = $^1/_{10}$ ➲ ÷ 10 ➔ 10% ≡ £ 32

50% = $^1/_2$ ➲ ÷ 2 ➔ 50% ≡ £160

60% = 50%+10% ➔ 60% ≡ £192

Method 2 – **Calculator**

Convert to a decimal and multiply

60% = 0.6 ➔ 0.6 X £320 = £192

Increase or decrease an amount by a proportion

Sparx GCSE U773, U671

Non-calculator method - find the required proportion then add or subtract from original

Calculator method (%s) - convert to a **decimal multiplier** and multiply by the original amount

- **to increase:** decimal multiplier will be >1 (100% + %increase)/100
- **to decrease:** decimal multiplier will be <1 (100% - %decrease)/100

Example 1: Increase £450 by 20%

Answer will be 100+20%=120% of original

Decimal multiplier ➲ 120/100 = 1.2

Calculation: £450 x 1.2 = £540

Example 2: Decrease £450 by 20%

Answer will be 100-20%= 80% of original

Decimal multiplier ➲ 80/100 = 0.8

Calculation: £450 x 0.8 = £360

Repeated proportional change

Key fact: This means you need to find a proportion **of** a proportion **of** a proportion (**of** an amount) etc. As "of" means multiply, you will need to multiply all proportions (and the amount) together:

Example 1: There are 800 pupils in the school. $\frac{5}{8}$ of pupils are girls. $\frac{1}{2}$ of girls study Spanish.
i) How many girls study Spanish?
Need to find: $\frac{1}{2}$ of $\frac{5}{8}$ of 800 pupils
Calculation: $\frac{1}{2} \times \frac{5}{8} \times 800 = 250$ girls study Spanish
ii) What proportion of pupils are girls who study Spanish?
Either: express as a fraction of an amount: $\frac{250}{800} = \frac{5}{16}$
Or find $\frac{1}{2}$ of $\frac{5}{8}$ => $\frac{1}{2} \times \frac{5}{8} = \frac{5}{16}$

Sparx GCSE U773, U671

For **repeated percentage change** use decimal multipliers:

Example 2: Sam earns £1500 per month
Sam spends 85% of this paying bills. His rent bill makes up 70% of all money paid on bills.
i) How much does he pay in rent each month?
Need to find: 70% of 85% of £1500
For percentages – use decimal multiplier
Calculation: 0.7 x 0.85 x 1500 = £892.50
ii) What proportion of his income goes on rent?
Calculation: 0.7 x 0.85 = 0.595 = 59.5%

Remember: fraction decimal & percentages can be equivalent – so chose "easiest" format:

Example 3: Sam pays £175 in utility bills each month. 80% of this is his gas and electricity of which $\frac{1}{4}$ is for the gas.
i) How much is his **electricity** bill each month?
Need to find: $\frac{3}{4}$ of 80% of £175
Either as fraction: $\frac{3}{4} \times \frac{4}{5} \times £175 = £105$
Or % (as multiplier): 0.75 x 0.8 x £175
ii) What proportion of his bills is for electricity?
Calculation: 0.75 x 0.8 = 0.6 = 60%

Simple Interest and Compound interest

Simple Interest is paid JUST on the original value. The amount received will be the SAME each year.

Example 1: A bank offers simple interest at 3% **per annum [means 3% each year]**
Charley invests £500 for 5 years.
i) How much interest does she get in total?
Need to find: 5 x value for 1yr (3% of £500)
Calculation: 5 x 0.03 x 500 = £75
ii) How much is in her bank account?
Need to find: **Add** interest to original amount
Calculation: 75 + 500 = £575

Sparx GCSE U553

Compound interest is paid on the original amount AND any interest already received. The amount will increase each year. This is the form of interest most commonly given by banks.

Non Calculator Method

Example 2: A bank offers **compound interest** at 5% **per annum.** Charley invests £500.
i) Calculate the value of the investment after 2 years?
Year 1 Need to find: 5% of £500 and add onto £500
Calculation: Original + 5% = £500 + £25 = £525
Year 2 Need to find: 5% of £525 and add onto £525
Calculation: 5% of £525 = £26.25
Total investment = £525 + £26.25 = £551.25
ii) How much more does she get from compound interest than if simple interest of 5% had been given?
Need to find: 2 x (value of interest for 1 year)
Calculation: 2 x £25 = £50 interest accrued in 2 years so Charley has £1.25 more with compound interest than with simple interest only.

[Exponential Growth and Decay]

Sparx GCSE U332, U988

Compound interest is normally a calculator paper topic.

Formula for compound interest:
£Original x decimal multiplier$^{(time)}$

Example 3: A bank offers **compound interest** at 3% **per annum.** Charley invests £500 for 5 years.
i) How much is Charley's investment after 5 years?
Investment will be worth 103% after 1 year
Need to find: repeated percentage increase of 103%
Calculation: 1.03 x1.03 x1.03 x1.03 x1.03 x500
or: $1.03^5 \times 500 = £579.64$ (2dp)
ii) How much interest did she get?
Need to find: **Subtract** original from total investment
Calculation: 579.64 - 500 = £79.64

Note: Compound interest and depreciation (growth and decay) is a form of geometric sequence (General rule : $ar^{(n-1)}$)

Depreciation occurs when a value decreases by given proportion each year – so is calculated like compound interest but percentage decimal multiplier will be less than 1

Example 4: Sam buys a car for £15000.
The car depreciates by 15% each year.
What is the value of the car after 3 years?
Car will be worth 100%-15% = 85% after 1 year
Need to find: repeated percentage decrease of 85%
Calculation: 0.85 x0.85 x0.85 x 15 000
or: $0.85^3 \times 15000 = £9211.88$ (2dp)

Sparx GCSE U286

Reverse proportions :

Finding the original amount after a proportional change

Key fact: this is the inverse process of finding a proportional increase or decrease.

Original ➲ multiply by proportional change ➲ New value

Original ➲ DIVIDE by proportional change ➲ New value

Eg "Increase £100 by 10%" problem: **£100 ➲ x 110% ➲ £110**

"Find original amount" problem: **£100 ➲ ÷ 110% ➲ £110**

DO NOT just find the same proportion of the new value :–

Increase £100 by 10%: **£100 ➲ x 110% ➲ £110**

but decreasing £110 by 10% …. **£110 ➲ x 90% ➲ £99**

… does not get back to the same value. Remember proportion is relative to the "total" … and this is different in both cases!

Fractions:

See Year 9 KO Term 1&2 Divide fractions = multiply by reciprocal: KFC"

Percentages: (Calculator Method)

Example 1: In May, a shop decreased the price of a certain brand of t-shirt by $\frac{1}{4}$ to £15. What was the price of the t-shirts before the decrease?

A decrease by $\frac{1}{4}$ means £16 is $\frac{3}{4}$ of the original

Process to decrease : Original ➲ x $\frac{3}{4}$ ➲ £15

So reverse to find Original ➲ ÷ $\frac{3}{4}$ ➲ £15

Calculation: £16 ÷ $\frac{3}{4}$ = £16 x $\frac{4}{3}$ = £20

Example 2: In May, a shop increased its sales income by 15% to £1840 per month.

What was its monthly sales before the increase?

An increase of 15% means £1840 is 115% of original

Process to increase: Original ➲ x 1.15 ➲ £1840

So reverse to find Original ➲ ÷ 1.15 ➲ £1600

Calculation: £1840 ÷ 1.15 = £1600

Non-calculator: The amount after an increase or decrease in value is in direct proportion to the proportional change applied to the original… so use ratio techniques to scale up or down as required. So see using ratios to solve real life problems….

Ratio

Sparx GCSE U687,U610

A ratio can be used to compare two quantities: **part to part**.

Once the quantities have been linked, equivalent ratios can be found by scaling up both parts by a common multiple or simplified by dividing by common factors (much like equivalent and simplified fractions).

Example 1: Harry is 120cm tall; George is 140cm. Express Harry's height to George's as a ratio in its simplest form

Harry : George ➲ 120 : 140

Simplify (÷20) ÷20 ↓ ÷20

6 : 7

Example 2: This year the ratio between Tom and Henry's age will be 2 : 7. If Tom is 10, how old is Henry?

Tom : Henry ➲ 2 : 7

Scale up (x5) x5 ↓ x5

10 : 35

If Tom is 10, then Henry is 35 years old.

- Make sure the ratio is written in the correct order for the question:

Harry : George	George : Harry
6 : 7	7 : 6

These are actually different ratios.

- Quantities must be in the same units when put into ratio form
- In ratio form, quantities do not contain any units… but units may need to be used when interpreting the ratio in context.

Ratios in Simplest form

Like fraction, simplify by dividing by the **highest common factor**. Simplest form ratios only include integer values.

Example: Simplify 50 : 75 → ÷25 → 2 : 3 ← ÷25

Unit Ratios

A unit ratio is one in the form **1 : n**. This is often called a **scale**. Note: as the first value must be 1, unit ratios can include decimals.

Example: Write as a unit ratio: 30 : 90 → ÷30 → 1 : 3 ← ÷30

Scale diagrams and Maps are the most common form of unit ratios.

Sparx GCSE U257

Map scales give the scale factor between lengths linked on the map and in real life

Remember – map scales are:

- always written **Map : Real** distance
- always given in the **same units (cm)**

Convert the scale or answer to useable units

Example : On a map the distance two points is 4.5cm. What is the actual distance if the map's scale is 1 : 100000 ?

Scale means: 1 cm = 100000 cm

= 1000m

= 1 km

so 4.5cm = 4.5 km (x4.5 on both sides)

Dividing in a given ratio

Sparx GCSE U577, U753

The TOTAL number of parts a quantity is divided into can be found by adding the elements of a ratio. This total will scaled up in the same way as the parts – and this can be used to see how a quantity may be divided in a given ratio:
…but be careful to check what information you have been given…

It may be about one of the ratio parts:

Or about the difference between the ratio parts rather than the total!:

Writing a ratio as a proportion

As TOTAL number of parts can be found by adding the elements of a ratio, information given as a ratio can easily be converted to a proportion:
Remember fractions show **part / whole**
And a fraction can then be converted to decimals or percentages as required

Example : Jon and Pat share £350 in the ratio 2 : 5. How much will Jon receive?

Jon : Pat ➲ Total
2 : 5 ➲ 7 parts (x50)
£100 : £250 ➲ £350 (x50)
Jon receives £100

350 ÷ 7 = 50
1 part = £50

Example : Yellow and blue paint is mixed in the ratio 3:4. Stan has 20 litres of blue paint and more than enough yellow. How much green paint can he make?

Yellow : Blue ➲ Total Green
(x5) 3 : 4 ➲ 7 (x5)
(15L): 20L ➲ 35L

Example : Jon and Karl share some money in the ratio 3 : 7. Karl receives £140 than Jon. How much money did they share?

Jon : Karl ➲ **Difference** ➲ Total
3 : 7 ➲ 4 parts ➲ 10 parts
140 ÷ 4 = 35 (x35) ➲ £140 ➲ £350 (x35)
1 part = £35 They share £350

What proportion of the money does Karl receive? Give your answer as a percentage

Jon : Karl ➲ Total
Ratio 3 : 7 ➲ 10 parts
Proportion $\frac{3}{10} : \frac{7}{10}$

$\frac{7}{10} = 70\%$

Karl receives 70%

Combining ratios and harder ratio problems

Two or more ratios may be combined if they share a common term. Find the lowest common multiple of that common term and scale each ratio up by that factor. Now combine the ratios around the common value ….

Example : A racecourse has 4 sections A, B, C and D. The distances of each section are in the following ratios A : B : C and C : D

Sparx GCSE U753, U921, U676, U865

Calculate the ratio A : B : C : D
Common section C : common multiple of 4 and 6 = 12

A : B : C
(x3) 2 : 3 : 4 (x3)
6 : 9 : 12

C : D
(x2) 6 : 5 (x2)
12 : 10

➲ A : B : C : D
6 : 9 : 12 : 10

Example: Given that $3x : 4 = 7 : 2$
Calculate the value of x
Link the terms and combine around a common value
4 and 2 in the same position so $3x : 4 = (7 : 2)$ (x2)
➲ $3x : 4 = (14 : 4)$ (x2)
As ratios are equal then $3x = 14$
$x = \frac{14}{3}$

Example : What number needs to be added to 5 and 3 so that the ratio of the 1st number to the 2nd becomes 4 : 3
Unknown number added to both ➲ $(5 + n : 3 + n)$
$4 : 3$

The scale factor between needs to be the same so create equivalent scale factors and solve as a linear equation:
$\frac{5 + n}{4} = \frac{3 + n}{3}$
$3(5 + n) = 4(3 + n)$
$15 + 3n = 12 + 4n$
$15 = 12 + n$
$n = 3$

Check: 5 + 3 = 8 ➲ (÷2) 8 : 6 (÷2)
3 + 3 = 6 4 : 3

Ratio and Direct Proportion – Problem solving

Ratio which can be used to solve many different types of real life problem when two quantities that are in **direct Proportion** – as one increases the other will also increase in the same proportion:

- **Scaling up recipes**

Sparx GCSE U721

Example 1: Nadia wants to make soup for 10.
How much of each ingredient will she need?
4 people ➲ 10 people
Either: (÷2) 2 people + (x2) 8 people
Or 10 ÷ 4 = 2.5 (multiply everything by 2.5)

People	Onion	Carrot	Oil	Tomatoes	Stock
4	160	80	1	500	840
x2.5 2	80	40	½	250	420 x2.5
+ 8	320	160	2	1000	1680
10	400g	320g	2½	1250g	2100ml

Soup Recipe: (Serves 4)
160g onions
80g carrots
1 tablespoon of oil
500g of tomatoes
840 ml vegetable stock

Finding Scale factor
"New" / "Old" = 10 / 4 ➔ 2.5

- **Finding "best buys"**

Sparx KS3 M681

Example 2: Two shops have a special on for toilet rolls. Which is the best value for money?

Quik Shop	Bargain Mart
9 rolls for £5.22	8 rolls for £4.72

Calculate a common ratio for both either unit ratios or a common multiple - here 72 (9x8 rolls)

÷9	9	:	£5.22	÷9	÷8	8	: £4.72 ÷8
	1	:	£0.58			1	: £0.59

Quik shop is better value (58p per roll) as the price per roll is 1p cheaper than Bargain Mart.

Careful you know what your ratio represents – the cost of 1 item or a quantity obtained for £1?

Sparx GCSE U257

- **Creating scale diagrams**

Example 3: Ian is creating a scale diagram of his house. His living room is 3.8m wide. On the scale drawing the living room is 16mm wide. His living room is 4.4m long, how long is it on the drawing?
Link two known variables Width : Length

Real life	3.8	:	4.4	
Scale drawing x5	16	:	22	x5

Scale factor
"New" / "Old" = 16 / 3.8 ➔ 5

- **Understanding and calculating with compound measures**

Sparx GCSE U151, U910, U527, U256

Compound measures involve two different units of measure linked in a proportional relationship e.g. Speed (miles per hour) or density (grams per cm^2)
The compound unit can be seen and treated as a ratio – for instance
Speed: "70 miles per hour" means 70 miles travelled in 1 hour
so travelling at this average speed for 3.5 hours you go 245 miles

x3.5	70	:	1 x3.5
	245	:	3.5

Example 1: Gail drives 20 minutes at 48 mph
How far does she travel?
Speed: 48 miles per 1 hour
20 minutes = 1/3 of an hour

÷3	48miles	:	1 hour	÷3
	16 miles	:	20 mins	

Best Practise : Work in the same units as needed for the compound measure

Example 2: Gail drives 40 minutes and travels 30 miles. What is her average speed?
Link information then scale Up the time again to 1 hour:

x1	30 miles	:	40 mins	
5	45 miles	:	1 hour	x1.5

Sparx GCSE U286

- **Calculating percentages including reverse percentages**

Percentage of amounts are in proportion: 10% of an amount will be double 5% of the same amount and half 20%! If you are given information linking a percentage of an amount with a value, scale up or down as required.

Example 1: The cost of a train fare increased by 5%
A ticket now costs £3.40 extra. How much was the ticket before the increase?
Linked information
Require 100%

x20	5%	:	£3.40	x20
	100%	:	£68.00	

The ticket was £68.00 before the increase

Example 2: The cost of a bus fare increased by 20%
A ticket now costs £15.60 extra. How much was the ticket before the increase?
Ticket is currently 100% + 20% = 120% of original
Linked information
Require 100%

÷6	120%	:	£15.60	÷6
	20%	:	£ 2.60	
x5	100%	:	£13.00	x5

The ticket was £13.00 before the increase

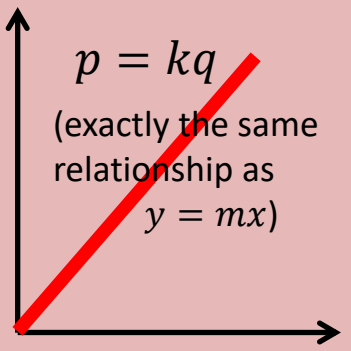
Example 3: In a sale the price of a coat was reduced by 40%
The cost now costs £54. What was the price before the sale ?
Coat is currently at (100%-40%)
60% of its original price
Linked information
Require

÷6	60%	:	£54.00	÷6
	10%	:	£ 9.00	
x10	100%	:	£90.00	x10

The price of the coat was £90.00 before the sale

Solving direct proportion problems algebraically

Sparx GCSE U640, U407,U238



Variables are in direct proportion if their graph is a straight line cutting through the origin.
Rather than using "$y = mx + c$" to describe the relationship shown by the line a slightly different notation is used **but the principles are the same**…

The symbol $\propto$ means "is in proportion to" and if variable p is in proportion to q ($p \propto q$) then you can describe the relationship as $p = kq$ where k is a scalar

Example 1:
p is in direct proportion to q.
When p is 15, q is 6
a) Find a formula for p in terms of q
b) Use your formula to find
i) p when q = 10
ii) q when p = 23

If $p \propto q$
then $p = kq$
so $15 = k \times 6$ (p=15 and q=6)
$k = \frac{15}{6} = \frac{5}{2}$
a) formula ➔ $p = \frac{5}{2}q$
b) i) If q=10 then $p = \frac{5}{2} \times 10 = 25$
ii) If p=23 then $23 = \frac{5}{2}q$
$q = \frac{23 \times 2}{5} = 9.2$

Process: state relationship ➲ use framework formula ➲ substitution of known values ➲ specific formula ➲ substitution for required values

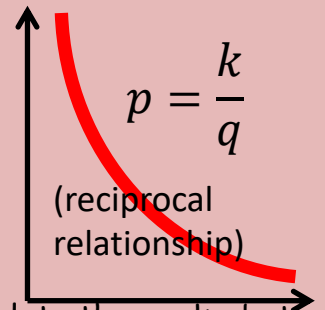
Make sure that you check what the key relationship in the question is:

Example 2:
t is in direct proportion to **the square** of v.
When t is 5, v is 3
a) Find a formula for t in terms of v
b) Use your formula to find
i) t when v = 1.8
ii) v when t = 1.25

If $t \propto v^2$
then $t = kv^2$
so $5 = k \times 3^2$ (t=5 and v=3)
$k = \frac{5}{9}$
a) formula ➔ $t = \frac{5}{9}v^2$
b) i) If v=1.8 then $t = \frac{5}{9} \times 1.8^2 = \frac{9}{5}$
ii) If t=4.8 then $1.25 = \frac{5}{9}v^2$
$v^2 = \frac{9 \times 1.25}{5} = \frac{9}{4}$
$v = \sqrt{\frac{9}{4}} = \frac{3}{2} = 1.5$

Note the process is the same in both examples… what is different is the complexity of the initial relationship

Solving indirect proportion problems



Variables are inversely (or indirectly) proportional when the **PRODUCT of the variables is constant**

Example: Indirect proportion in "real life"
If it takes 8 workers 6 days to build a bridge
how many days will it take 12 workers?
The more workers used the shorter the time taken to complete the work… but the total work days will remain the same.

Total work days = 8 workers x 6 days = 48 work days
If 12 workers were employed: 48 work days ÷12 workers=4 days

(The change is inversely proportional: the number of workers has been multiplied by 1.5… the number of days has been divided by 1.5)

Solving indirect proportion problems algebraically

Use the same process as for direct proportion – the only change is the initial relationship: the inversely proportional relationship is a reciprocal:

if p is inversely proportional to q then: $p \propto \frac{1}{q}$ **and** $p = \frac{k}{q}$

Sparx GCSE U364, U138,U238

Example 3:
F is inversely proportional to d.
When F is 7, d is 8
a) Find a formula for F in terms of d
b) Use your formula to find
i) F when d = 0.4
ii) d when F = 448

If $F \propto \frac{1}{d}$
then $F = \frac{k}{d}$ → $k = F \times d$
so $k = 7 \times 8$ (F=7 and d=8)
$k = 56$
a) formula ➔ $F = \frac{56}{d}$
b) i) If d = 0.4 then $F = \frac{56}{0.4} = 140$
ii) If F = 448 then $488 = \frac{56}{d}$
$d = \frac{56}{448} = \frac{1}{8}$

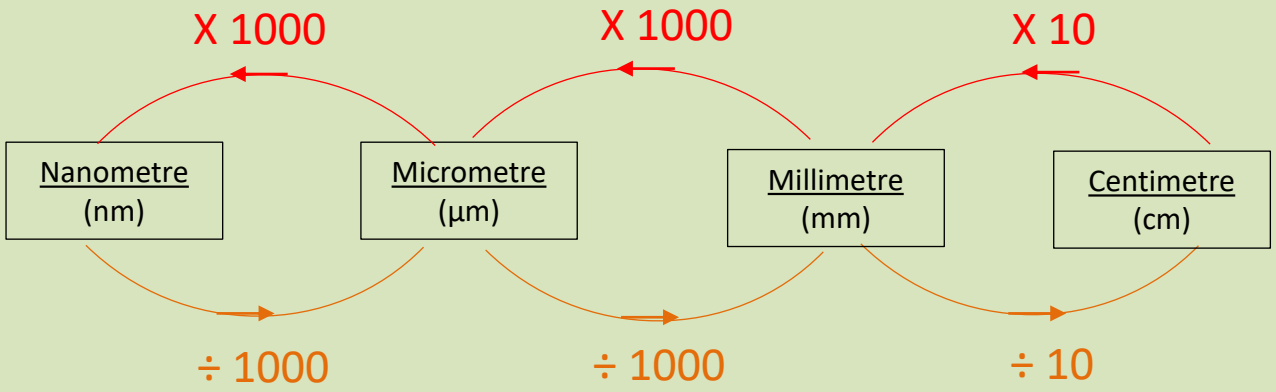
Again take care to check the key relationship. If the question had said "F is inversely proportion to d^2" then the set up would be: $F \propto \frac{1}{d^2}$

Science: Useful Information

Key Word / Term	Definition
Accuracy	Results are close to the true value
Precision	Results are similar to each other but not necessarily close to the true value
Repeatable	Similar results are obtained if the investigation is done again by the same person
Reproducible	Similar results are obtained if it is repeated by a different person
Resolution	Is the smallest change a measuring instrument can detect
Validity	A measure of how correct the results of an experiment are

Prefix	Number	Standard Form	e.g. metres
Giga	1,000,000,000	$1x10^{9}$	Gm
Mega	1,000,000	$1x10^{6}$	Mm
kilo	1,000	$1x10^{3}$	km
----------	1	1	m
milli	0.001	$1x10^{-3}$	mm
micro	0.000001	$1x10^{-6}$	µm
nano	0.000000001	$1x10^{-9}$	nm

Converting units of measure:



Variables:

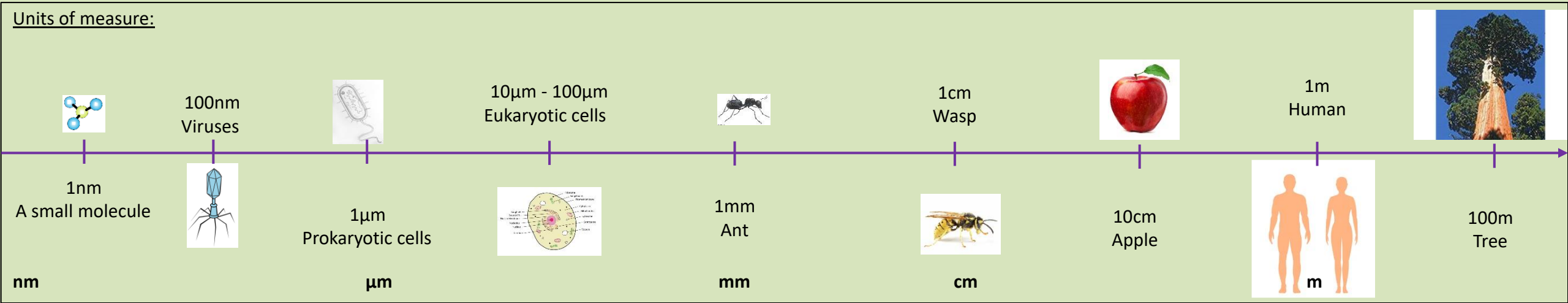
Independent: the variable that is being changed during the experiment

Dependent: the variable being tested or measured during the experiment

The independent variable affects the dependent variable, the others must be controlled

Control: Keep the same (there can be more than one control variable) so that they do not affect the independent variable

Units of measure:



The Periodic Table of Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Nh** nihonium 113	[289] **Fl** flerovium 114	[289] **Mc** moscovium 115	[293] **Lv** livermorium 116	[294] **Ts** tennessine 117	[294] **Og** oganesson 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

KS4 Biology: B6 Preventing and treating disease

Key term	Definition
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.
Antibiotic	Cure bacterial diseases by killing the bacterial pathogens inside your body.
Placebo	A medicine that does not contain the active drug being tested, used in clinical trials of new medicines.
Double blind trial	Neither patient or prescribing doctor know if they are taking/giving the drug or the placebo so they cannot be **biased.**
Mutate	Change in DNA.
Pre-clinical testing	Carried out on a potential new medicine in a laboratory using cells, tissues, and live animals.
Clinical testing	Test potential new drugs on healthy and patient volunteers for safety, efficacy and dosage.

Vaccination
Introduce small quantities of **dead** or **inactive** forms of a **pathogen** into the body to stimulate the **white blood cells** to produce **antibodies.**
If the same pathogen re-enters the body the WBC recognise the pathogen and respond quickly to produce the correct **antibodies**, preventing **infection.**
MMR = measles, mumps, rubella vaccine

Herd immunity
If a large proportion of the population is immune to a pathogen, spread of the pathogen is reduced. Vaccination can speed up herd immunity e.g. measles.

Cognito

Treating symptoms:
Viruses have no cure (it is difficult to develop drugs that kill viruses without damaging the body's tissues).
You can treat the symptoms of both viral and bacterial infection though.
e.g. Aspirin and paracetamol are pain killers.
e.g. Ibuprofen targets inflammation.

Free Science Lessons

Antibiotics e.g. penicillin
Kill bacteria whilst they are inside the body without damaging body cells – either taken as a pill or put straight into the blood stream.
Specific bacteria treated by specific antibiotic.
Decreased deaths from bacterial infections but some bacteria are now becoming resistant to antibiotics eg MRSA.
To prevent this: don't prescribe for viral infections, limit use in agriculture, take the full course.
ANTIBIOTICS DO NOT TREAT VIRAL INFECTIONS.

Discovery and development drugs

Traditionally drugs were extracted from plants and microorganisms.

- The **heart drug** digitalis originates from **foxgloves.**

- The painkiller **aspirin** originates from **willow.**

- **Penicillin** was discovered by **Alexander Fleming** from the ***Penicillium*** mould.

New medical drugs have to be tested for:

- **Toxicity –** is it safe to use, do the benefits outweigh the side effects?
- **Efficacy –** does it prevent, cure a disease or make you feel better?
- **Dosage –** how much to take to be effective but limit side effects?

- New drugs synthesised by chemists in the pharmaceutical industry. The starting point may still be a chemical extracted from a plant**.**

Preclinical testing – done in a laboratory using cells, tissues and live animals.

Clinical trials – healthy volunteers and patients.

- Very low doses of the drug and given at the start of the clinical trial.
- If the drug is found to be safe, further clinical trials are carried out to find the **optimum dose** for the drug.
- In **double blind trials,** some patients are given a **placebo.**

Cognito

Free Science Lessons

Antibiotic goes through the **Discovery and Development**

⇩

Pre-clinical stage: Lab testing on cells and tissues and then live animals

⇩

Clinical trial (Phase 1): Low dose of the drug are tested on <u>healthy people</u>

⇩

Clinical trial (Phase 2) : Testing on <u>small number of people who have the disease</u>. Placebos as well as drug is given→ **double blind trials**

⇩

Clinical trial (Phase 3) : Testing on <u>large number of people who have the disease</u>. Placebos as well as drug is given→ **double blind trials**

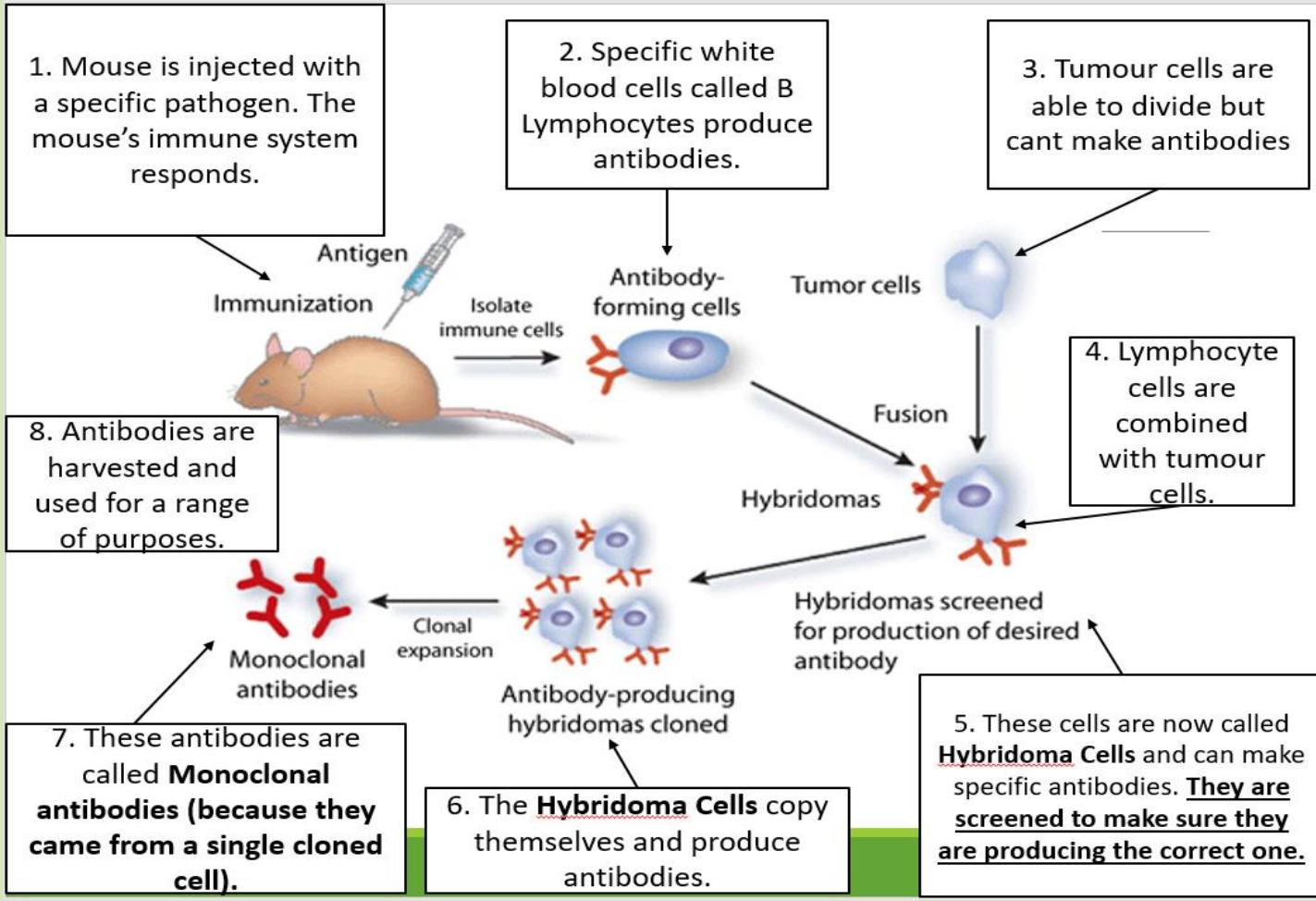
⇩

Review and approve: Results of testing <u>are peer-reviewed</u> to make sure that the results are <u>valid</u> and <u>unbiased.</u> The results then published in journals

Biology only - Making monoclonal antibodies

[HT ONLY]

Key word	Definition
Clone	Identical copy
B Lymphocyte	White blood cells that produce antibodies
Tumour cell	Cells able to divide repeatedly
Hybridoma cell	Cells made in a lab by fusing antibody specific B-lymphocytes and tumour cells together. Once screened and cloned, they produce monoclonal antibodies.



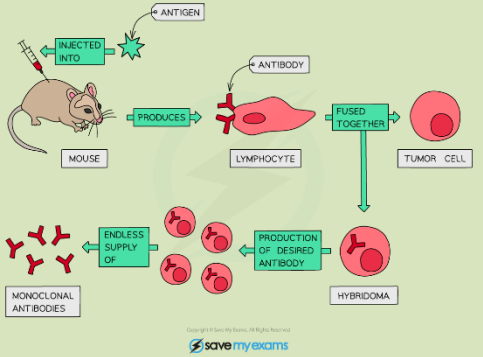
Biology only - Uses of monoclonal antibodies

- For diagnosis eg **pregnancy kits**
- In laboratories to **measure levels of hormones** and other chemicals in the blood or **detect pathogens.**
- In research to **locate** or **identify** specific molecules in a cell or tissue by **binding them to a fluorescent dye.**
- To **treat** some **diseases:** for **cancer,** the monoclonal antibody can be bound to a **radioactive substance, a toxic drug or a chemical which stops cells growing and dividing.** It delivers the substance to the cancer cells without harming other cells in the body.

Free science Lessons uses

Fuse

Cognito



KS4 Biology: B7 Non-communicable diseases

Key term	Definition
Non-communicable diseases	Are **not infectious** and **cannot be passed from one organism to another.**
Carcinogen	Agents that **cause cancer** or significantly increase the risk of developing cancer.
Ionising radiation	Has enough **energy** to cause **ionisation** in the material it passes through, which in turn can make them biologically active and may result in **mutation** and **cancer**
Correlation	An apparent **link** or relationship between **two factors.**
Causal mechanism	Something that explains how one factor influences another.
Mutation	A change in the genetic material of an organism.
Benign tumour	**Growths of abnormal cells** that are contained in **one area,** usually within a membrane, and **do not invade** other tissues.
Malignant tumour	**Invade neighbouring tissues** and **spread** to **different parts of the body** in the blood where they form **secondary tumours.** They are also known as **cancers.**

Emma the Teachie

Free Science Lessons

Health is the state of being free from **illness** or **disease.** It refers to **physical** and **mental** wellbeing.

Disease and lifestyle **risk factors** such as diet, smoking, alcohol consumption and the use of illegal drugs, can all impact the health of a person.

Some conditions are linked with certain lifestyle choices and **causal mechanisms have been proven:**

- **Liver conditions** associated with poor **diet and prolonged excessive alcohol consumption.**
- **Lung cancer** is linked to **smoking.**
- Memory loss, poor physical health and hygiene are associated with the use of illegal or recreational drugs.
- **Obesity and diabetes** are associated with poor diet.

To study these risk factors, **samples of the population** have been selected to study the correlations. To select the groups, scientists try to find:

- LARGE SAMPLE GROUPS – the more people the more reliable the data.
- Controls:
  - Age
  - Gender
  - Lifestyle (diet, exercise)

Impact of disease:

- On families: financial cost if a wage-earner cannot work.
- On Local communities: cost of supporting people wither through taxes or by taking care of affected families.
- On the Nation: expense of treating ill people, loss of money earned when large amount of people are ill.
- Globally: economy suffers especially if young people are ill.
- **Non-communicable diseases affect far more people that communicable diseases so have more impact on human and economic levels.**

Cancer

The result of changes in cells that lead to **uncontrolled growth and division.**

Benign tumour
Usually grow slowly.
Usually grow within a membrane and can be easily removed.
Can cause damage to organs and be life-threatening e.g. brain tumours have no space to grow and can put pressure on the brain.
Does not spread around the body
Does not normally grow back.

Malignant tumour
Usually grow rapidly.
Cancerous
Cells can break away and cause secondary tumours to grow in other areas of the body.
Can spread around the body, via the bloodstream.

Causes: Some **genetic** risk factors e.g. early breast cancer, **mutations from carcinogens** e.g. tar in tobacco or asbestos, **ionising radiation** too much UV light from sunlight and X-rays.
Treatments: Radiotherapy which stops mitosis or Chemotherapy which causes cells to self-destruct.

Cognito

Smoking

Cigarettes produce around 4000 different chemicals that are inhaled into the throat, trachea and lungs. **150 of these are linked to disease.**
Nicotine: addictive.
Carbon monoxide: reduces the ability of red blood cells to carry oxygen for respiration.

Smoking in pregnancy: reduces the oxygen available for the foetus can lead to:
- Premature birth
- Low birthweight
- Still birth, when the baby is born dead.

Cilia damage: cilia become anaesthetised by some of the cigarette chemicals so dirt and mucus not removed from trachea and bronchi leading to increased risk of infection.

Carcinogens: tar can cause cancer of throat, larynx, trachea and lungs.

Tar: thick sticky black chemical can increase risk of bronchitis and COPD (chronic obstructive pulmonary disease). Can lead to breathlessness and death.

Heart: smokers are more likely to have cardiovascular problems, narrowing of blood vessels also causes you to look older.

Fuse

Diet, exercise, obesity

If you eat too much, the excess is stored as **fat.**

Being obese can lead to: **type 2 diabetes, high blood pressure and heart disease.**

Exercise increases heart fitness and lung capacity. You also get more muscle which does more respiration using more energy from food.

Type 2 diabetes cells stop responding to insulin so blood glucose levels rise too high.

Causes problems in:
- Circulation
- Kidney function
- Eyesight

Type 2 diabetes can often be controlled by low carbohydrate diet and more exercise.

Cognito

Alcohol

Alcohol is addictive.
After drinking, ethanol is absorbed into the blood and can pass easily into other tissues e.g. the brain.

In small amounts:
- Relaxed, cheerful, reduced inhibitions.

In larger amounts:
- Lack of self-control, lack of judgement.
- Possibly unconsciousness, coma, death.

Longer term addiction:
- Cirrhosis of the liver (scarring of the liver tissue).
- Cancer of the liver.
- Brain damage.

In pregnancy:
- Alcohol can pass through the placenta.
- Can cause miscarriage, stillbirth, premature birth, low birthweight, foetal alcohol syndrome (facial deformities and learning difficulties).

KS4 Biology: B8 Photosynthesis

Keyword	Definition
Active Transport	The movement of particles against a concentration gradient, requires energy.
Chlorophyll	A green pigment found in chloroplasts which absorbs light for photosynthesis.
Chloroplast	Organelle found in plant cells and algae, site where photosynthesis takes place.
Endothermic Reaction	A reaction where energy is transferred from the environment.
Eukaryote Cell	A complex cell such as a plant.
Guard Cell	A specialised cell found on either side of the stoma which controls their size.
Limiting Factors	A factor which prevents a reaction from going any faster.
Nitrate Ions	Absorbed from the soil combined with glucose to make amino acids, building blocks for protein.
Osmosis	The movement of water molecules across a partially permeable membrane from a region of higher water concentration to a region of lower water concentration.

Cognito

Carbon dioxide + water $\xrightarrow[\text{Chlorophyll}]{\text{Light}}$ glucose + oxygen

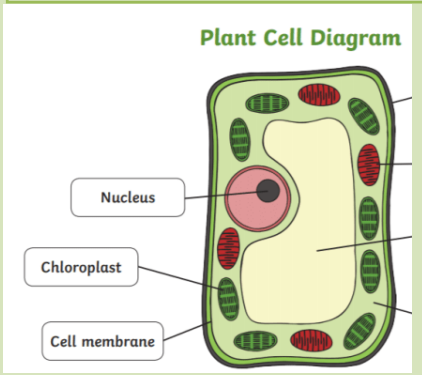
$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

Leaves are specially adapted for photosynthesis.:

- Broad, giving them a large surface area
- Thin, short diffusion distances for the gases.
- Veins, plenty of water in the xylem, removes waste products.
- Air spaces, to allow carbon dioxide to get to the cells and oxygen to leave by diffusion.
- Guard cells, that open and close the stomata to regulate gas exchange.

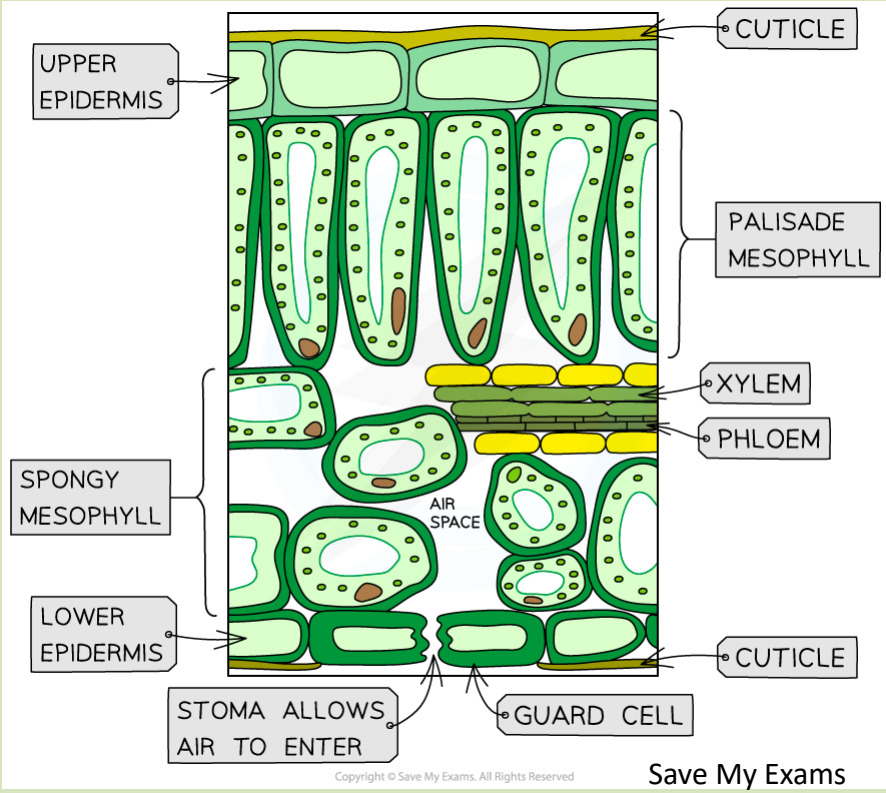
Uses of Glucose

- Respiration: to transfer energy from glucose.
- Making cellulose: to make strong cell walls.
- Making amino acids: glucose is combined with nitrate ions to make amino acids which are the building blocks of proteins.
- Stored as oil or fat: glucose is converted into lipids and stored in seeds.
- Stored as starch: stored in roots, stems and leaves as an energy source when the rate of photosynthesis is slow. Storing glucose would cause the cell to absorb water and swell up. Starch is insoluble so does not cause this problem.



Photosynthesis

- Takes place in chloroplasts in green plant cells they contain pigments like chlorophyll that absorb light.
- Energy is transferred to the chloroplasts from the environment by light – it is an endothermic reaction.



Save My Exams

Hint:

- More photosynthesis = more glucose. More glucose = bigger the plant / greater the yield of crop
- Less chlorophyll / reactants = less photosynthesis

Higher Only

Inverse Square Law: As the distance of the light from the plant increases, the light intensity decreases. This increase is inversely proportional to the square of the distance:

$$\text{Light intensity} \propto \frac{1}{\text{distance}^2}$$

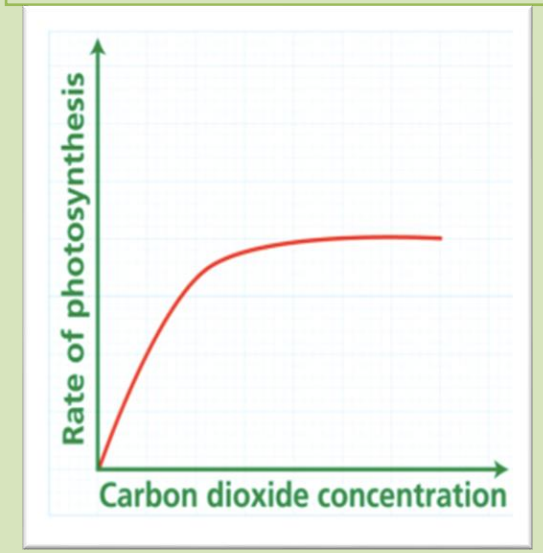
Keyword	Definition
Palisade Mesophyll Cell	Elongated cells, packed closely together with many chloroplasts.
Partially Permeable Membrane	A membrane with tiny holes which lets some molecules through.
Phloem	Type of plant tissue which transports dissolved sugars around the plant.
Photosynthesis	Process by which plants use energy to convert carbon dioxide and water into glucose and oxygen.
Protein	Large biological molecule made up of long chains of amino acids.
Root Hair Cell	Cell on the surface of a plant root which absorbs water and mineral ions. Specially adapted.
Starch	Insoluble carbohydrate used as a store of glucose in plants
Stoma	Tiny hole in the under surface of a leaf where gaseous exchange occurs.
Transpiration Stream	Movement of water from a plants roots through xylem and out of the leaves.
Xylem	Type of plant tissue which transports water and mineral ions around the plant.

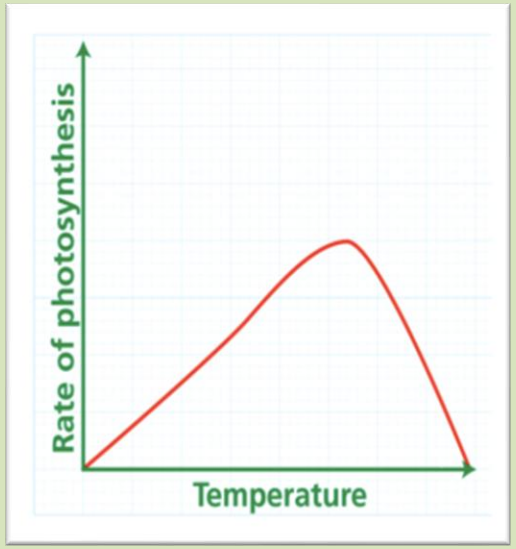
Interpreting Limiting Factor Graphs

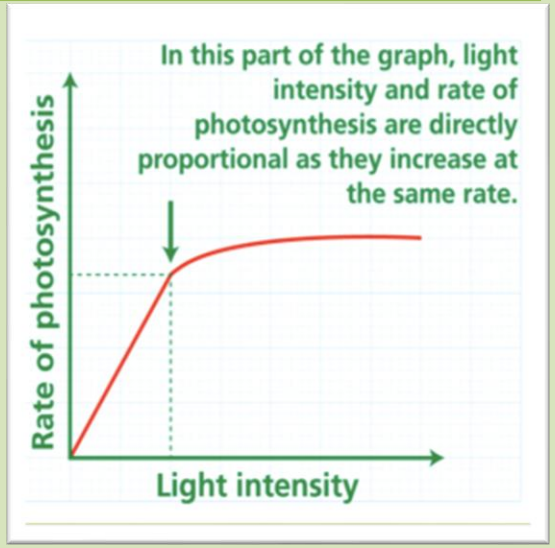
- Initially the rate of photosynthesis increases.
- When the scale on the x axis increases but the scale on the y axis plateaus (levels off) the x axis is no longer the limiting factor.

Limiting Factors

- These three factors can prevent the rate of photosynthesis happening faster:



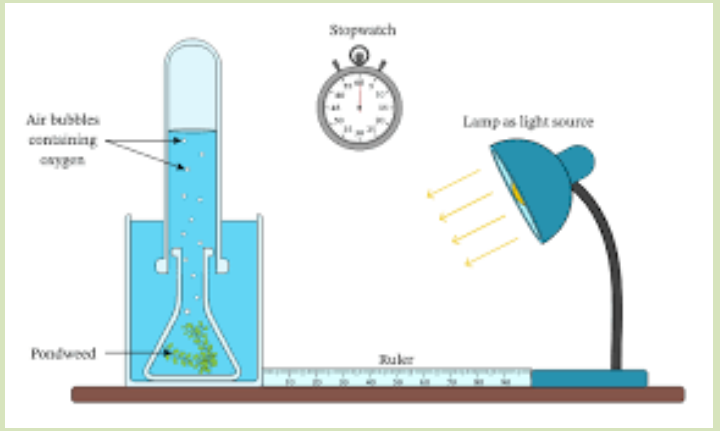




Required Practical

- The effect of light intensity on the rate of photosynthesis.
- Count the number of oxygen bubbles produced by the plant, in a minute.
- Move the plant further away from the lamp.
- Types of plants mentioned in exams:
  - Elodea
  - Immobilised algae balls
- How to improve:
  - Record practical and slow down the bubbles.
  - Use gas syringe and collect volume of oxygen.
- Risk assessment:
  - Keep electrical equipment dry.
  - Lamp bulb will get hot.

Tip: don't worry about the type of plant



KS4 Biology: B9
Respiration

Keyword	Definition
Aerobic Respiration	Chemical reaction involved in breaking down glucose using oxygen to transfer energy.
Alveoli	Tiny air sac in the lungs where gas exchange occurs.
Anaerobic Respiration	The incomplete breakdown of glucose which produces lactic acid in humans and ethanol in plants and yeast.
Breathing	Physical process of moving air in and out of the lungs.
Enzymes	A protein that acts as a biological catalyst. Eg) Protease, lipase, amylase
Eukaryote Cell	Complex cell such as a plant or animal cell.
Exothermic Reaction	Reaction that transfers energy to the environment.
Fermentation	Process of anaerobic respiration in yeast cells.
Glycogen	A molecule that acts as a store of glucose in liver and muscle cells.
Haemoglobin	Red pigment found in red blood cells which carries oxygen.

Aerobic Respiration
- With oxygen.
- Occurs in mitochondria.
- More energy produced than in anaerobic respiration

Respiration
- Chemical reaction that occurs inside cells in all living organisms.
- Process of transferring energy from the breakdown of glucose.
- Exothermic reaction.

Anaerobic Respiration
- Without oxygen.
- Occurs in cytoplasm
- Useful in emergencies as can produce energy quickly
- Less energy is produced as glucose is not fully oxidised.
- In humans produces lactic acid which is toxic.
- Creates muscle fatigue.

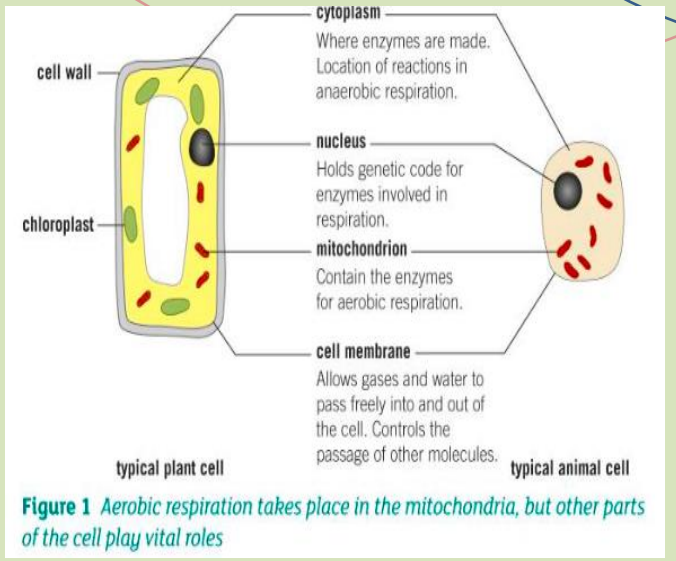


Figure 1 *Aerobic respiration takes place in the mitochondria, but other parts of the cell play vital roles*

Energy from Respiration
- Used in growth and repair of cells and tissues
- Used for protein synthesis
- Movement

BBC Bitesize

Cognito

Freescience

Aerobic Respiration

Glucose + Oxygen → Carbon dioxide + water + releases energy

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + releases energy

Anaerobic Respiration

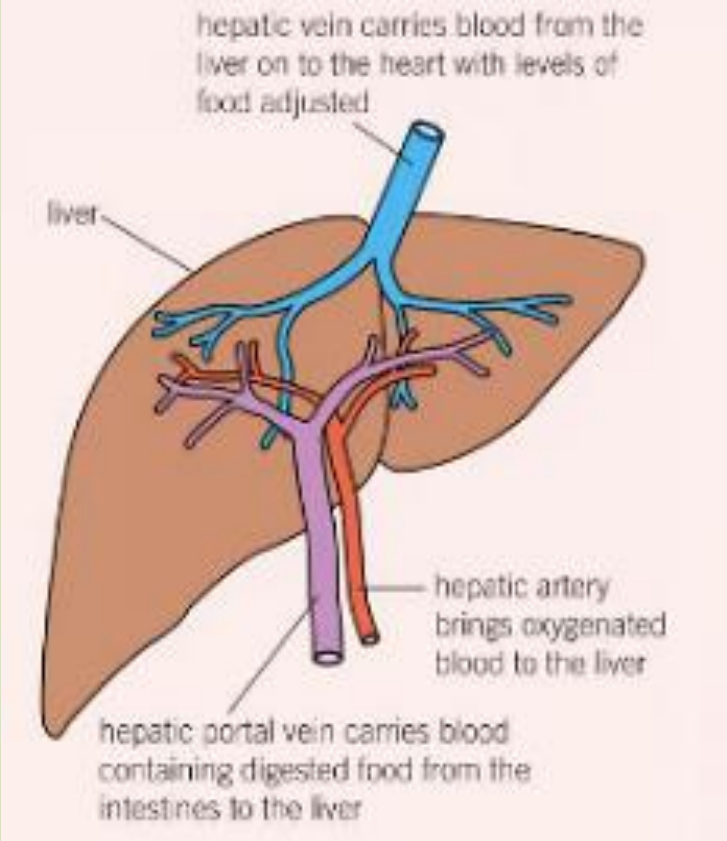
Humans: Glucose → lactic acid + energy

Plants: Glucose → ethanol + carbon dioxide + energy

Keyword	Definition
Lactic Acid	Product of anaerobic respiration that builds up in muscle cells.
Metabolism	All the chemical reactions that happen in a cell or the body.
Mitochondria	Organelle in a cell, site of most of the reactions for aerobic respiration.
Oxygen Debt	The amount of extra oxygen the body needs after exercise to react with the build up of lactic acid and remove it from cells.
Recovery Period	After anaerobic exercise when the heart rate and breathing rate stay higher than normal to repay the oxygen debt.
Red Blood Cell	Transports oxygen around the body and removes carbon dioxide as a waste product.
Respiration	The process of transferring energy from glucose, which goes on in every cell.

Freescience

Liver



Higher Only

The role of the liver

- Detoxifying poisonous substances such as ethanol from alcoholic drinks
- Passing the breakdown products into the blood so they can be excreted in the urine
- Breaking down old, worn out blood cells and storing the iron until it is needed to make more blood cells
- Removing lactic acid, converting it back to glucose

Exercise

- When we exercise we need to get more glucose and oxygen to our muscles for respiration.
- Do more work = need more energy.
- The energy that is transferred during respiration is used to enable muscles to contract.
- During exercise the human body responds to the increased demand for energy.
- Body responses to exercise include:
  - An increase in the heart rate, the breathing rate and the breath volume.
  - Glycogen stores in the muscles are converted to glucose for cellular respiration.
  - The flow of oxygenated blood to the muscles increases.
- These responses act to increase the rate of supply of glucose and oxygen to the muscles and the rate of removal of carbon dioxide the muscles.

Oxygen Debt

- Is the amount of extra oxygen the body needs after exercise to react with the build up of lactic acid and remove it from the cells.
- The pulse and breathing rate stay high whilst there are high levels of lactic acid and carbon dioxide in the body to deliver more oxygen to the cells.
- Lactic acid is transported to the liver where it is converted back to glucose.

Metabolism

- Is the sum of all the reactions in the body.
- The energy transferred by respiration in cells is used by the organism for the continual enzyme-controlled processes of metabolism that synthesise new molecules.
- Metabolism includes the conversion of glucose to glycogen (animals, starch and cellulose (plants). Metabolism also includes the formation of lipid molecules, and the use of glucose and nitrate ions to form amino acids, which are used to synthesise proteins and breakdown excess proteins to form urea.

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

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

CS Exam Practice

SS Exam Practice

Cognito

Homeostasis

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

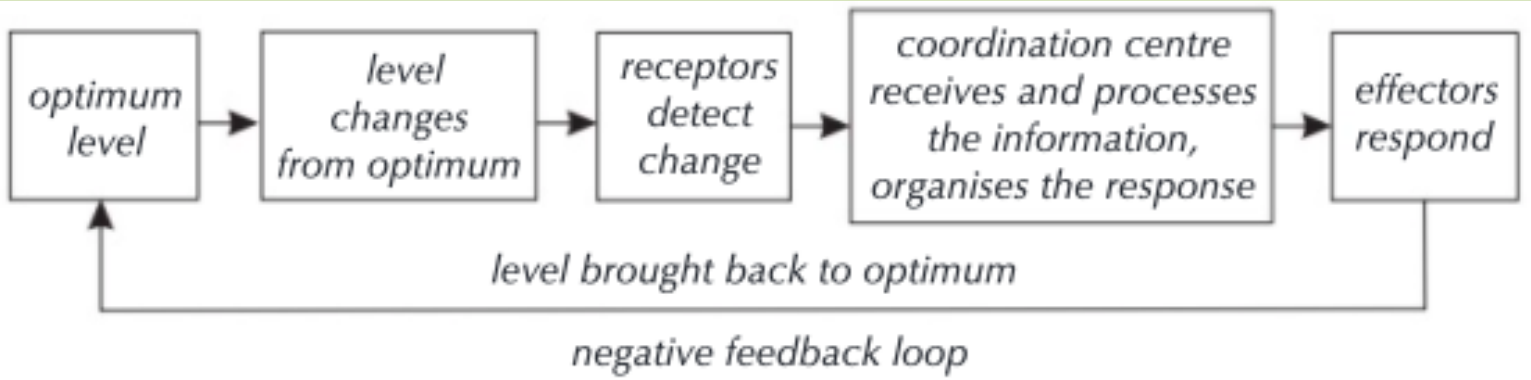


Figure 1: *A negative feedback mechanism.*

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

Example

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

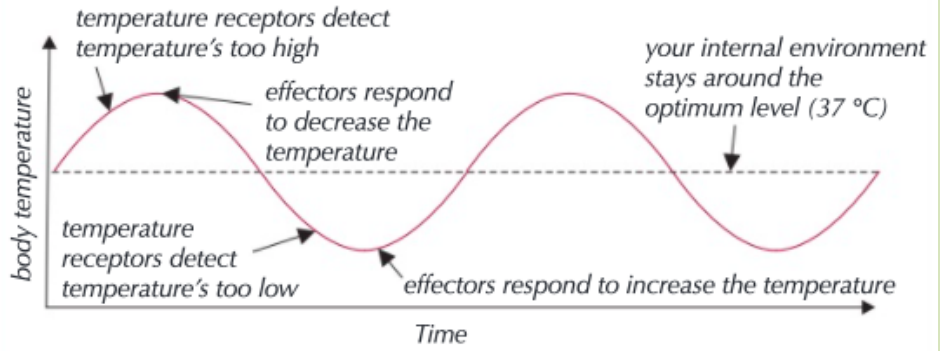
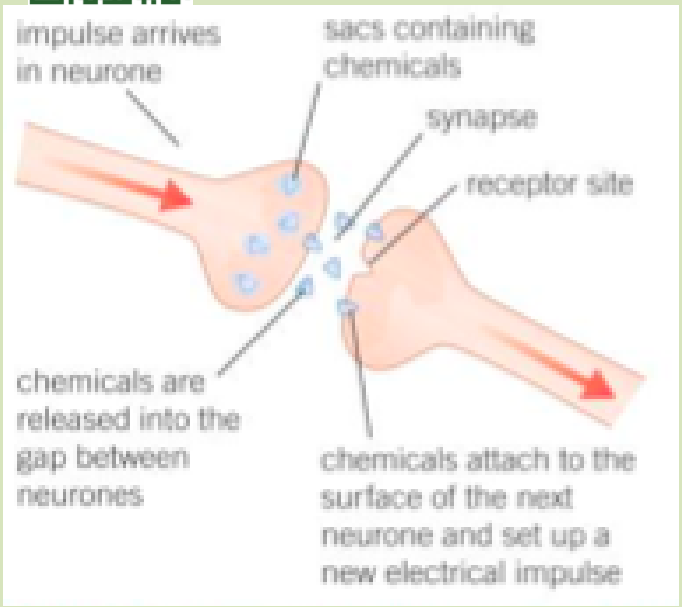


Figure 2: *Control of body temperature via negative feedback.*

Keyword	Definition
Motor Neurones	A nerve cell that carries electrical impulses from the CNS to effectors.
Relay Neurones	A nerve cell that carries electrical impulses through the CNS co-ordinating a response.
Sensory Neurones	A nerve cell that carries electrical impulses from the receptors in the sense organs to the CNS.
Stimulus	A change in the environment.

Cognito



Receptors: cells that detect changes in the internal or external environment. These changes are known as stimuli.

Coordination centres: areas that receive and process information from receptors. They send out signals and coordinate the response of the body. They include the brain and the spinal cord.

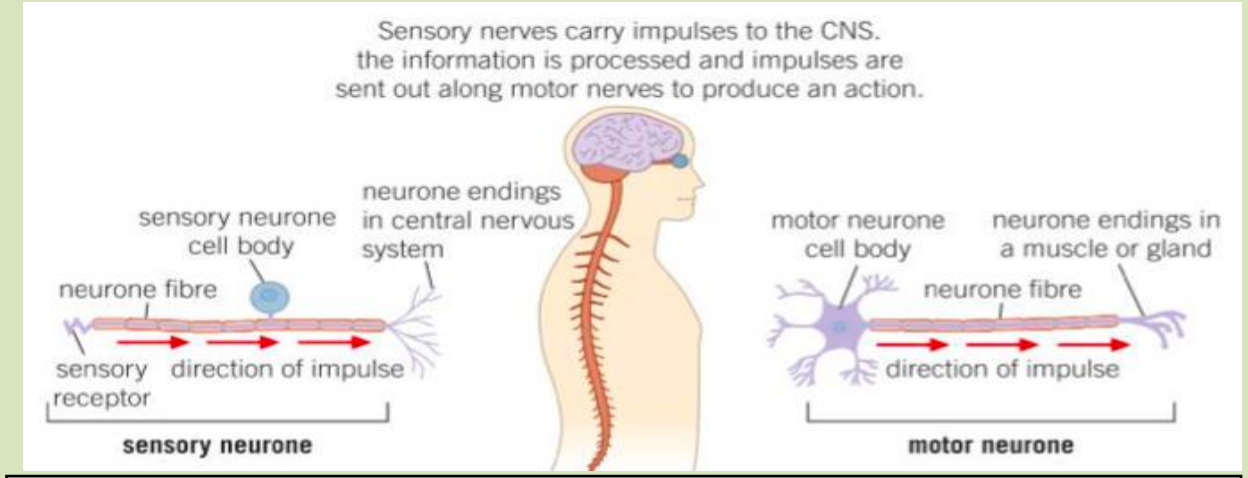
Effectors: muscles or glands that bring about responses to the stimulus.

The Nervous System

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

Synapse

- Neurones not joined, there are junctions called synapses.
- Electrical impulses travel along the neurones and across the synapse to the next neurone.
- A neurotransmitter is secreted across the synapse, electrical impulse travels down next neurone.

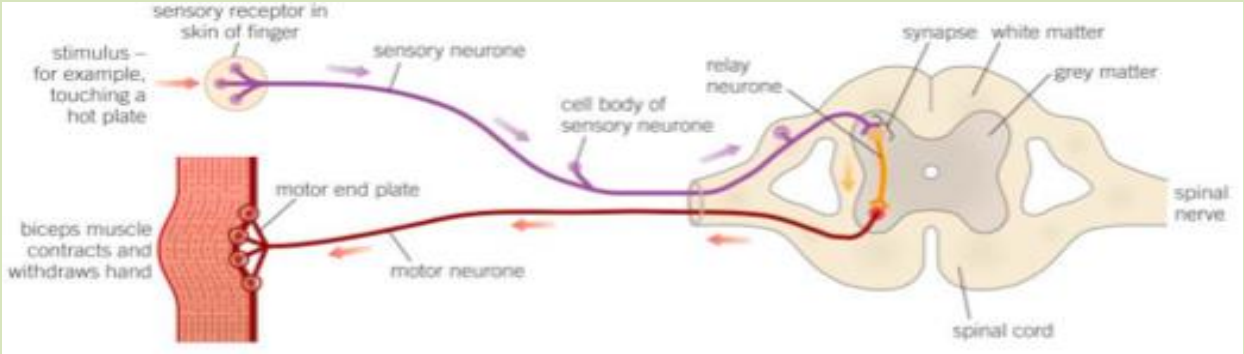


Reflexes

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

Reflex Actions:

1. Stimulus detected by receptor
2. Electrical impulse travels down sensory neurone
3. Across the synapse changing from electrical to chemical impulse
4. Back to electrical impulse across the relay neurone
5. Across the synapse changing from electrical to chemical impulse
6. Back to electrical impulse across the motor neurone
7. Muscle contracts preventing injury



Separate Science Only

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

The Brain

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

Parts of the Brain

The cerebral cortex is concerned with consciousness, intelligence, memory and language

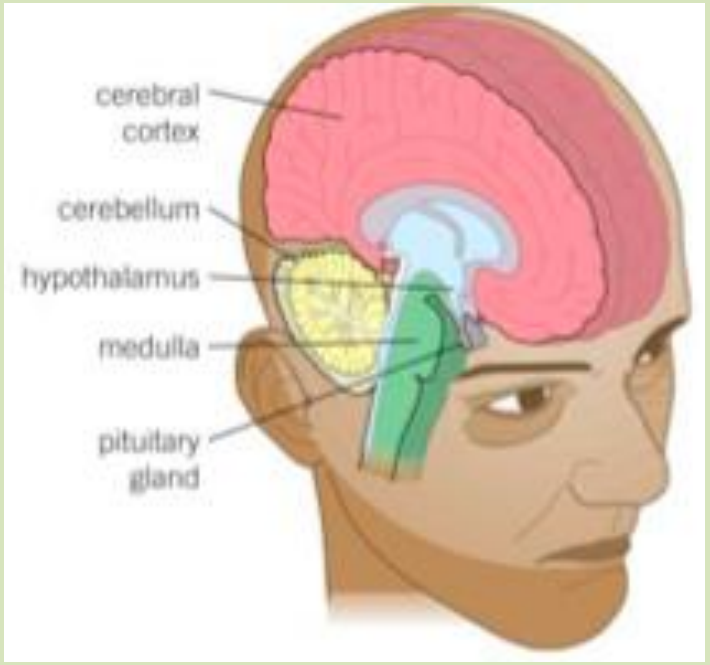
The cerebellum is concerned mainly with coordinating muscular activity and balance

The medulla is concerned with unconscious activities, such as controlling the heartbeat, movements of the gut and breathing

Cognito

Investigating the Brain

- Electrically stimulating different parts of the brain
  - No sensory nerve endings in the brain, brain surgery is usually undertaken with conscious patients
- MRI Scans
  - Magnetic resonance imaging scan will show exactly which area of the brain is affected
- Problems with the brain
  - Difficult to investigate and treat
  - Drugs do no always reach the brain through the membranes which surround it



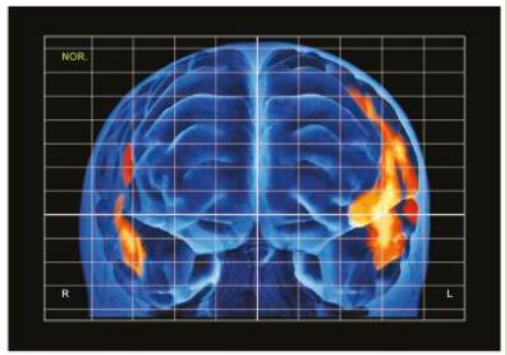


Figure 3 *This special MRI scan shows the areas of your brain active as you read – so they are working right now*

Separate Science Only

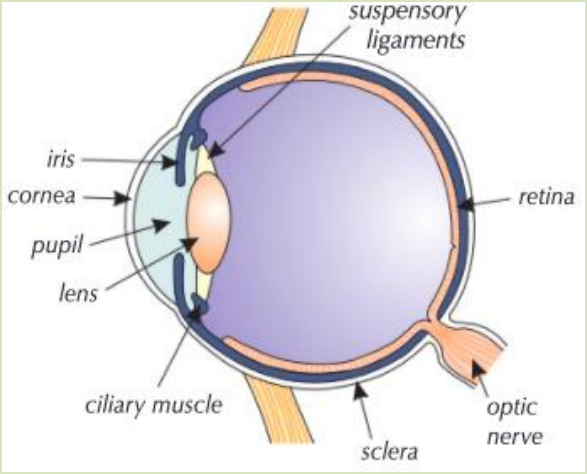
The Eye: A sense organ containing receptors in the retina that are sensitive to light intensity and colour.

Common defects of the eye

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

Cognito

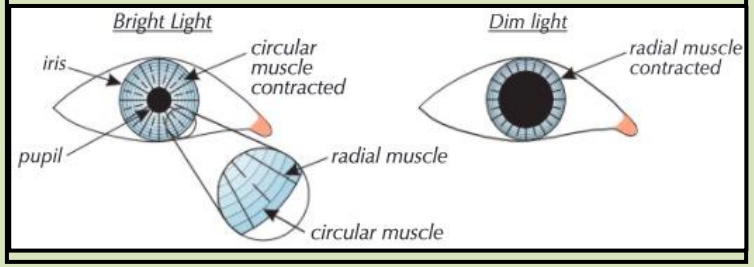
Sclera – the tough, supporting wall of the eye
Cornea – the transparent outer layer found at the front of the eye, it refracts (bends) light into the eye
Pupil – the hole in the centre of the eye, through which light enters
Iris – contains muscles that allow it to control the diameter of the pupil and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



Myopia

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

The Iris Reflex



New Technology

- Contact lenses
- Laser eye surgery – used to treat myopia
- Replacement lenses – permanent

Hyperopia

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

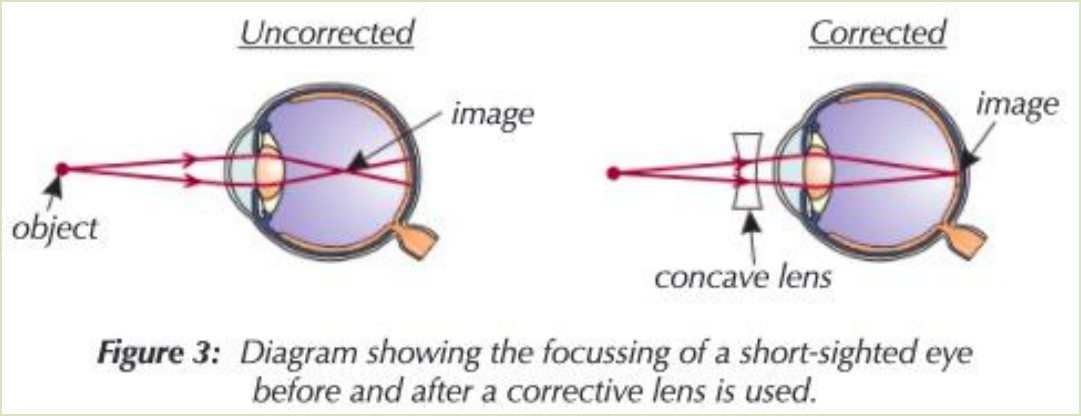


Figure 3: *Diagram showing the focussing of a short-sighted eye before and after a corrective lens is used.*

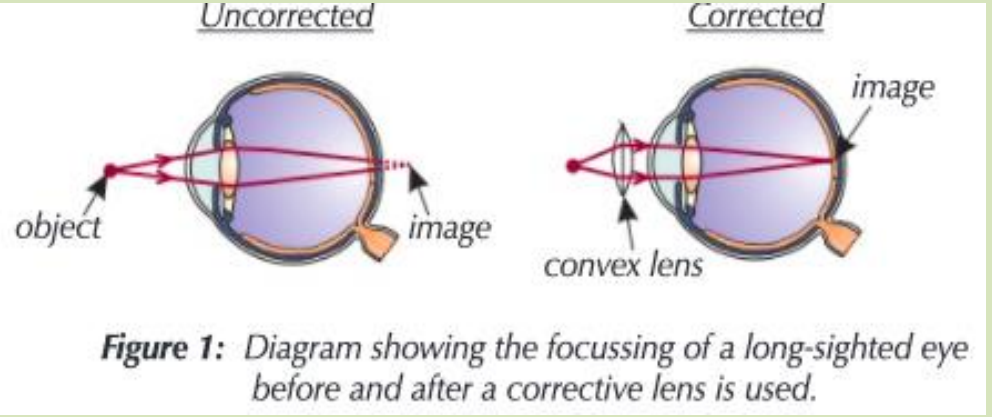
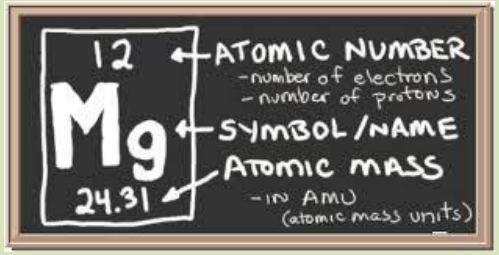


Figure 1: *Diagram showing the focussing of a long-sighted eye before and after a corrective lens is used.*

KS4 Chemistry:
C4 Chemical calculations

Relative atomic mass (Ar)
The relative atomic mass of an element is the relative mass of its atoms compared to the mass of a carbon-12 atom. The Ar values for elements are given in the periodic table. Since Ar is a measure of relative mass, it has no units.



Relative formula mass (Mr)
This is the mass in grams of 1 mole of the substance. To calculate it you need to:
add up the atomic mass (bigger number) of all of the atoms in the molecule.
e.g. 1. NaCl = Na + Cl = 23 + 35.5 = 58.5
e.g. 2. MgF_2 = Mg + (2 x F) = 24 + (2 x 19) = 62

Keyword	Definition
Law of conservation of mass	The law of conservation of mass states that no atoms are lost or made in a chemical reaction
Relative atomic mass	An average value of mass that takes account of the abundance of the isotopes of the element.
Relative formula mass	the total mass of atoms in a compound
Avogadro constant	The number of atoms, molecules or ions in one mole of a substance. Its value is 6.02×10^{23} per mole
mole	Unit of measurement in chemistry, calculated using $moles = \frac{mass}{Mr}$

Calculating masses in reactions (Higher)
Mg + 2HCl → $MgCl_2$ + H_2
This equation shows that one mole of magnesium reacts with two moles of hydrochloric acid to produce one mole of magnesium chloride and one mole of hydrogen gas. Suppose you started with 5 grams of magnesium, how much magnesium chloride would you make?
Step 1: Calculate the moles of the element or compound you were given in the equation:
5/24=0.21 moles of magnesium
Step 2: Look at the balanced equation, you must therefore have 0.21 moles of magnesium chloride, as the ration between magnesium and magnesium chloride is 1 to 1.
Step 3: Calculate the Mr of the relevant product: what you want to find is the Mr of magnesium chloride:
Mr of MgCl2 =24+35.5+35.5= 94
Step 4: Now find the mass of that number of moles of the product
Mass = moles x Mr
so 0.21 x 94= 19.7 grams

Calculating moles from masses -Higher Tier
If you know the mass of each reactant and product you can calculate a balanced equation from the masses, for example:
Calculate the balanced equation when 12 grams of magnesium reacts completely with 19.25g of HCl, to make 99 grams of $MgCl_2$ and 1 gram of H_2

Mg + HCl → $MgCl_2$ + H_2

Step 1: work out the moles of each reactant and product. Mg=12/24= 0.5
HCl=19.25/38.5= 0.5 MgCl2 =99/99 =1 H2 ½ = 0.5
Step 2: divide through by the smallest number Mg=0.5/0.5=1
HCl=0.5/0.5 = 1 $MgCl_2$ =1/0.5=2 H_2 ½ = 0.5/0.5=1
Step 3 write the balanced equation:
Mg + HCl → 2$MgCl_2$ + H_2

Concentration of solutions

A solution forms when a solute dissolves in a solvent

The concentration of a solution is a measure of how 'crowded' the solute particles are. The more concentrated the solution, the more particles it contains in a given volume.

Calculating concentration

The concentration of a solution can be calculated using:

- The mass of dissolved solute in grams, g
- the volume of solution (or solvent) in cubic decimetres, dm^3

$$concentration\ in\ g/dm^3 = \frac{mass\ of\ solute\ in\ g}{volume\ in\ dm^3}$$

Most chemical reactions are done in solution.

The concentration can be measured in grams per dm^3

For example what is the concentration in grams/dm3 of 2.4 grams of sodium chloride dissolved in 0.5 dm3 of water?

Concentration = Mass/Vol

Concentration = 2.4/0.5

Concentration = 4.8 g/dm3

In Chemistry we use dm_3 (decimetres cubed) to measure volume, a decimetre cubed is the same as a litre or 1000 cm_3.

Chemical measurements

Whenever a measurement is made in chemistry, there is always some uncertainty in the result obtained. There are many causes of uncertainty in chemical measurements.

For example it may be difficult to judge:

whether a thermometer is showing a temperature of 24.0°C, 24.5°C or 25.0°C or exactly when a chemical reaction has finished

There are two ways of estimating uncertainty:

- by considering the resolution of measuring instruments. The resolution of a measuring instrument is the smallest change in a quantity that gives a change in the reading that can be seen. A thermometer with a mark at every 1.0°C has a resolution of 1.0°C.

- from the range of a set of repeat measurements. For a set of repeat measurements, the uncertainty is ± half the range. This means that the value can be given as the mean value ± half the range.

Indicators – triple students only

For titrations universal indicator is not a suitable indicator to use.

As the colour changes are too gradual. For a titration, a sharp colour change is required .

Suitable indicators are listed below

	In acid	In alkali
Litmus	Red	Blue
Methyl Orange	Red	Yellow
Phenolphthalein	Colourless	Pink

Separate science only

Keyword	Definition
Yield	The amount of product made in a chemical reaction
Atom economy	The percentage of atoms that form useful products
Limiting reactant	The reactant that is all used up during a reaction
Molar gas volume	the volume occupied by one mole of any gas, at room temperature and pressure

Yield

A percentage yield is always 100% or less, the law of conservation of mass states that we cannot make mass in a chemical reaction. It is extremely rare that the yield of a chemical reaction is 100% reasons for this are:

$$\text{percentage yield} = \frac{mass\ of\ product\ actually\ made}{maximum\ theoretical\ mass\ of\ product} \times 100$$

- The reaction is reversible and may not go to completion
- There may be side reactions
- Some maybe lost when the product is transferred from the reaction vessel

Atom economy

Some reactions make more than one product, atom of these products will be waste products. The atom economy is a measure of the atoms that form useful products. Like percentage yields we express atom economy as a percentage so that comparisons can be easily made between reactions.

$$\text{atom economy} = \frac{total\ M_r\ of\ the\ desired\ product}{total\ M_r\ of\ all\ reactants} \times 100$$

For example below two ways of making hydrogen are outlined:

1. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Mr of $H_2 = 1 + 1 = 2$

Mr of $ZnCl_2 = 65 + 35.5 + 35.5 = 136$

Atom economy = $2/136 + 2 \times 100 = 1.45\%$ Very low atom economy

2. $CH_4 + 2H_2O \rightarrow CO_2 + 4H_2$

Mr of $H_2 = 1 + 1 = 2$

Mr of $CO_2 = 12 + 16 + 16 = 44$

Atom economy = $4 \times 2/44 + (4 \times 2) \times 100 = 15.4\%$ Higher atom economy

In the second example the atom economy is higher, therefore in terms of atom economy reaction 2 is better. Chemists often need to balance atom economy and percentage yield. A poor atom economy is bad for a number of reasons:

1. A lot of reactant is wasted, this costs money.
2. The waste products have to be disposed of, this can be expensive. Some companies try to get around this problem by reusing the waste product.

The best reactions in terms of atom economy are those that only make one product, for example the Haber Process.

Gas volume

The molar volume is equal to 24 dm^3 (24,000 cm^3). This volume is given in questions that need it.

The volume of a known Amount of gas can be calculated:

Volume = amount in mol × molar volume

For Example: What volume would 2 grams of carbon dioxide occupy at room temperature and pressure?

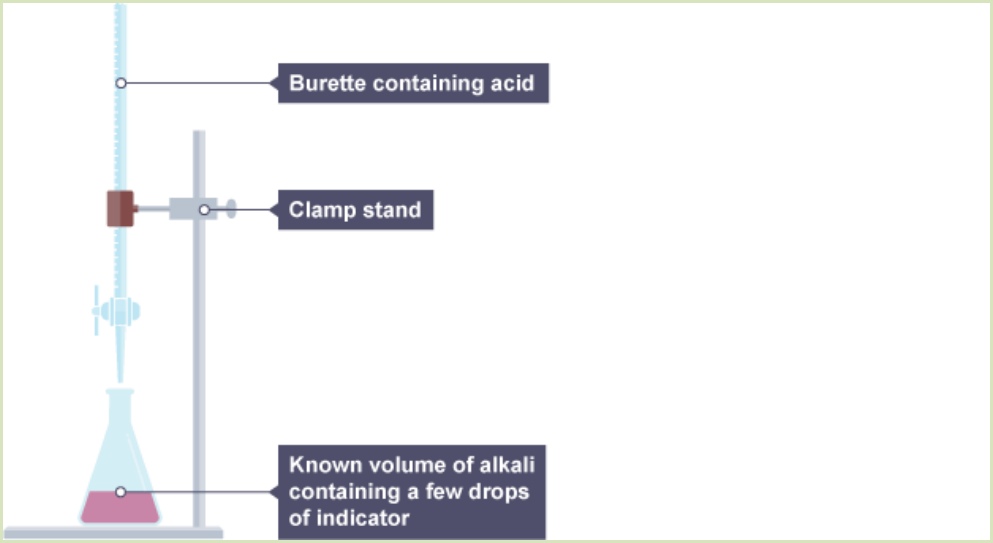
Step 1: Calculate the moles of carbon dioxide= 2/44= 0.05 moles

Step 2: Multiply this number by 24 as we know 1 mole occupies 24 dm_3 0.05x24= 1.2 dm^3

Separate science only

Titrations

Titrations are used to find out an unknown concentration of a solution, this is often used to find out the concentration of an acid or an alkali in a neutralisation reaction.



To carry out a titration to find the concentration of an alkali you need to do the following:

1. A pipette is used to measure 25 cm3 of alkali, this is then transferred to a conical flask.
2. 3-4 Drops of indicator is added (phenolphthalein).
3. An acid of known concentration is placed in the burette
4. The solution from the burette is allowed to slowly run into the conical flask. As the end point approaches the acid is added one drop at a time. When phenolphthalein is used as an indicator, the end point is where the solution turns from colourless to pink.
5. The volume of acid used from the burette is noted to calculate the concentration of the alkali in the conical flask.

Hazards, risks and precautions

Identify the hazards and suggest precautions needed to reduce the risk of harm.

For example:

Hazard	Possible harm	Precaution
Dilute sodium hydroxide solution	Causes skin and serious eye irritation	Wear gloves and eye protection, and use a pipette filler
Spilling hydrochloric acid while filling the burette	Causes eye irritation	Fill the burette slowly below eye level, using a funnel

Titration Calculations

We can use the information that we get from a titration to work out the concentration of an alkali or acid.

For example a titration was carried using hydrochloric acid and sodium hydroxide, the equation for this reaction is:

$HCl + NaOH \rightarrow NaCl + H_2O$

This means that one mole of hydrochloric acid will neutralise 1 mole of sodium hydroxide.

Therefore we can calculate the following: 27.5 cm^3 of 0.2 mol/dm^3 hydrochloric acid is needed to titrate 25.0 cm^3 of sodium hydroxide solution. What is the concentration of the sodium hydroxide solution?

Step 1: Convert all volumes to dm3

27.5 cm^3 = 27.5 ÷ 1000 = 0.0275 dm3

25.0 cm^3 = 25.0 ÷ 1000 = 0.025 dm^3

Step 2: Calculate the number of moles of the substance where the volume and concentration are known

number of moles = concentration × volume

number of moles of hydrochloric acid = 0.2 × 0.0275 = 0.0055 mol (5.5 × 10–3 mol)

Step 3: Calculate the unknown concentration. We can say that 0.0055 mol of acid will react with 0.0055 mol of alkali

concentration of alkali = moles ÷ volume

= 0.0055 ÷ 0.025 = **0.22 mol/dm^3**

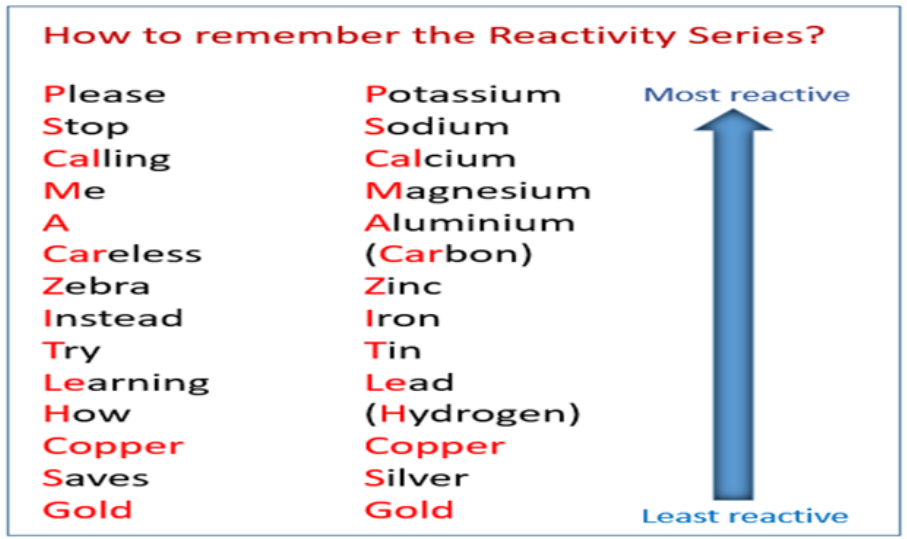
KS4 Chemistry – C5 Chemical Changes

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 *unreactive* (at the bottom) and do not react easily or at all in reaction e.g. gold



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: $Mg\ (s) - 2\ e^- \longrightarrow Mg^{2+}\ (aq)$

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

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 using 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 scale to tell us how acidic or alkaline an aqueous 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 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 dissociated in solution, e.g. ethanoic acid

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

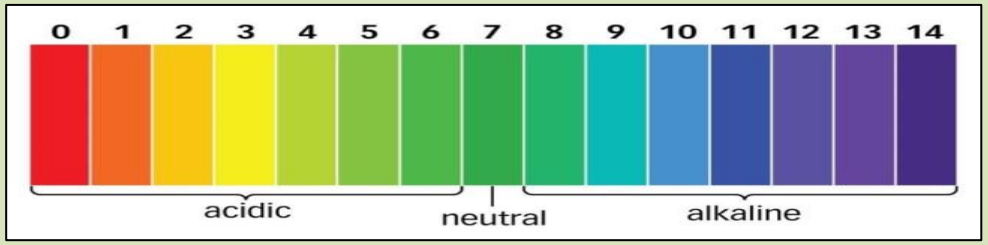
e.g. lead oxide + carbon → lead + carbon dioxide

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

OILRIG is a useful way of remembering:

Oxidation Is Loss (of electrons)

Reduction Is Gain (of electrons)



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

Names of Salts

The acid used provides the negative ions present in all salts.

Hydrochloric acid 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.

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

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

Making a copper salt – this is a required practical.

Sulphuric acid + copper oxide → copper sulfate + water

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

Method:

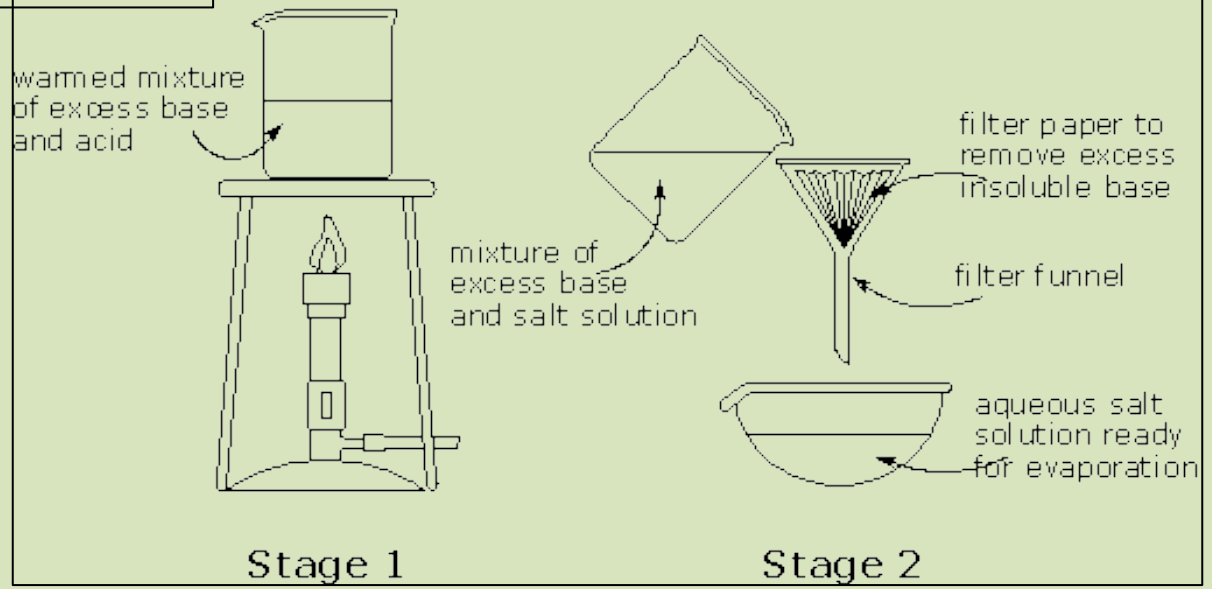
Add EXCESS insoluble copper oxide to sulphuric acid and stir.

Warm gently on a tripod – the solution will turn blue.

Filter off excess copper oxide.

Evaporate the water so that crystals of copper sulfate start to form.

Stop heating when you have evaporated about half the water and allow the rest of the water to evaporate off naturally.



KS4 Chemistry C6 - Electrolysis

Electrolysis

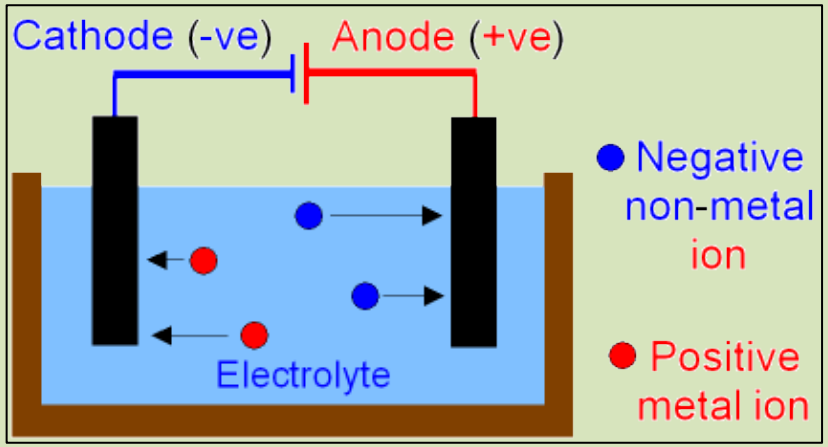
When an ionic compound is melted or dissolved in water, the ions are free to move about within the liquid or solution (electrolyte). Electrolytes can conduct electricity.
If an electric current is passed through this solution the ions will move to the electrodes.
Opposites attract.
Positive ions (cations) will go to the negative electrode (cathode)
Negative ions (anions) go to the positive electrode (anode).
For example, in the electrolysis of lead bromide, Lead ions (Pb^{2+}) go to the negative electrode and bromide ions (Br^{--}) go to the positive electrode. The elements lead and bromine are formed.

Key Term	Definition
Electrolysis	The breaking down of a substance using electricity.
Electrolyte	The solution which is being broken down during electrolysis.
Oxidation	The loss of electrons.
Reduction	The gain of electrons.
Anode	The positive electrode.
Cathode	The negative electrode.
Half Equation	An equation that shows the reaction at each electrode.

Electrolysis of Copper Sulfate

Which elements form at which electrode depends on the **reactivity** of the elements involved.
In the electrolysis of aqueous copper sulfate, there are also H^+ and OH^- ions from the water which is used as the solvent. This means there are more than one possible ion that can go to each electrode.
Positive ions: copper (Cu^{2}+) and hydrogen(H^+)
Negative ions: sulfate(SO_4^{2-}) and hydroxide(OH^-)

Copper is **less reactive** than hydrogen, so copper (Cu) is produced at the negative electrode.
The half equation is: $Cu^{2+} + 2e^- \rightarrow Cu$
The hydroxide ion is more reactive than the sulfate ion, therefore this **forms water (H_2O) and oxygen** at the positive electrode.
The half equation is: $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$



OILRIG – Oxidation is Loss (of electrons), Reduction Is Gain (of electrons)
When a positive ion reaches the negative electrode, it gains electrons. This is a reduction reaction.
When the negative ion reaches the positive electrode, it loses electrons, this is an oxidation reaction.
We can represent these using half equations A half equation can represent the reaction at each electrode. Half equations show how electrons are transferred and an electron is represented in an equation by an *e*- symbol. Half equations show electrons (e-) and how ions become atoms. For example $Cu^{2+} + 2e^- \rightarrow Cu$.
1. Write down the ion and atom: $Cl^- \rightarrow Cl_2$
2. Balance the number of ions and add electrons to balance the charges if required $2Cl^- \rightarrow Cl_2 + 2\,e^-$

Remember that non-metal ions will typically form diatomic molecules.

Extracting Aluminium from bauxite

Aluminium oxide is dissolved in molten cryolite .

Cryolite reduces the melting point of aluminium oxide so the process requires less energy.

Aluminium ions (Al^{3+}) are attracted to the negative electrode.

Aluminium atoms are formed at the negative electrode (gain 3 electrons)

Oxide ions ($O2^-$) are attracted to the positive electrode.

Oxygen is formed at the positive electrode (each ion loses 2 electrons).

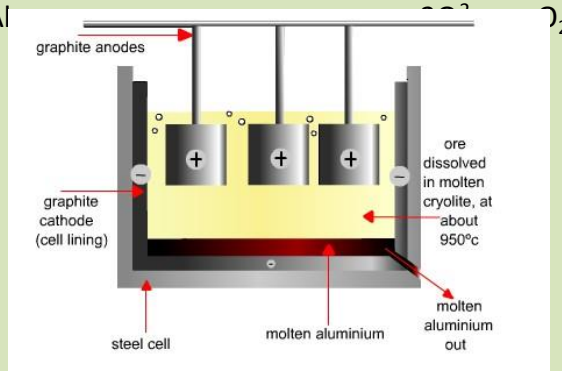
Oxygen reacts with carbon to make carbon dioxide. The carbon electrode needs to be replaced constantly.

At the negative electrode:

$Al^{3+} + 3e^- \rightarrow Al$

At the positive electrode

$O_2 + 4e^-$



Overall equation: $2Al_2O_3 \rightarrow 4Al + 3O_2$

Electrolysis of Brine – required practical

Which elements form at which electrode depends on the **reactivity** of the elements involved.

The electrolysis of brine is the electrolysis of a solution of sodium chloride so there are also H^+ and OH^- ions from the water which is used as the solvent. This means there is more than one possible ion that can go to each electrode.

· **Positive ions:** sodium (Na+) and hydrogen (H+)

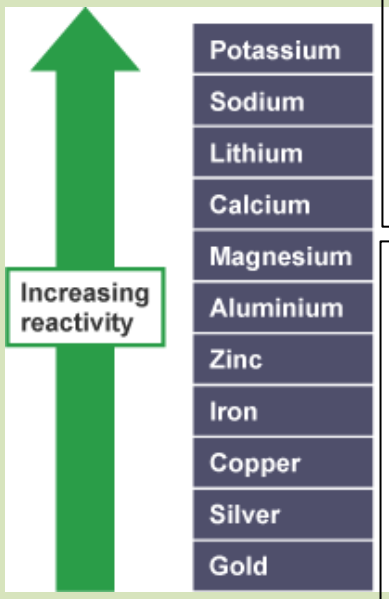
· **Negative ions:** chlorine (Cl-) and hydroxide (OH-)

When there is a mixture of ions, the products formed depend on the reactivity of the elements involved.

Hydrogen is less reactive than sodium, so hydrogen gas (H_2) is produced at the negative electrode.

Chlorine gas (Cl_2) is produced at the positive electrode.

Sodium hydroxide is produced from the ions that remain in solution.



Rules if there is more than one positive or negative ion present

If there are 2 positive ions present, the lease reactive element gets discharged

If there are 2 negative ions present the halogen (if present) will be discharged first.

Types of ions

Metals and hydrogen form positive ions e.g. H^+. Na^+. Mg^{2+}, Al^{3+}

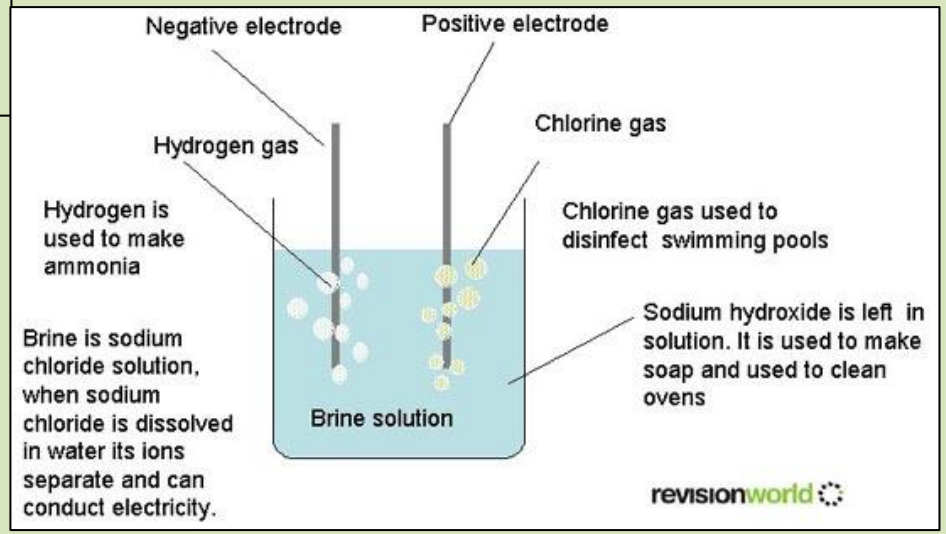
Non-metals from negative ions e.g. O^{2-}, Cl^-, OH^-

The formula of the compound formed depends on the charges on the ions and the number of positive and negative ions needed to form a neutral compound.

Gas Tests

During electrolysis the products made are often gases. Below are the tests for three common gases you need to know

Gas	Test	Result
Hydrogen	Place a lit splint into the gas	If a squeaky pop is heard hydrogen is present
Oxygen	Place glowing splint into gas	If splint is relighted then oxygen is present
Chlorine	Damp litmus paper placed in gas	If paper bleaches chlorine is present
Carbon Dioxide	Bubble the gas through limewater	If the limewater goes cloudy carbon dioxide is present

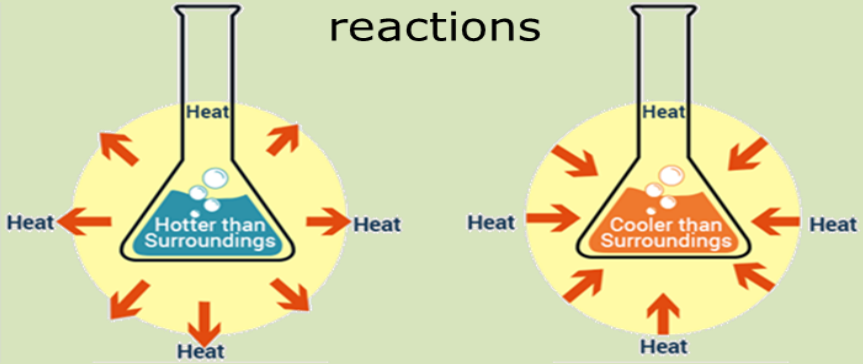


KS4 Chemistry:
C7 Energy changes

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

Bond breaking	Bonds need to be broken between the reactants before bonds can be made to form the products. Energy has to be taken in to break a bond, so bond breaking is always endothermic.
Bond making	To form bonds between the product molecules, energy is released, so bond making is always exothermic.

Exothermic vs Endothermic reactions

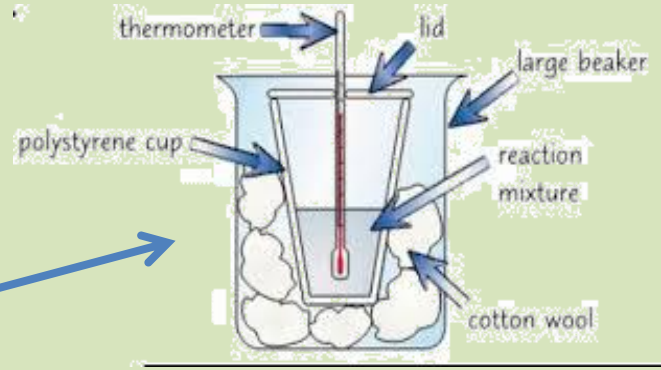


Energy can not be created or destroyed- only transferred from one form to another. Heat is an example of energy, in Exothermic reactions heat is transferred to the surroundings from the reaction and in Endothermic reactions heat is transferred from the surroundings to the reactions

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

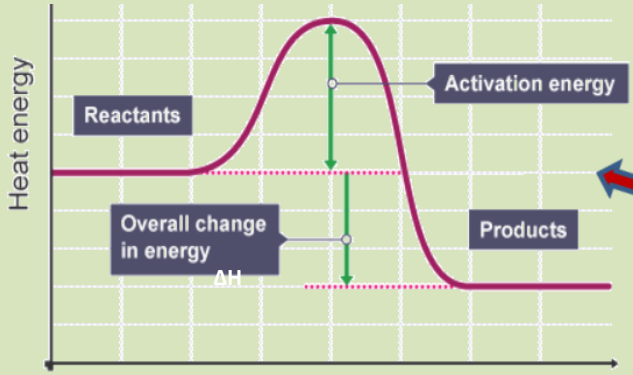
Examples

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

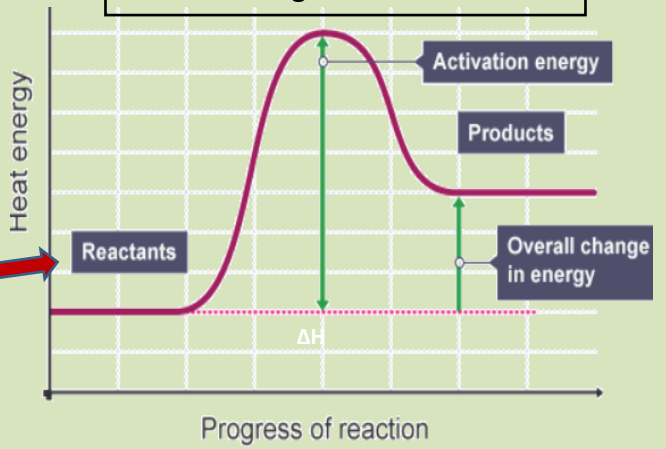


Reaction Profiles

Exothermic
Reactants higher than products



Endothermic
Products higher than reactants



Bond energy calculations (Higher)

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

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

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

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

Energy change = Energy of bond breaking (Reactants) − Energy of bond making (Products)

Reaction: $2H_2 + O_2 \rightarrow 2H_2O$

1

2

H—H 436 x2

O=O 498 x1

3

H—O 464 x4

872kj/mol + 498kj/mol = 1370kj/mol

1856kj/mol

Energy change = Energy of bond breaking (Reactants) − Energy of bond making (Products)

4

1370kj/mol − 1856kj/mol = -486kj/mol

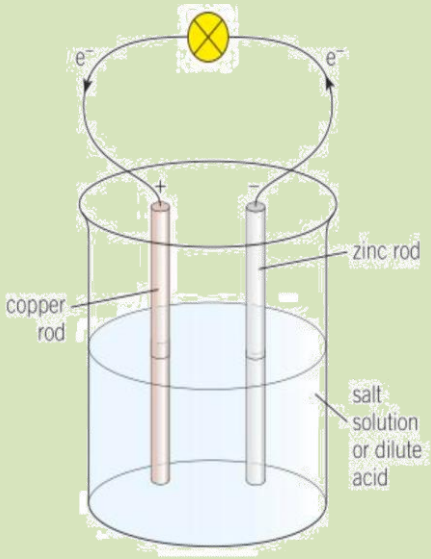
Chemical and fuel cells (Chem only)

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

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

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

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



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

<u>Pros</u>
- Does not need to be electrically recharged
- No pollutants produced

<u>Cons</u>
- Hydrogen is difficult to store
- Is highly flammable
- Is sometimes produced using finite resources

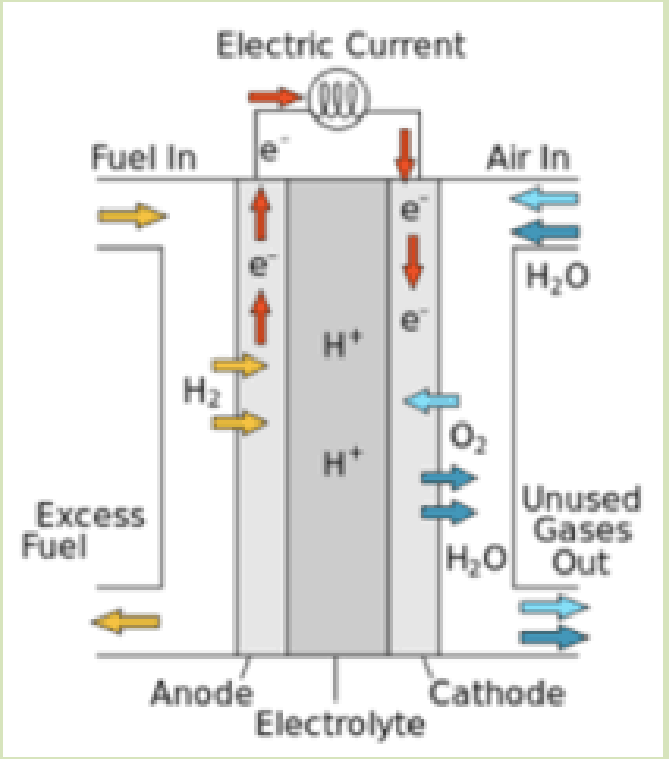
<u>Half equations</u>

Negative electrode: $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$

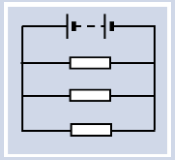
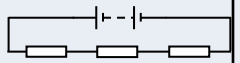
Positive electrode: $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

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

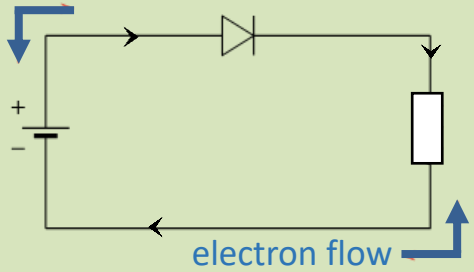
$2H_2 + O_2 \rightarrow 2H_2O$



KS4 Physics: P4 Electrical circuits

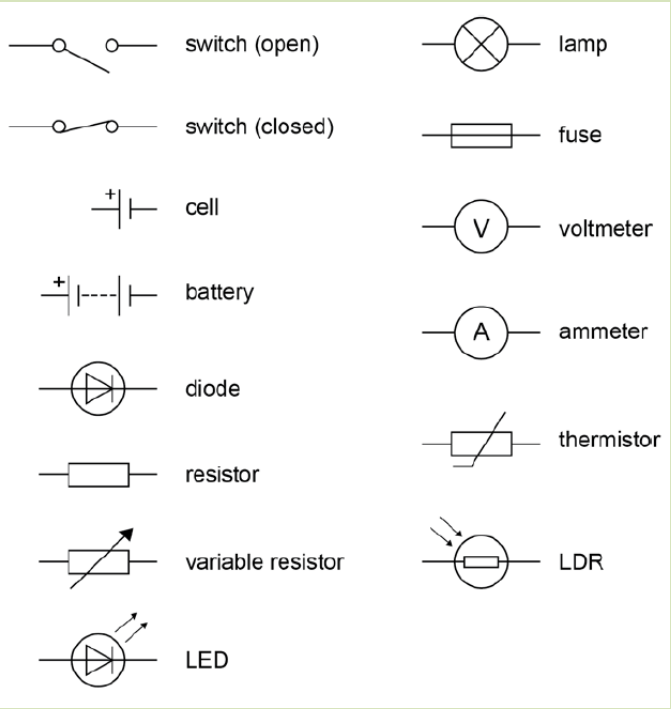
Key words	
Current	The rate of flow of charge. Negatively charged electrons flow in the wire. Current is a measure of how much charge passes a point every second. The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. 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

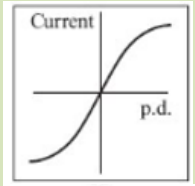
Conventional current goes from positive to negative. It is shown on circuit diagrams using arrows on the lines(wires). *This important when considering which way round to put diodes in a circuit!*



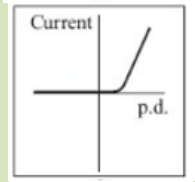
They later discovered **electrons flow in the wires** from negative to positive, this is shown with arrows outside the circuit.

Circuit symbols

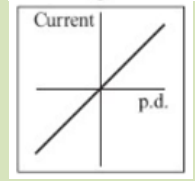




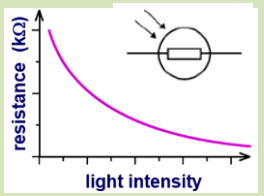
Filament bulb: As you pass a voltage across a filament lamp, the filament wire gets hotter. This causes the ions in the wire to vibrate faster making it harder for electrons to flow, increasing the resistance. As you increase the voltage the current increases but at a decreasing rate.



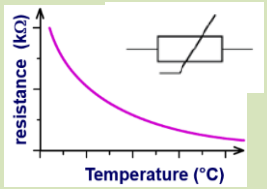
Diode: Diodes only allow current to flow in one direction. In the other direction they have an extremely high resistance



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

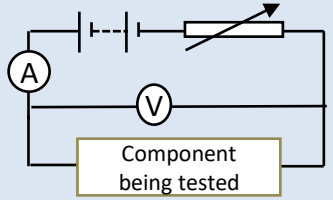


Light dependent resistor (LDR): As the light intensity increases the resistance of an LDR deceases. They are often used as light sensors.

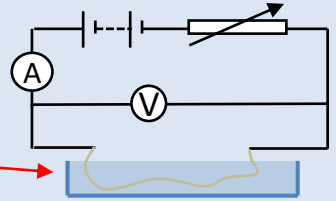


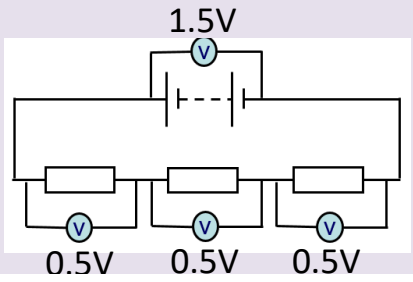
Thermistor: As the temperature of a thermistor increases the resistance deceases. They are often used in thermostats and temperature sensors.

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

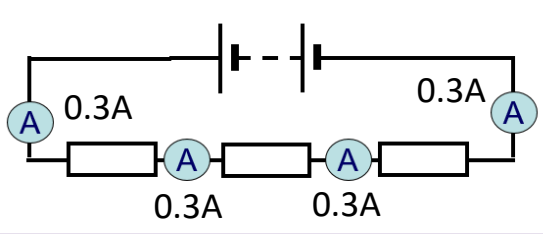


Through of water with wire submerged to maintain a constant temperature





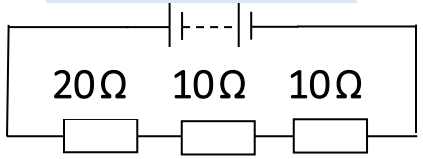
In Series
Potential difference is shared across each component depending on the resistance of each component



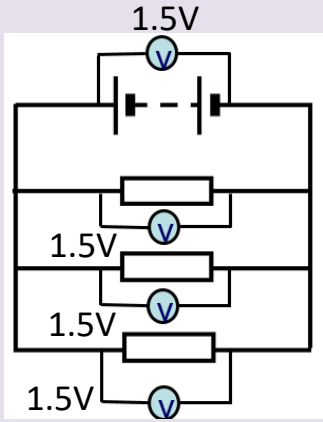
Current is the same every where in the circuit

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

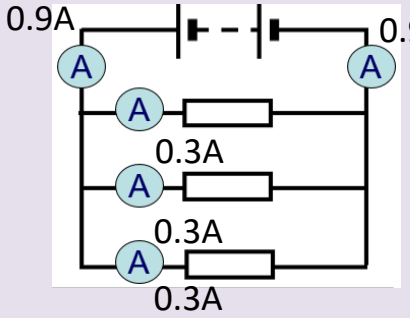
$R_T = R_1 + R_2 + R_3$



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 charges to flow, thus reducing the overall resistance.

$$Q = I\ t$$

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

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

Required practical 3

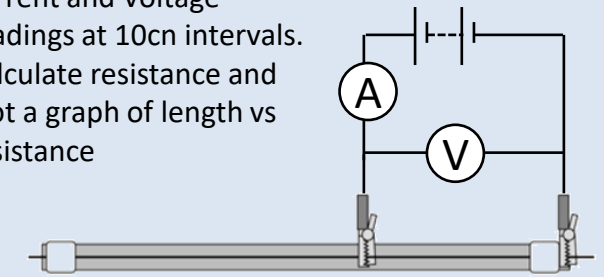
How does length of a wire affect its resistance

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



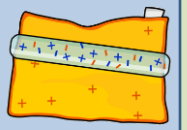
Static electricity – Separate Science only

Friction can remove or add electrons to objects

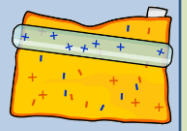
Opposite charges attract

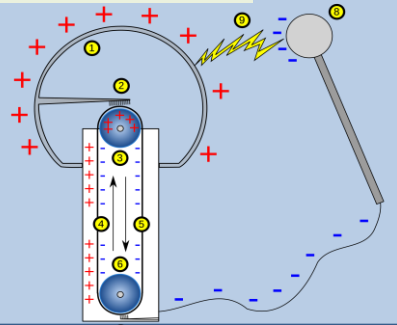
Like Charges repel

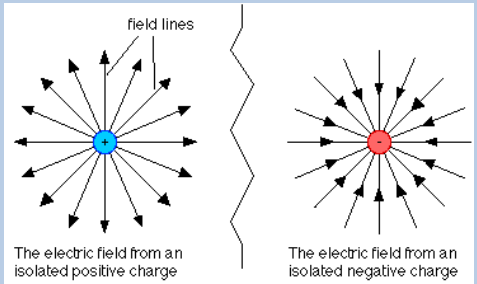
Polythene rod – becomes negative as electrons transfer from the cloth to the rod

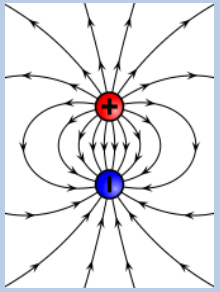


Acetate rod – becomes positive as electrons transfer from the rod to the cloth

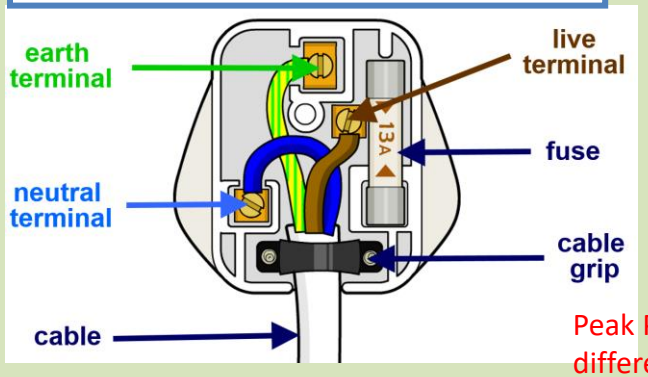




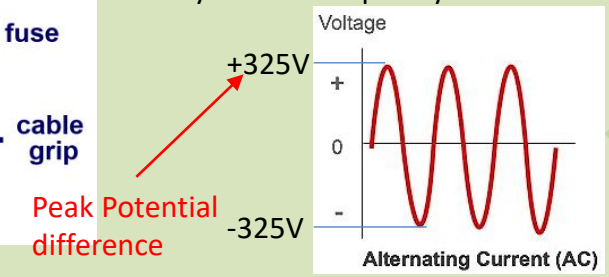




KS4 Physics:
P5 Electricity in the home

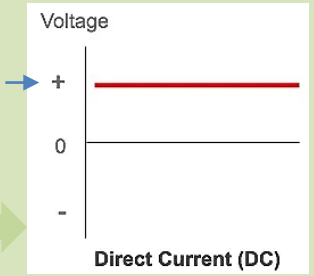


Mains electricity is an **Alternating Current** (AC). The current switches repeatedly from + to –
The electrons flow back and forth in the wire. It does this 50 times a second. We say it has a frequency of 50Hz.

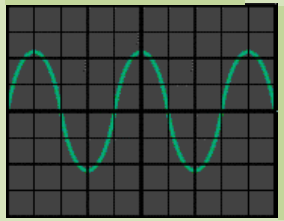


Frequency = $\frac{1}{\text{time taken for 1 cycle}}$

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)

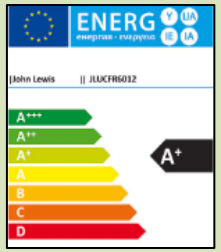
Live wire	**brown**	The live wire carries the alternating potential difference from the supply. The potential difference between the live wire and earth (0 V) is about 230 V (It alternates between +325V and -325 volts)
Neutral wire	**blue**	The neutral wire completes the circuit. The neutral wire is 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 = $\left(\frac{\text{Useful energy output}}{\text{Total energy input}}\right) \times 100$

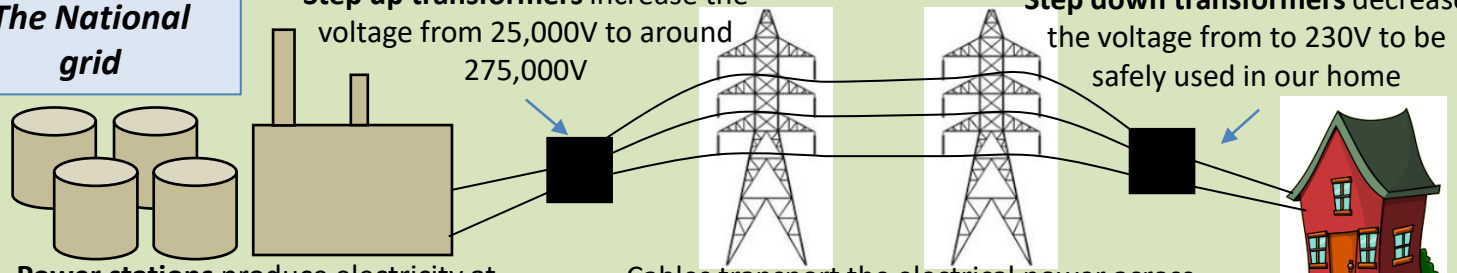
Efficiency = $\left(\frac{\text{Useful power output}}{\text{Total power input}}\right) \times 100$

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**

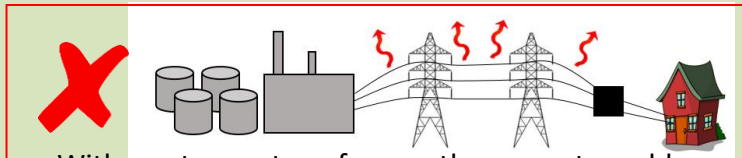
Step down transformers decrease the voltage from to 230V to be safely used in our home

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

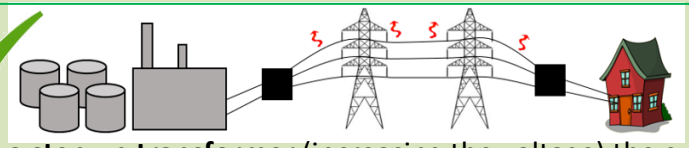
Reducing electrical energy losses

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



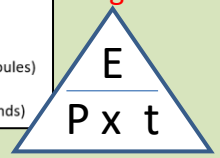
With a **step up transformer** (increasing the voltage) the current would reduce resulting in much less heating in the wires, resulting in more electrical power being supplied to the home.

Power, Energy, Time

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

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

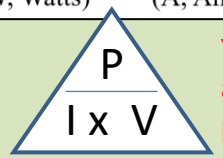
Power is the amount of energy used every second. You can work out how much energy you have used with an appliance if you know the power rating of the appliance and how long it has been on for.



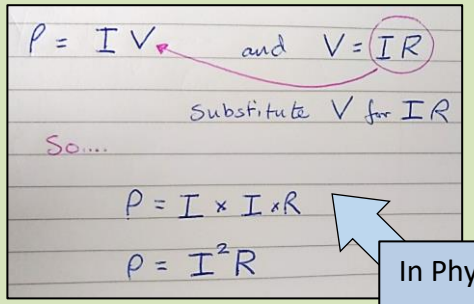
Power, Current, Potential difference

$$P = I \times V$$

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 Physics: P7 Radioactivity

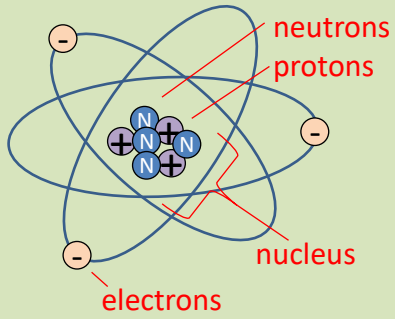
Atomic structure

Subatomic particle	Mass	Charge
Neutron	1	0
Proton	1	+1
Electron	Very small $\frac{1}{2000}$ th	-1

Relative atomic mass = number of protons and neutrons in the nucleus

$^{7}_{3}Li$

Atomic number = number of protons (number of electrons also)



P = 3
E = 3
N = 4 (7-3)

To work out the **number of neutrons** = **atomic mass – atomic number**

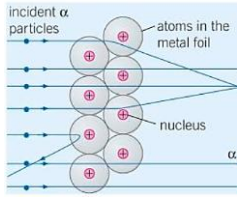
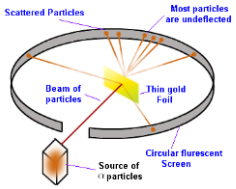
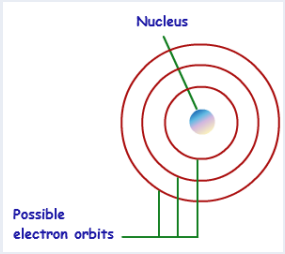
Isotope: An element containing the same number of **protons** but a different number of **neutrons**

$^{12}_{6}C$ P=6 E=6 N=6

$^{14}_{6}C$ P=6 E=6 N=8

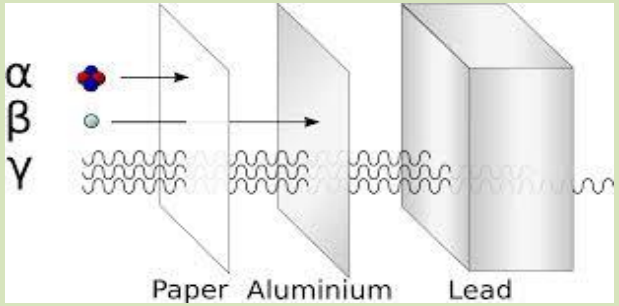
Some isotopes are more stable than others. Some isotopes are unstable and undergo radioactive decay.

The History of the Atom

Name	Date	Discovery	Diagram	Explanation
J J Thomson	1897	The electron – Plum pudding Model		Discovered the electron, proposed the plum pudding model that there were negatively charged electrons embedded in a sphere of positive charge
Rutherford Geiger and Marsden	1911	The Nucleus Nuclear model of the atom – gold leaf exp.	 	Positively charged alpha particles were fired at very thin gold foil, with Thomson's model they would have passed through but some were deflected and some reflected back. This could only be explained by a concentrated mass and charge at the centre of the atom. The charge must have been positive to deflect the alpha particles. Most of the atom must be empty space for the majority to pass straight through.
Niels Bohr	1922	Electron shells		He discovered that elements emitted light of only specific wavelengths leading to the idea that electrons exist in specific energy levels or shells. Electrons move closer to the nucleus when they emit EM radiation and further from the nucleus when they absorb EM radiation.
James Chadwick	1932	The neutron		Noticed that the mass of protons in an atom did not add up to the total mass of the atom, he later experimentally discovered the charge-less neutron.

Some isotopes **decay**, radioactive substances give out nuclear radiation in the form of **alpha particles** (α), **beta particles** (β), and **gamma rays** (γ).

When this nuclear radiation interacts with other atoms or molecules, they may break them up into **ions.** This is known as **ionization**.



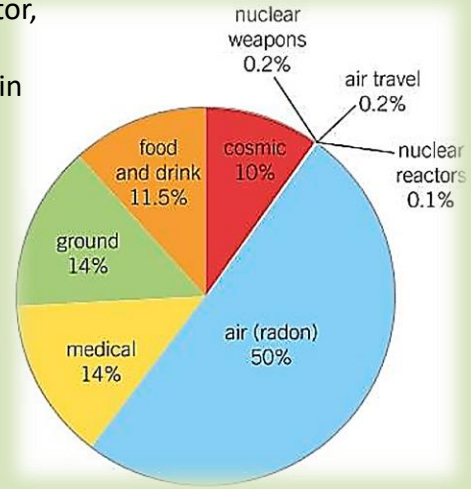
Radiation	Symbol	What is it?	Ionisation strength	Penetrating power	Range in air
Alpha α	$^{4}_{2}He$ $^{4}_{2}\alpha$	A Helium nucleus	Strongly ionising	Stopped by paper	A few cm (~10cm)
Beta β	$^{0}_{-1}e$ $^{0}_{-1}\beta$	An electron	Moderately ionising	Stopped by aluminium	Several metres
Gamma γ	$^{0}_{0}\gamma$	An electro magnetic wave	Very weakly ionising	Stopped by thick lead	Many, many meters

Measuring radiation:

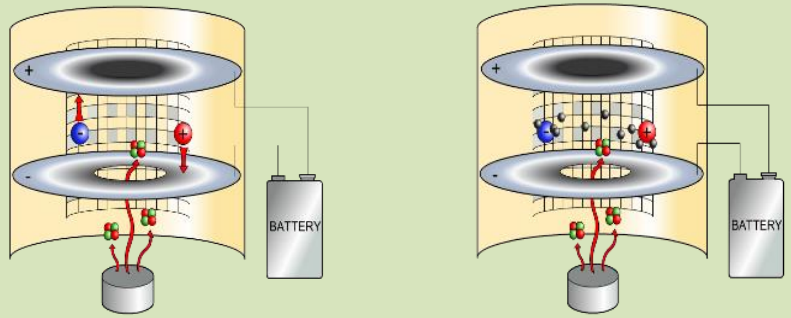
- **Count-rate** is the number of decays recorded each second by a detector, such as the Geiger-Muller tube.
- **Activity:** the number of decays per second from a sample (measured in Becquerel's Bq).
- **Sieverts**: this is a unit for dose (Sv) usually given in milli Sieverts, mSv

We are exposed to **background radiation** every day and it poses an extremely low risk. Most of this occurs naturally.

People who work with ionising radiation have to monitor their exposure time to ensure they do not go above the safe limits of exposure.

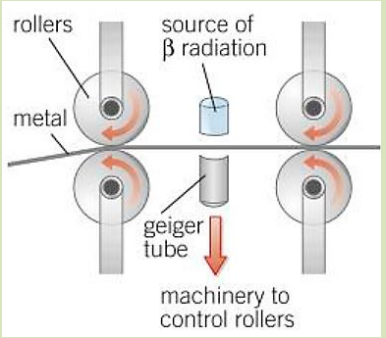


Uses of radioactive decay

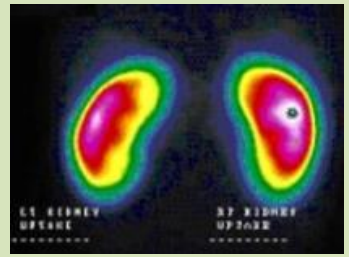


Alpha particles are used in smoke detectors. The alpha particles ionise air between two plates in a circuit. This allows a current to flow. If smoke is present, this interacts with the alpha particles resulting in a drop in the current and the alarm sounds.

Beta particles are used to detect the thickness of paper. If the detector detects too much beta radiation the paper has become to thin and the rollers are adjusted. If too little radiation passes through it means the paper is too thick.



Gamma Radiation has many uses. It can be used to sterilise medical equipment. It can be fired in narrow beams at cancerous cells as it can pass through the skin and body tissue.

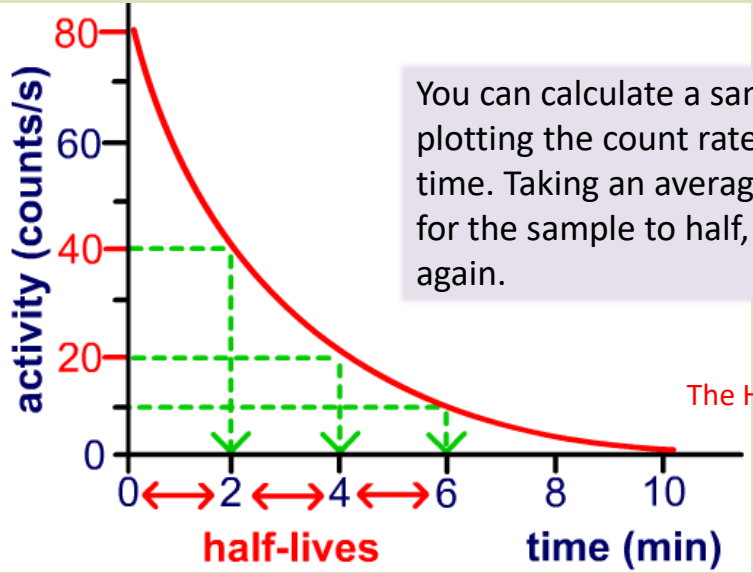


It is used for radioactive tracers, for example to check for blockages in the kidneys. A solution containing a gamma source is ingested and gamma radiation will be emitted more strongly from an area that may be blocked as their will be a greater concentration of the gamma source. The source must have a long enough half-life to get readings but short enough not to cause harm to the body.

Half-life The half-life of a radioactive isotope is the average time that it takes for **half** the nuclei in a sample to decay.

There are three ways to consider half-life:

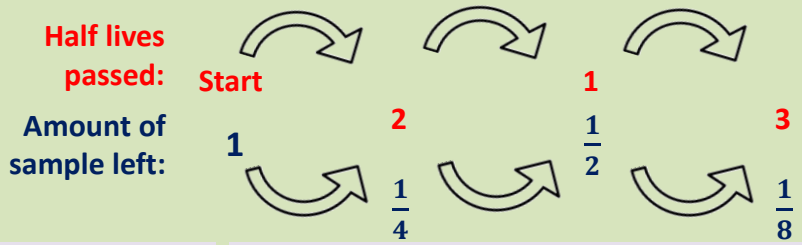
Half-life is the time it takes for half of nuclei in a sample to decay
Half-life is the time taken for the activity of the sample to halve
Half-life is the time taken for the count rate to halve



You can calculate a sample's half-life by plotting the count rate of the sample over time. Taking an average of the time it takes for the sample to half, then half again and again.

The Half life of this sample is 2 minutes

You may be asked to work out how much of a sample is remaining after a particular time. To do this work out how many **Half-lives** have passed. If 3 half-lives have passed you will have $\frac{1}{8}^{th}$ the original sample left.



Example. A sample of 12g of iodine has a half-life of 8 days. How much of the sample will remain after 24 days?

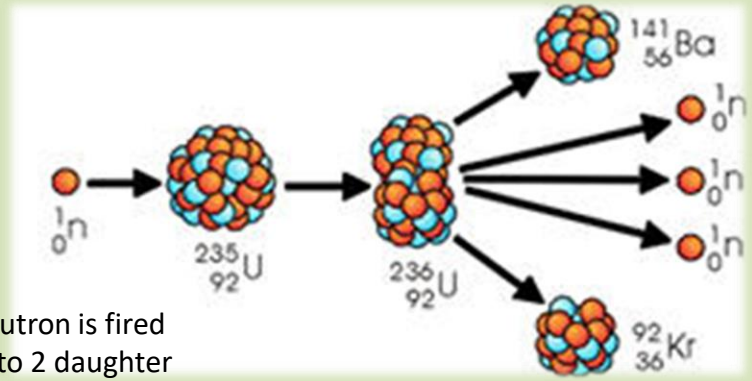
Answer: 24 days = 3 x half-lives. So the sample with have halved 3 times. There will be 1/8th remaining so 1/8th of 12g = 1.5g remaining

Physics Separates Science only

Fission and fusion

Fission : splitting atoms
Fusion : joining atoms

Nuclear fission occurs when a stable isotope is struck by a **neutron**. The isotope absorbs the neutron, becomes unstable and then **splits** apart, releasing large amounts of energy.



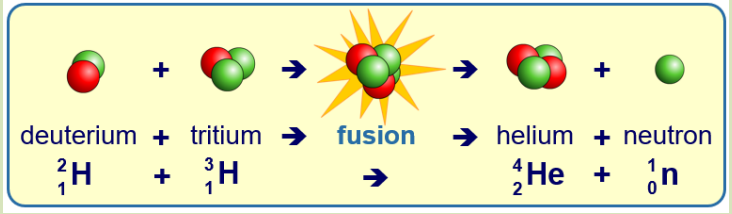
In a fission chain reaction a neutron is fired at a ^{235}U nucleus. This splits into 2 daughter nuclei and releases 3 more neutrons. These in turn collide with other ^{235}U nuclei and the process repeats. Lots of energy is released in the form of kinetic energy and gamma rays.

Nuclear Power stations control the chain reaction to harness the energy and heat water (creating stem to spin a turbine and generator)

Benefits: The fission of 1 kilogram of **uranium-235** releases more energy than burning 2 million kilograms of coal and there is no CO_2 output from Nuclear fission.

Drawbacks: Nuclear power stations produce nuclear waste that remains radioactive for 1000s of years. Accidents at nuclear power plants can result in harmful substances entering the environment.

Nuclear fusion occurs in under extremely high temperatures and pressures like that found in the sun and other stars. Small Nuclei are fused together to form larger atoms and energy is released.



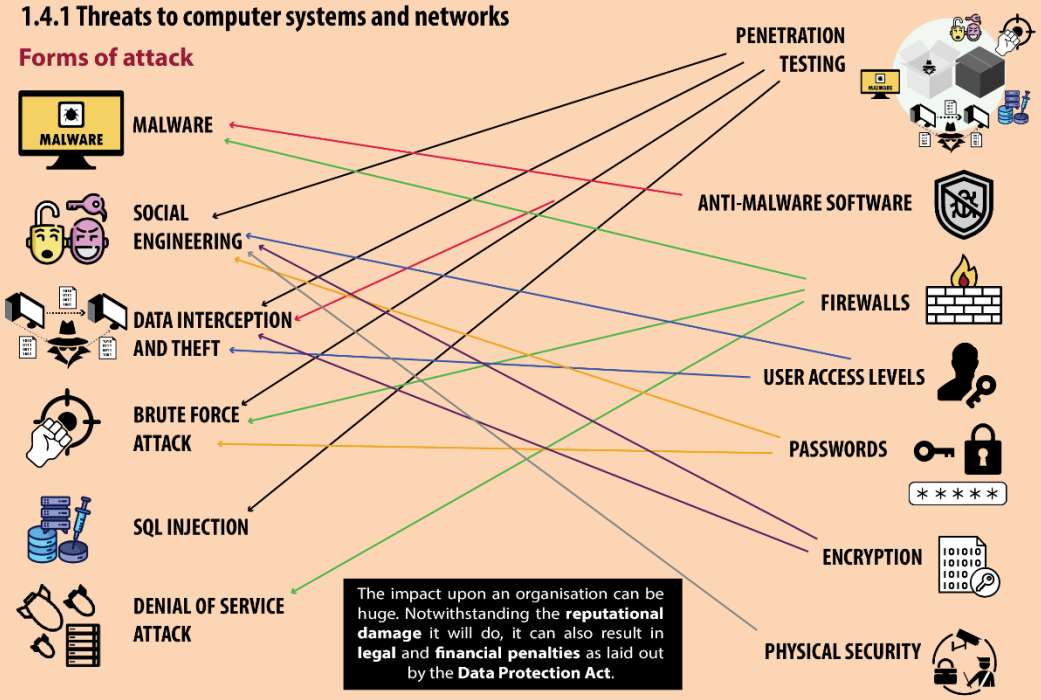
The Torus fusion reactor can achieve this on earth but at the moment we put in more energy in than we get out so can not use it to generate electricity

Nuclear weapons involve uncontrolled fission chain reactions that trigger further fusion reactions releasing extraordinary amounts of energy.

1.4 Network Security

1.4.1 Threats to computer systems and networks

Forms of attack



1.4.2 Identifying and preventing vulnerabilities

Many system vulnerabilities are caused by people being careless:

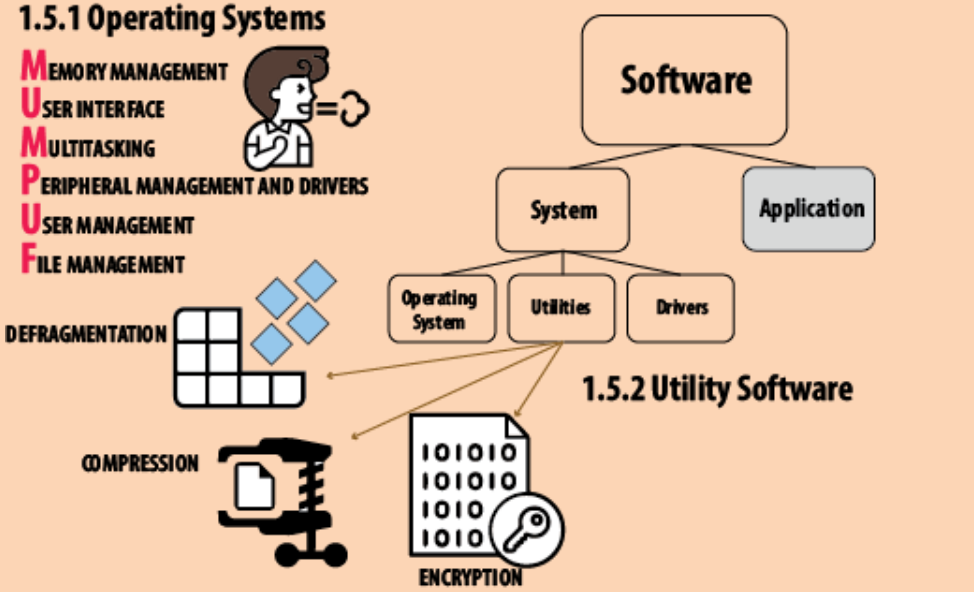
- Not installing operating system updates.
- Not keeping anti-malware up to date.
- Not locking doors to computer rooms.
- Not logging off or locking their computer.
- Leaving printouts on desks.
- Writing passwords down on sticky notes attached to computers.
- Sharing passwords.
- Losing memory sticks / laptops.
- Not applying security to wireless networks.
- Not encrypting data.

Form of Attack	Description	Threats posed to Networks	Identifying and Preventing Vulnerabilities
Malware	Software written in order to infect computers and commit crimes e.g. fraud or identify theft. Malware exploits vulnerabilities in software Malware is term that covers (among other things) viruses, trojans, worms, ransomware, spyware and adware	• Files are deleted, become corrupt or are encrypted. • Computers crash, reboot spontaneously and slow down. • Internet connections become slow. • Keyboard inputs are logged and sent to hackers.	• Security software (Spam filter, Anti-virus, Anti-spyware, Anti-spam) • Enabling OS and security software updates. • Staff training • Backup files regularly onto removable media.
Phishing (an example of social engineering)	Online fraud technique used by criminals. It is designed to get you to give away personal information such as usernames, passwords, bank details, credit card details… Achieved by disguising as a trustworthy source in an electronic communication, e.g. an email or fake website.	• Accessing a victim's account to withdraw money, or purchase merchandise and services. • Open bank accounts, credit cards, cashing illegitimate cheques. • Gain access to high value corporate data. • Financial services can blacklist the company	• Strong security software. • Staff training: awareness of spotting fake emails and websites. • Staff training: not disclosing personal or corporate information. • Staff training: disabling browser pop-ups.
Brute Force Attack	A trial and error method used to decode encrypted data (such as passwords). Uses every combination until it hits upon the correct one.	• Theft of data. • Access to corporate systems.	• Network lockout policy, Using progressive delays. • Staff training
DOS/DDOS Attack	Denial of Service attack. Floods a server with useless traffic causing the server to become overloaded and unavailable. Distributed Denial of Service Attack. Using multiple computers (zombies) in a Botnet to undertake a DOS attack	• Loss of access to a service for customers • Lost revenue • Lower productivity • Damage to reputation	• Strong firewall and packet filtering • Properly configuring servers and auditing and monitoring systems
Data Interception and Theft	Stealing information from an unknowing victim's computer in order to get confidential information, or to compromise their privacy. E.g. to sniff usernames and passwords	• Usernames and passwords compromised • Disclosure / theft of corporate data	• Encryption and using virtual networks • Staff training and computer use policies
SQL Injection	A technique used to view or change data in a database by inserting additional code into a text input box, creating a different SQL command.	• Contents of databases can be output, revealing private data. • Data in the database can be amended or deleted. • New rogue records can be added to the database.	• Validation on text boxes • Database permissions

1.5 Systems Software

1.5.1 Operating Systems

Memory Management
User Interface
Multitasking
Peripheral Management and Drivers
User Management
File Management



Systems Software	Systems Software is the software used to control the hardware of the computer. It is contrasted to application software which is used to enable the user to perform tasks and create content and products
Operating System	An operating system is a piece of system software that communicates with the hardware of the computer and allows other programs to run. It is comprised of system software, or the fundamental files your computer needs to boot up and function
Peripherals	Peripherals are controlled by software called device drivers. Standard drivers (mouse and keyboard) are included in the operating system, however more specialist peripherals may need drivers programmed by the manufacturer which convert signals into machine code and are installed separately
Utility Software	Utilities are programs that are installed to perform a specific function, usually to improve the efficiency or security of a computer system

Features of an OS	Purpose
Memory Management	When programs are loaded, the operating system decides where they are held in memory. Over time the memory becomes fragmented as programs are loaded and closed because they use different amounts of memory. The operating system must keep track of different program fragments. When the memory is full, the operating system uses virtual memory
User Interface	• **GUI**: A Graphical User Interface provides windows, icons, menus, (mouse or other) pointer… Sometimes calls WIMP. It is visual, interactive, and intuitive. Optimised for mouse/touch input • **CLI**: A Command Line Interface is text based. It uses less resources than a GUI. It is more efficient but harder to learn. Often repetitive processes can be automated with scripts • **Menu**: A Menu Interface presents successive menus to the user with options to choose at each stage. Often used with buttons on a keypad. (Think calculator when you press the 'MENU' button) • **Natural Language**: A Natural Language Interface responds to questions in a spoken language. They are not always reliable but are improving all the time. (Think Siri or Alexa)
Multitasking	Running multiple applications at the same time by giving each application a small time-slice of processor time. This allows more than one program to be held in memory at a time, and data shared between them such as copy and paste. It also enables you to listen to music on your PC at the same time as word processing for example
Peripheral Management	Peripherals are controlled by software called device drivers. Standard drivers (mouse and keyboard) are included in the operating system, however more specialist peripherals may need drivers programmed by the manufacturer which convert signals into machine code and are installed separately
User Management	Providing for different users to log into a computer. The operating system will retain settings for each user, such as icons, desktop backgrounds etc. Each user may have difference access rights to files and programs. A client server network may impose a fixed or roaming profile for a user, and manage login requests to the network.
File Management	Data is stored in files. An extension to the filename tells the operating system which application to load the file into. Files can also be placed in folders for ease of organising.

Features of an OS	Purpose
Encryption	Encryption utilities use an algorithm to scramble plain text into cipher text. It can be decrypted and read again with a Key
Defragmentation	Defragmentation utilities reorganise files on a hard disk, putting fragments of files back together, and it collects together free space. This reduces the movement of a read/write head across the surface of the disk, which speeds up file access. Solid state drives should not be defragmented (it is unnecessary as they have no moving parts. It also reduces their lifespan)
Compression	Compression utilities reduce the size of a file so that it takes up less space, and is quicker to download/upload. Compressed files must be extracted before they can be read. Compression is lossy or lossless.
Backup	Backup utilities take a copy of the data and place it elsewhere (disks, tapes, cloud, etc.). Backups can be either full (backup everything) or incremental (back up changes since the last backup).

1.6 Ethical, Legal, Cultural, Environmental Impacts of Digital Technology

1.6.1 Ethical, legal, cultural, and environmental impact

Sectors: Healthcare, entertainment, warfare, commerce, government, education, banking & finance, insurance, food and drink, energy, transportation, media, accommodation, leisure & tourism, telecommunications, travel.

Issues: Privacy, security, digital divide, artificial intelligence and machine learning, algorithmic bias, employment, health & safety.

	Issue	
Impact 1	+ PE	– PE
	+ PE	– PE
Impact 2	+ PE	– PE
	+ PE	– PE

Legislation relevant to Computer Science

fair, lawful, explicit purposes, adequate, relevant, accurate, up to date,, kept no longer than necessary, secure

Unauthorised access, intent to commit or facilitate another offence, acts that can impair, making or supplying tools, acts causing damage.

the right to control a piece of original work. Applies equally to digital content, such as music and movies.

to not break the law above, you need to makje sure you haver the correct licenses for your software. Open source and Creative commons do not require payment.

Software	Points that you can make on Open Source vs Proprietary Source
Open Source	Users can modify and distribute the software. Can be installed on any number of computers. Support provided by the community. May not be fully tested. Users have access to the source code
Proprietary Source	Users cannot modify the software. Protected by CD&P Act. Usually paid for and licensed per user or per computer. Supported by developers. Users do not have access to the source code. Tested by developers prior to release. Although they may run beta programmes.

Questions in this section typically take the form of long-answer discuss questions. This means that you need to structure your answers to capture all aspects of the questions, and be prepared to discuss them in a balanced view (e.g. advantages/disadvantages, positives/negatives, impacts on one group over another group). Marks are awarded across:

AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science.
AO2: Apply knowledge and understanding of key concepts and principles of Computer Science.

Cultural	Points that you can make under Cultural issues
Implications	• The impact of technology in our daily lives (Technology is changing how people live their lives today. We have an ever increasing dependency on technology in the 21st Century) • The digital divide (Access to technology and the Internet is not the same across the world) • Globalisation (As people around the world become more exposed to technology this impacts on the values and expectations of the people in each country)
Positive Effects	• In the developing world, the rapid spread of technology, fuelled by the Internet has led to positive cultural changes in developing countries. • Easier, faster communication has contributed to the rise of democracy, as well as working towards the alleviation of poverty. • Globalisation can also increase cultural awareness and promote diversity
Negative Effects	• Diffusion of technology must be carefully controlled to prevent negative cultural consequences. • Developing countries risk losing their cultural identities and assimilating themselves into an increasingly westernised world. • Challenges of inequality from the uneven distribution of technology within a country also still remain • Traditionally, most computer applications are designed by developers in North America. These designers unintentionally apply their cultural values and systems of thought whilst developing computer applications

Impacts	Points that you can make under Impacts on Wider Society
Customers	Customers can do more from home with less travelling involved. They can do things 24/7. They can access their data on many devices. Computers can make instant decisions without human involvement. Potentially open to hacking. Less personal
Staff	Job losses as things become more automated. New types of jobs created that didn't previously exist. Up-skilling required
Companies	Less overheads (salary, rent, utility bills) if fewer staff and buildings required. More ways to target potential customers. Increased importance of data protection and security
Local Communities	Local shops may suffer is town centres are more empty. Elderly and vulnerable customers may have nowhere local to go as local services are scaled back

Privacy	Points that you can make about Privacy
Implications	• Implications for personal privacy have arisen due to the vast array of cameras and surveillance systems around. • The amount of data that we share and that is recorded about us is growing hugely • Free speech / freedom of expression / right to personal privacy vs. Law and Order / Public security / government's role

Medieval Medicine 1250-1500

Medieval Britain

1	Medieval Britain is the period between **1250-1500** also known as the **13th-16th century. It is also known as the Middle Ages.**

Key Events

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

Key Concepts

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

Ideas on the Cause of Disease

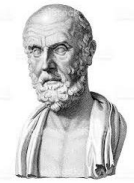
12.	**Superstition**	**Beliefs based on the supernatural like witchcraft or astrology.**
13.	Sins	Idea that God caused to punish for peoples sins
14.	Miasma	'Bad air' which was blamed for spreading disease
15.	Astrology	Study of the planets/stars and its affect on humans
16.	Urine Chart	A chart used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

Medieval Medicine 1250-1500: The Essentials

Impact of Medieval Society on Medicine

Church: Church controlled everything and people afraid of God, they limited change as no one challenged
They controlled education and training of doctors, they support Hippocrates/Galen's ideas so no one dared or wanted to challenge ideas as if you challenged Church, you were challenging God
Tradition: Many simply respected traditional ideas, e.g. Hippocrates/Galen and saw ideas as rational and respected. Galen wrote over 300 books, so why bother looking for change?
Government: King and government most powerful but spent nothing on improving public health, it was only during the Black Death of 1348/9 that killed 40% that King Edward did something
As a result, there was little progress (continuity) in medicine in the Middle Ages

Hippocrates and Galen



The ideas of Galen and Hippocrates were well respected as they were over 1000 years old, and the four humors made sense to people at the time Galen had written over 300 medical books, it was assumed he was right. All medieval training (from the church) focused on the work of Hippocrates and Galen, it was never challenged

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

Renaissance Medicine 1500-1700

Renaissance Britain

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

Key Events

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

Key Individuals

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

Key Terms

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

Key Changes

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

Industrial Revolution Medicine 1700-1900

Summary

1	The Industrial Revolution period was the period between **1750-1900** also known as the **18th and 19th centuries.** It was an **age of breakthroughs**

Key Events

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

Key Words

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

Key Words

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

Modern Medicine 1900-present

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

Key Events

1902	**Archibald Garrod, an English doctor theorises that hereditary diseases are caused by missing information in the body's chemical pathways.**
1911	National Insurance Act – workers under a certain wage were entitled to free medical care.
1928	Penicillin identified by Alexander Fleming
1940	Florey and chain successfully treat mice with Penicillin
1942	Diphtheria vaccination introduced
1948	The National Health Service is established
1950	Whooping Cough vaccination introduced
1951	Rosalind Franklin and Maurice Wilkins create images of DNA using X-rays
1953	DNA discovered
1956	First successful kidney transplant carried out between identical twins in the USA
1956	First Clean Air Act introduced to deal with increasing smog and pollution in cities.
1961	Tetanus vaccination introduced
1963	First successful lung transplant
1967	First successful liver and heart transplants
1968	Measles vaccination introduced
1968	Second Clean Air Act introduced
1970	Rubella Vaccination introduced
1990	Human Genome Project Launched
2007	Smoking Ban. It became illegal to smoke in any pub, restaurant, nightclub, and most workplaces and work vehicles, anywhere in the UK

Key Words & People

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

Paper 1 (physical) – Topic: **ECOSYSTEMS – general principles**

What is an Ecosystem? An ecosystem is a natural system made up of plants, animals and their surrounding physical environment which includes various components such as soil, rainwater & sunlight. All of the components are closely inter-linked and if one changes there will be knock- on effects to the whole ecosystem.

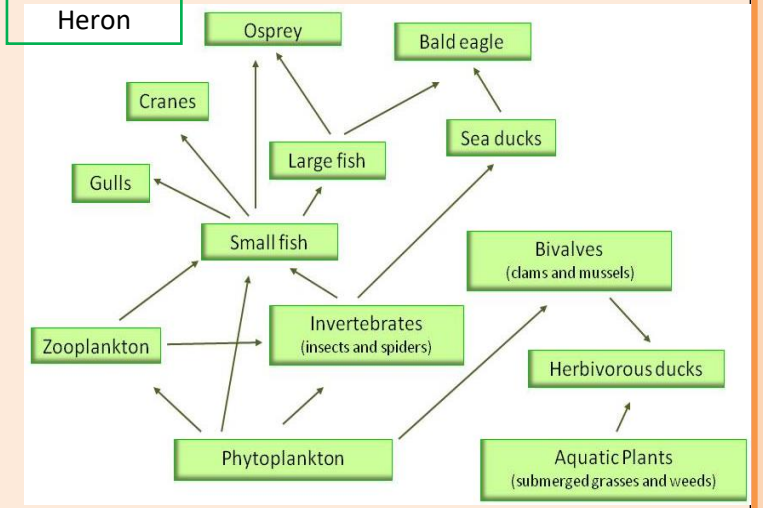
Food chains & Food webs

The links between **biotic** components in an ecosystem can be shown through two flow diagrams: a **food chain** and a **food web.**

Food chain:

Algae → Tadpole → Stickleback → Perch → Heron

Food web:



What is Nutrient cycling?

Nutrients are food that are used by plants and animals as they grow. Nutrients are derived from two main sources:

- **Rainwater**, washing chemicals out of the atmosphere
- **Weathering of rocks**, releasing chemicals onto the soil.

A typical **nutrients cycle has** 3 main nutrients stores & several flows responsible for transferring nutrients between the stores.

Decomposers help return nutrients to the soil as they break down dead **biotic** components of an ecosystem.

The impact of change on an Ecosystem.

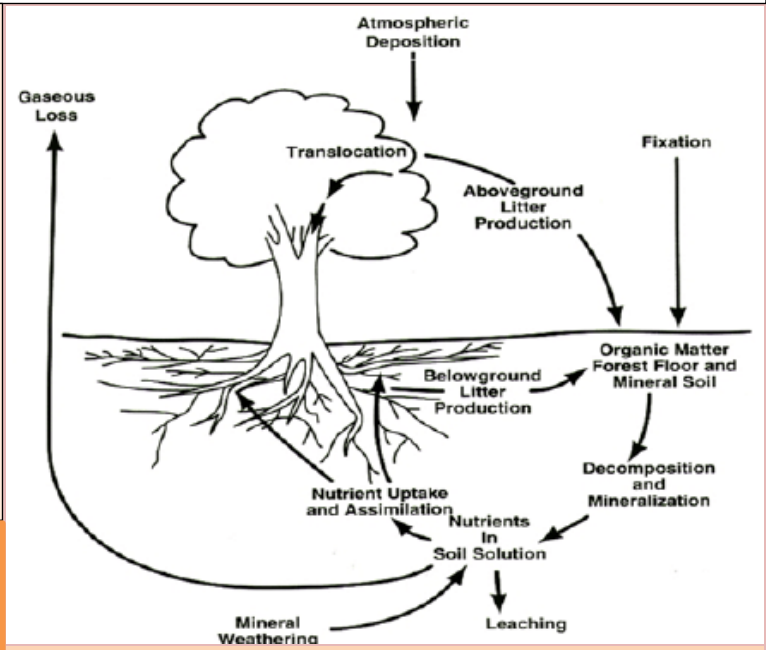
A **sustainable** and healthy ecosystem can take hundreds of years to develop. A sudden change can make everything become unbalanced which can have disastrous impacts. There are two main types of changes: natural changes & human – induced changes.

Natural Changes:

- Extreme weather events, such a flood or a drought
- Fire caused by a lightning strike
- Climate change and global warming
- Spread of invasive species or introduction of new species.

Human – induced Changes:

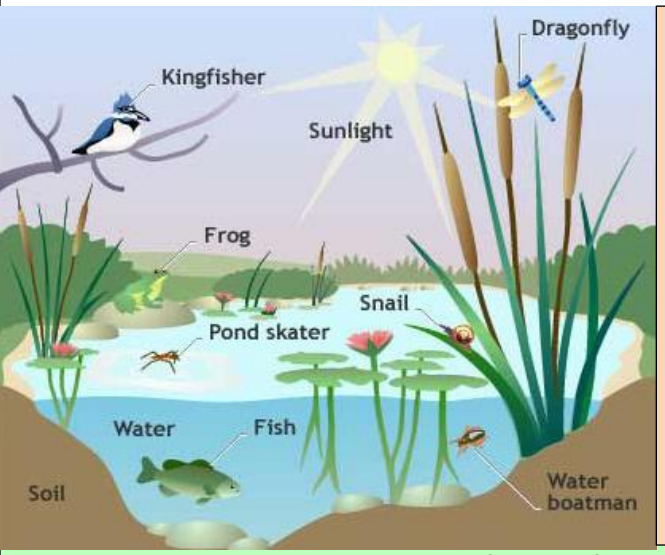
- Land use change, such as deforestation
- Alteration to water & soils
- Hunting or trapping animals or wildlife
- Introduction of new species



Key terms and definitions for this topic

Ecosystem- biological community of interacting organisms and their physical environment.
Food chain -a series of organisms each dependent on the next as a source of food.
Food web-a system of interlocking and interdependent food chain
Nutrient cycling- repeated pathway of a particular nutrient or element from the environment through one or more organisms and back to the environment
Species- group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
Decomposers- an organism that decomposes organic material
Weathering- describes the breaking down or dissolving of rocks and minerals on the surface of the Earth.

A small scale ecosystem: a freshwater pond



In this picture, there are examples of producers, consumers & decomposers. If one of these species is removed or there is an increase in another species this will have an effect on the whole food chain and might cause an increase or decrease in another species.

Key terms and definitions for this topic

Biotic – living things such as plants & animals.

Abiotic – non-living things such as climate & soils.

Food chain – shows the direct links between different organisms that rely on each other as a food source.

Food web - shows the complex system of plants & animals that rely on each other as a source of food within an ecosystem.

Producer – convert energy from the environment into sugars. (Makes food)

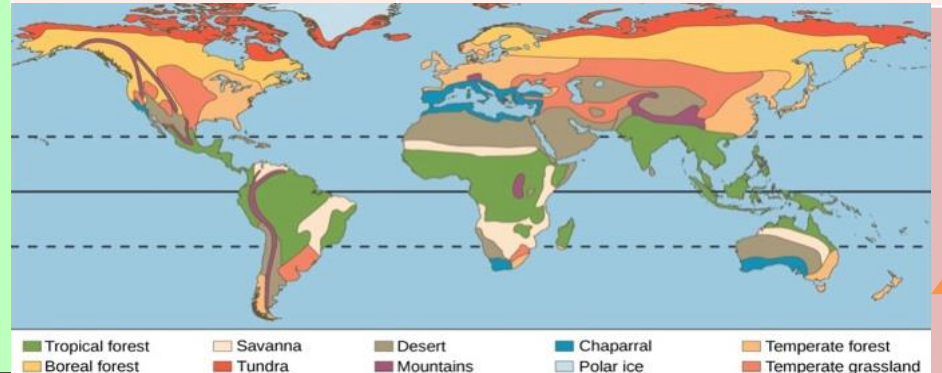
Consumers – get energy from the sugars produced by the producers. (Eats a plant or another animal)

Decomposers – break down plant&animal matter, returning nutrients to the soil

Biomes – a global ecosystem often found at specific latitudes.

Nutrients – A nutrient is a substance used by an organism to survive, grow, and reproduce. The requirement for dietary nutrient intake applies to animals, plants, or fungi.

Global Ecosystems	Definition
Coniferous/Boreal forest	cold & dark winters with quite warm summers. Made up of coniferous trees and many more evergreen plants.
Deciduous/Temperate forest	mild & moist conditions with few extreme temperatures. Made up of deciduous trees meaning they lose leaves.
Desert	Hot during daytime & cooler at night. Plants & animals well adapted. Little rain leading to arid conditions.
Mediterranean(Chaparral)	hot & dry summer, wet & mild winters,vegetation includes citrus fruit, oak & olive trees.
Tundra	extremely cold all year round with brief summers where much of the land can become very boggy at surface level, but remain frozen deep down in the soil.
Temperate grassland	hot summers & cold winters with low rainfall perfect for grasses
Tropical rainforest	moist air rises to produce heavy rainfall & high temperatures. Ideal conditions for plant growth.
Tropical grassland	Tropical climate with wet & dry seasons. Fires are very common due to lightning strikes.
Polar Ice	Very cold all year around, with some ice melt but temperatures often below -40°C.
Mountain/Alpine	Comprise some of the most intriguing habitats of the world for the stark beauty of their landscapes and for the extremes of the physical environment. It's a hard place for plants and animals to live, with seasonal extremes of snow, rain and temperatures, as well as poor soils and rocky, often very steep slopes .These habitats lie above the upper limit of tree growth but in the summer often have a spectacular display of colourfully flowered plants. Globally, alpine ecosystems cover only about 3% of the world's land area.



The distribution of the different types of global ecosystems can be seen on this choropleth map.

Paper 1 (physical) – Topic: Tropical Rainforests

What is it like in a tropical rainforest?

A tropical rainforest has some key characteristics that make it very different to other ecosystems or biomes and support a wide variety of different species. This means that they have a high **biodiversity.**

Climate

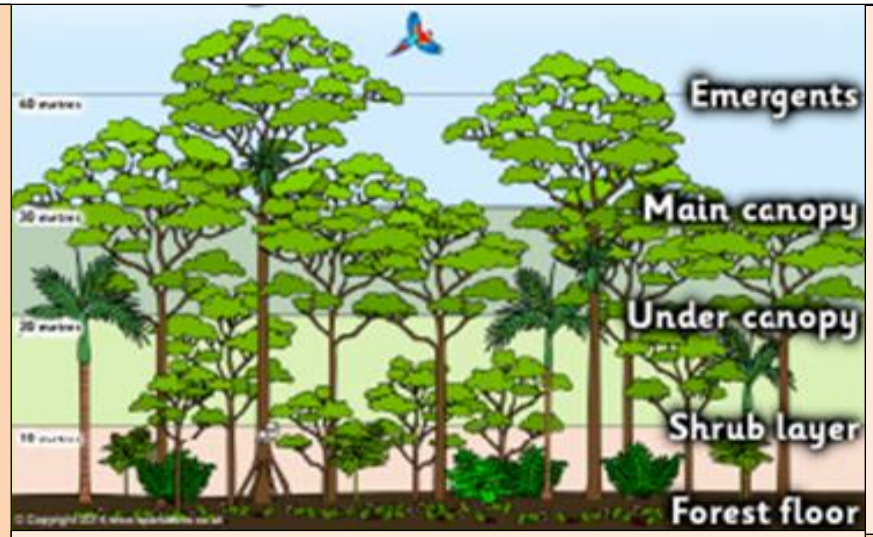
Tropical rainforests are very wet with over 2,000 mm of rainfall per year, and very warm with an average daily temperature of 28°C. The temperature never drops below 20°C and rarely exceeds 35°C. The atmosphere is hot and humid. The **climate** is consistent all year round. There are no seasons.

Soil

Most of the soil is not very fertile. A thin layer of fertile soil is found at the surface where the dead leaves decompose, but due to heavy rainfall the nutrients are quickly washed out of the soil. This is why trees have shallow roots. The soil is red in colour because it is rich in iron.

Structure of a tropical rainforest

A tropical rainforest has several distinct layers, as shown on the diagram. It is important to remember that the closer to the ground a tree or plant is, the less sunlight it will receive as the trees above will be shading it. For example, the shrub layer will be relatively dark and damp compared to the main canopy.



Plants

Lianas – Have adapted to the rainforest by being vines which are rooted in the ground but attach themselves to trees, so that as the tree grows, they too climb high into the tree canopy to receive light.

Buttress roots – Trees have adapted by growing very large roots which start above ground level and make the base of the tree wider and therefore more stable given the trees height.

Shallow roots – Plants have roots that generally grow outwards rather than downwards deep into the soil, to absorb nutrients from the thin fertile layer in the soil close to the surface.

Plants - in the shrub layer have large leaves that rotate with the sun in order to obtain enough energy in the low light conditions. These would be very easily snapped off if too much water collects on them, so they have drip tips to channel water away rapidly. These are three interlinked adaptations!

Layers of the Tropical Rainforest

Emergent- The top layer of trees which gets the most amount of sun.

Main canopy - 80% of sunlight is caught in here which leaves very little for below.

Under canopy - This is just below the main canopy and is home to squirrels, monkeys, bats etc. There is loads of food so life is plentiful.

Shrub layer- The shrub layer. It is dark and gloomy with very little vegetation between the trees. During heavy rainfalls this area can flood.

Forest floor – Made up of tree roots, soil and decaying matter.

Animals

Flying frog - has fully webbed hands and feet, and a flap of loose skin that stretches between its limbs, which allows it to glide from plant to plant.

Spider monkey - has long, strong limbs to help it to climb through the canopy.

Sloth - uses **camouflage** and moves very slowly to make it difficult for predators to spot.

Parrot – has a large, strong beak to help it crack nuts.

Facts

- 80% of sunlight gets caught in the main canopy.
- 80% of the flowers in the Australian rainforests are not found anywhere else in the world.
- Bats are essential for the pollination of many tropical foodstuffs such as bananas and mangoes.
- 1 out of 4 ingredients in our medicines are from rainforest plants.
- Tropical rainforests are located between the tropics.

Value of rainforests

- They are home to more species of plants and animals than any other ecosystem on the planet (over 50% of all species in the world!)

Tropical rainforests act as life support systems for the planet as they:

- **Regulate the composition of the atmosphere** - all tropical rainforests, such as the Amazon, regulate the composition of the atmosphere and help to offset the effect of climate change by taking in carbon dioxide through photosynthesis and releasing oxygen.
- **Maintain soil health** - in areas such as the Amazon, tropical rainforests have a thin yet rich, fertile top soil due to the rapid leaf fall and decomposition which rapidly recycles nutrients. These soils can be used to grow cassava and maize which is the staple diet of the local people.
- **Influence the hydrological cycle** - rainforests help to provide water for people. Trees act as a water store by intercepting rainfall. They release water into the atmosphere by evapotranspiration (evaporation and transpiration). This then falls again as precipitation and so gives the people living in areas such as the Amazon a constant supply of water. Tree roots also increase infiltration.

Goods and services

Food - rainforests can produce food such as nuts, which forms part of the diet of local people in the **Amazon**.

Cash crops - rainforests also produce cash crops, such as the development of wild coffee that resists disease and has a higher yield than the Arabica beans traditionally used by growers in the rest of Brazil.

Medicines - **rainforests** have also been used to search for medicines. For example, the rosy periwinkle from the rainforests of Madagascar can help treat childhood leukaemia. In total, more than 1 in 4 of all known medicinal ingredients are sourced from the rainforest!

Raw materials - rainforests can be logged to produce timber such as hardwoods for garden furniture exports. In Indonesia, oil palm plantations cover 7.8 million hectares and employ over 2 million people, making up 7% of Indonesia's **exports**, valued at $12 billion. Palm oil is used in cosmetics, confectionary, detergents and many other **products**.

Causes of deforestation

- Clearing land for cattle ranching accounts for over 80% of **deforestation** globally.
- Clearing land for mining valuable minerals found beneath.
- Creation of **Hydroelectric power (HEP)** stations in the **Amazon Basin** has resulted in large areas of forest being flooded to create the reservoirs and dams. The flooding of the Balbina dam in Brazil resulted in the loss of 920 miles^2 of rainforest.
- The timber trade- global demand for tropical hardwoods which are hardwearing and durable, e.g. mahogany.
- Clearing land for transport links – mainly roads – to be developed between cities and countries, to increase trade between them.

Impacts of deforestation

- When **deforestation** occurs in the rainforest, millions of animals and plants lose their habitats.
- Indigenous people (300 tribes in Amazon alone) will lose homes. They are poorly equipped to adapt to modern city life.
- Loss of medicinal plants, some yet undiscovered.
- The soil soon loses **nutrients** due to surface run off, rendering the land useless for anything.

Key terms and definitions for this topic

Biodiversity - The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

Vegetation – collective name for the plants and trees in an ecosystem.

Adaption –Plants and animals changing to fit the needs of the environment.

Climate – long term weather patterns.

Deforestation – the act of cutting down large areas of trees.

HIC – High Income Country

LIC – Low Income Country

Strategies to manage deforestation include

- Setting up an **ecotourism** resort (Yachana Lodge) which supports local people with jobs, local children with training and education, and brings money in, in a sustainable manner.
- **Selective logging** can be utilised, rather than mass clearance techniques, so that only the trees required are removed, rather than large quantities of forest being flattened simply to make access to the desirable timber.
- At a National level, Governments could set up areas as **legally protected reserves**, while internationally, **HIC** governments could write off debts of **LICs** in return for the protection of areas of forest. Banning the international trade of tropical hardwoods reduces the incentive for cutting them down.

Characteristics

Deserts have extreme **diurnal temperatures.** During the day the temperature may reach 50°C, while at night it may fall to below 0°C. Deserts have less than 250 mm of rainfall per year. The rain can be unreliable. Most deserts are found between 20° and 35° north and south of the equator. They are generally **sparsely populated** areas with little vegetation or **biodiversity** because the soil is dry and sandy with little water or nutrients and it is often windy. The Thar Desert is, however, the most densely populated desert anywhere in the world.

Adaptations

Due to the challenges of living in a hot desert, many animals and plants have adaptations to help them survive. Common themes include animals keeping cool by being active at night (being nocturnal), or digging underground burrows to shelter from the heat. Other animals have big ears, light-coloured coats, and adaptations that help conserve water. These are often **endemic** species – they only live in this one place.

- **Camel –** large feet help to spread their weight safely across the sand and their humps store fats so that they can go for long periods of time without food. Also has two sets of eyelashes to help keep sand out of it's eyes!
- **Cactus –** spikes offer protection from animals who want a tasty snack; a waxy surface helps to minimise water loss; and long roots enable it to collect water from up to 10m away.
- **Joshua tree-** deep, thick roots up to 12m long to collect water and it retains it's dead leaves, which hang against the trunk like an umbrella to shade it from the hot sun, reducing water loss.

Desertification

Causes

- **Soil erosion-** means that there is less plant growth as the topsoil is lost, often through windblown movement. This occurs more frequently where vegetation has been removed.
- **Salinization-** a process which occurs when the water in soils evaporates in high temperatures, drawing salts from the soil to the surface. These salts are toxic to many plants and make the land unusable. This has consequences such as low yields, poor profits and even starvation. **Irrigation of land** - when water is brought to land that is naturally dry - can cause salinization on desert margins.
- **Climate change –** means a change in seasonal rainfall, less rainfall, long droughts, higher rates of evaporation .
- **Population growth-** increased water consumption, over grazing and over cultivation, as well as **Urbanisation** – the growth of settlements.
- **Removal of wood –** logging to provide fuel wood means top soil is at risk of erosion.
- **Over-cultivation-** growing too much in one place reduces nutrients, fertility and weakens soil; overusing pesticides and planting crops in the same place each year damages the soil.
- **Over-grazing –** livestock eat plants quicker than they can grow, cattle trampling stops water from penetrating and infiltrating the soil, often as a result of reduced nomadic lifestyles (local people moving around less on the land than they used to).

Reduction

- **Water and soil management-** use drought resistant plants, roots of plants bind the soil together, building walls stops erosion.
- **Tree planting –** Great Green Wall (project in Saharan Africa, 800km wide) leaves provide shade for soil, acts as a wind break, there are jobs available planting trees meaning more money for locals.
- **Appropriate technology-** no machinery (not enough resources or money) 'magic stones ' protect plants and provide shade, meaning less erosion of the soil.
- **Winds barriers –** provides shade and wind protection, stops soil eroding.

The Thar desert

- Crosses the border between India and Pakistan
- Average temperature is 27.3° C
- Temperatures often exceed 50° C
- In 1992, 3000km2 was made into a national park
- The desert has a population density of over 80 people per km2. (Other deserts have population densities below 10 per km2).
- There are many mobile sand dunes, and sandy hills.

Challenges

- **Water supply-** population growth and development in farming means demand is increased, low rainfall and high temperatures mean high rates of evaporation, water sources include: ponds, underground wells and intermittent rivers (only after rainfall).
- **Extreme temperatures-** high temperatures and low rainfall mean high rates of evaporation, means little water and nutrients in soil.
- **Inaccessibility-** limited road networks, high temperatures melted tarmac roads, winds blow sand over roads, transport usually consists of camels or overloaded buses.

Opportunities

- **Tourism-** camel tours/ safari, unique cultural hotels, selling local goods, dune buggies and dune surfing, cultural activities.
- **Energy-** solar panels, wind turbines, coal and oil extracted from under the soil.
- **Farming- Subsistence -** The desert area is not very fertile. Soils are quickly drained, and contain few nutrients. The farming is limited, typically a few animals on more grassy areas and fruit. Most is subsistence farming.
- **Farming- Commercial -** Commercial farming has been possible since the building of the Indira Ghandhi Canal. This irrigates an area near Jodhpur. Wheat and cotton can be grown. The canal also supplies drinking water.
- **Mining-** Minerals such as gypsum and feldspar can be sold for use in building products. Limestone from Jaisalmar quarry is used in buildings. Minerals in the area (rock phosphate) are used to make fertiliser for crops.

Key terms and definitions for this topic

Diurnal temperature - the temperature throughout the day/night.

Feldspar – mineral used in glass and ceramics.

Gypsum – mineral used in plaster/ plasterboard.

Rock phosphate – used in fertiliser.

Irrigation - application of water to plants and crops.

Biodiversity – the variety of plants and species in a certain environment.

Endemic – a species native to a certain place.

Desertification – the destruction of land until nothing grows, due to loss of water and vegetation.

Salinization - the process of increasing salt levels in soil.

Commercial farming – growing crops to sell.

Subsistence farming – growing crops for your own needs.

Sparsely populated – low population density

Christian Practices

Types of Worship

At church:

Liturgical worship is worship at church which follows a set pattern or order. This is very traditional and is used for formal and routine services, for example the Eucharist or Advent service. This means they are the same each time. This can give familiarity and comfort for Christians. They have set prayers and passages from the bible that reflect that service, with set hymns too. This worship is also very formal and would be the same whoever lead the worship.

Non-Liturgical worship is more informal. This is where the preacher (vicar, priest etc) will create his own service. He would speak from the heart for prayer and would choose a theme for his service e.g. forgiveness or sin etc. This way he could choose relevant bible passages or parables to use. This service is more personal to the preacher and his community. The worship could also focus on something important in the community or world for example if there has been a disaster to focus on. Services can also have modern music and songs. This clip (below the photo opposite) is from London Holy Trinity Church, a more modern church and service.

Charismatic worship is very free flowing and informal. This would be a church where the service is filled with music and movement. The congregation would often sing out and throw their hands up in praise of God, they may even call out, as if the Holy Spirit is within them. This allows the congregation to express themselves and their devotion to God and be free with their feelings.

At Home:

Private worship can be done wherever and when ever a Christian wants. This may be more formal like a set Grace (prayer) before dinner or the Lord's prayer before bed. Or this can be informal such as choosing to prayer when they like, speaking from the heart. A Christian my also use things to worship such as lighting a candle (Jesus represents the light of the world). Catholics use Rosary beads to prayer. Other Christians may meditate or read a parable or bible passage.

https://www.youtube.com/watch?v=Jacv52sRyEA

Key vocabulary

Liturgical
Non-Liturgical
Charismatic
Congregation
Rosary beads
Lord's prayer

Why do Christians worship?

- Connection to God to develop a relationship
- Show praise and devotion
- Show deep love and respect
- To join a religious community

Prayer

There are 5 general reasons for a Christian to pray these are illustrated on the **prayer hand** (see below. There are lots of these you could also search too).

"We shall devote ourselves to prayer" Bible

"Ask and it will be given to you" Bible

Some Christians use **set prayers** (those already written), the most common of these is the **Lord's Prayer** (below)

THE LORD'S PRAYER

**Our Father, who art in heaven,
hallowed be Thy name.
Thy kingdom come.
Thy will be done on earth as it is in heaven.
Give us this day our daily bread and forgive us our trespasses as we forgive those who trespass against us.
And lead us not into temptation, but deliver us from evil.
Amen.**

Christian Practices

Key vocabulary
Sacraments
Conformation
Baptism
Believers Baptism
Testimony
Declaration of Penitence

Sacraments

A sacrament is a **special event** in a Christians life. These events could be taken once or on a regular basis. A sacrament means an **outward action that has an inner meaning**.
Here are 2 examples: Baptism outward action is to pour water over a person, the inward meaning is that this washing away sin. Marriage: the Outward action is placing the rings on finger; the inward message is eternal love.

Catholics beliefs of Sacraments:
- See the sacraments as God's gift and follow all of them (x7)
- They are special events that are regular or at different times of a person's life e.g. baptism, confirmation
- They connect closer with God's love by taking part in them

Quakers beliefs about Sacraments:
- They reject the sacraments, saying many are not mentioned in the bible
- They believe Jesus did not intend for baptism and Eucharist to become a ritual
- They believe Christians speak directly to God – there is no need for sacraments to connect with God

Baptism – origins and reasons for

This is one of the most common sacraments taken by Christians. It originates back to when Jesus was baptized by John the Baptist in the River Jordan, when he was an adult. The baptism signifies **washing away of sin and being re-born into the Christian faith.** Jesus wanted all his followers to be baptised, as it also embraces the Holy spirit and God's love into a Christian. Jesus said *"Go make disciples of all Nations, baptising them in the name of the Father, the Son and the Holy Spirit".*

	Infant Baptism	Believers baptism (adult)
Why choose this baptism?	• Traditional to English Christianity • Bring up their children as Christian • Children can then take part in other sacraments as they grow • If the baby is ill and may die	• It is the adults choice – they understand that they are becoming a Christian and joining the church • Jesus was baptised as an adult • As a baby you would not have sins, therefore it has more meaning as an adult
What happens?	• Baby wears white • Oils are given as a sign of strength and to fight off evil and acceptance into Heaven (Salvation) • Holy water is placed in the sign of a cross over the baby's head, showing their faith to Jesus • Godparents make promises to protect the child growing up • A candle is lite, signifying receiving the light of Christ (Jesus)	• White clothes are often worn • A testimony is given by the person, to show why they wanted to be baptised. • A Declaration of Penitence (sins) is given to show they are truly sorry for their sins, dedicating themselves to Christ • The person is dropped backwards into the pool of water, then risen. This also represents re-birth, much like Jesus' resurrection.

Christian Practices

Eucharist

The Eucharist is another name for Holy mass or communion. All Christians take the Eucharist, however this may vary in how and how often.

The Eucharist sacrament comes from the instruction of Jesus at the **Last Supper**. The night before he would be crucified, Jesus knew of his death so told his disciples to remember him and the **atonement** (sacrifice) for mankind by representing wine and bread as his body and bread. By taking part in the Eucharist Christians are showing **faith and obedience to Christ**, they are receiving **God's Grace and salvation.**

Catholic Eucharist: What happens and why?

- Often called Holy Communism. Happens quite regular as seen as important.
- The service starts with the confession of peoples sins and God's forgiveness.
- The Eucharist prayer is read at the beginning and end of service.
- Bread and wine are consecrated (blessed) at the altar.
- The priest places the consecrated bread on the worshippers tongue or in their hands, wine is drunk, often from a chalice.
- Catholics believe in **transubstantiation.** This is a belief that the wine and bread become the blood and body of Christ. Therefore the Eucharist is more about a **spiritual connection with Christ**, embracing the Holy Spirit.

Protestant Eucharist: What happens and why?

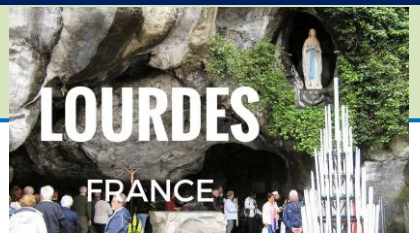
- It is often called the Lord's Supper
- The Minister reads the Gospel (Bible) story of The Last Supper.
- Worshippers stand at the front of the church, bread is given and wine (usually non-alcoholic) is in separate glasses.
- The Lord's Prayer is read at the end.
- Therefore the Eucharist for Protestants is more about the **remembrance of Jesus' sacrifice**.

Key vocabulary

Eucharist
Atonement
Grace of God
Salvation
Holy Communion
Lord's Supper
Transubstantiation
Pilgrimage
Lourdes

Why do Christians go on pilgrimage?

- To follow the footsteps of Jesus e.g. to Jerusalem
- To visit a sacred place e.g. place of Jesus or a disciple / saint
- For healing – physical or spiritual
- To break from normal life and focus on God
- To reflect on their life
- To connect with God
- For forgiveness of sins
- To meet other Christians
- To connect with Christian communities around the world



Pilgrimage places

Lourdes:

Lourdes is a pilgrimage site because of Saint Bernadette. Bernadette was illiterate, poor and suffered with health problems. Bernadette had 8 religious visions, the last from the Virgin Mary. On one vision, Bernadette had injured her arm, Mary had told her to dig out a spring water in a nearby cave to heal her dislocated arm. Her arm was healed by being placed in the water in the cave. Others after her had shown that the spring in the cave had healing powers.

Today many people come to the caves to touch the walls and bath / drink the spring water. There are processions at different times of year to celebrate the religious site. The Catholic church arrange for pilgrimages for the sick and there is a special children's pilgrimage there every Easter, where 1,000 sick or special needs children come.

Santiago de Compostela.

Santiago is the local Spanish name for Saint James. James was one of the 12 disciples of Jesus. According to legend, the remains of St James were carried by boat from Jerusalem to northern Spain where he was buried on what is now the city of Santiago de Compostela.

Today, thousands of Christian pilgrims travel a pilgrimage route to Santiago de Compostela. Most travel by foot, some by bicycle and a few travel, as some of their medieval forbears did, on horseback or by donkey. It takes 35 days to walk the 500 miles. Many of the pilgrims wear cockle-shell badges and this is the emblem of pilgrims to Santiago.

Christmas

Matthews Gospel:

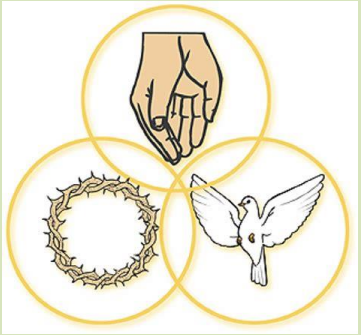
Matthew mainly talks about how Mary found out she was with child from the **Angel Gabriel.** This talks about Joseph's reaction. It talks of how she will give birth a virgin to a **Messiah**. Matthew also talks about the **Magi** (wise men) who were instructed by Herod to visit the Messiah and inform him. The Magi worshiped the Messiah and presented him with gifts.

Luke's Gospel:

Luke mainly talks about how and why Joseph and Mary travel from Nazareth to Bethlehem. He talks about how the **Shepard**'s find out and find their route to visit Jesus.

Why is the birth of Jesus important?

- It was foreseen in a **prophesy** that the **Messiah** would be born in Bethlehem to lead the people of Israel
- The virgin Mary showed that Jesus was the Son of God; this in turn showed the **Trinity**: God, his power of the Holy Spirit living through his Son
- The birth of Jesus showed the **incarnation** of God and **God's grace** (love) for mankind to send his son down.



"The word became flesh and lived among us for a while"

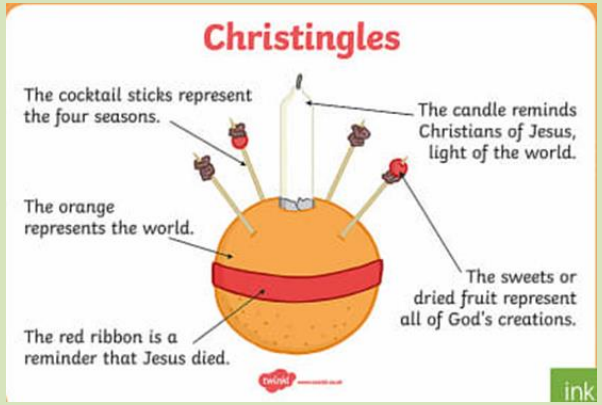
BVT

Key vocabulary

Gospel	Messiah
Incarnation	Trinity
Atonement	Christingle
Grace of God	Magi
Prophesy	Midnight mass

How do Christians celebrate Christmas?

- Attending **Midnight mass** on Christmas Eve, where the Eucharist is practiced. This begins in darkness and when the Gospel story is read, a candle is lite to signify the light as Jesus' birth.
- **Christingle service**; Carols and readings from the Gospels about the nativity story. A Christingle is given, often to children.
- Churches are decorated and nativity scenes are put up
- Exchanging of gifts and presents to show love for family and friends; like those of the Magi.
- Some Christians invite someone into there house or go and help serve meals for the homeless
- Some Christians will attend church for the **Epiphany** Service on **the 6th January** which recognizes when the Magi visited baby Jesus.



Easter

BVT

Why is Holy Week important to Christians?

- Shows the **Prophesy** of the **Messiah**
- Show Jesus' **Atonement** for mankind
- Establishes the **Eucharist**
- Shows **God's Grave** (love) ***"God loved the world so much he gave his only son"***
- Enables **salvation** for Christians
- **Resurrection** shows Jesus is the Son of God (**Incarnation**)

Key vocabulary

Palm Sunday
Maundy Thursday
Good Friday
Atonement
Grace of God
Salvation
Prophesy
Eucharist
Resurrection

How do Christians celebrate over Easter?


Palm crosses are given out at church


Christians often eat fish as opposed to red meat.


Christians may walk behind a procession of someone carrying a Cross


The church may be stripped of its decorations to show God's House.


The Queen often gives out money (coins) to the elderly.


A light is lit at the start of the church service to represent Jesus.

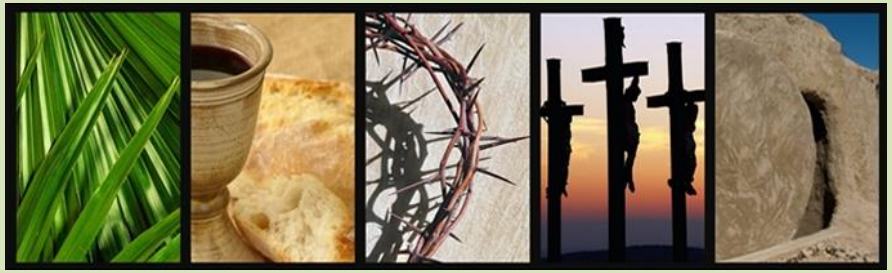

Easter eggs are given and broken


In Rome the Pope reads out Mass on Sunday


Christians take part in the Eucharist

Events in Holy Week

- **Palm Sunday** - Jesus rides into Jerusalem over palm branches to celebrate Passover (Jewish festival to remember Moses) on a donkey as stated in the **prophecy** from the Old testament saying a **Messiah** would save them.
- **Monday**– Jesus went to the **temple** and spoke about how God did not need followers to pay riches to the church and use the sacred house for trading.
- **Tuesday** – Jesus went back to the **temple** to challenge the authority of the high priests called the Sanhedrin.
- **Wednesday** – On the Wednesday it is said that **Judas** agreed to betray Jesus. He was paid **30 pieces of silver**. Judas was fed up with Roman oppression and believed Jesus was one to start a rebellion, he was disappointed to learn that this was not so.
- **Maundy Thursday** – **The last Supper** – including the wine and bread. Jesus challenges Judas on his betrayal and is later arrested and brought before the high priests.
- **Good Friday** – The trial of **Pontius Pilate**, Jesus is **crucified**. Jesus atones for the sins of mankind to reconcile the relationship between God and his believers, so they can have salvation. The temple curtain ripped showing all had access to God.
- **Saturday** – The **disciples** hide, fearing they will be arrested. Losing Jesus had challenged their faith in God.
- **Easter Sunday** - 2 women arrive at the tomb, the stone covering the tomb entrance is gone. Jesus has **resurrected** from the dead.



BVT
Christian Church

Why do Christian help? What inspires Christians?

Parables:

- **Good Samaritan**: To help strangers in need. To not discriminate against others and to help all groups of people.
- The **Widows Offering**: To give all you can to help others i.e. Charity
- **Lazarus and the Rich Man** OR **The Sheep and the Goats**: These are about judgment day. Therefore, Christians help others so they will be rewarded in Heaven

Quotes:

- *"let's not love with words or thoughts but with actions"* Bible
- *"For I was hungry, and you gave me something to eat. I was thirsty and you gave me something to drink. I was a stranger and you invited me in"* Bible
- *"Love your enemies and pray for those who persecute you"* Jesus
- *"Go make disciples of all nations"* Jesus

Key vocabulary

Parables
Street Pastors
Trussell Trust
Evangelism
Missionaries
Christian Army
SIM (Serving in Mission)

Christian Help in the Local Community: UK based

Street pastors

- These are Christian groups who go out Friday and Saturday nights into town / city centres to **support the police** in giving people support late at night with drink and drug problems.
- They work in **270** towns/cities in the UK.
- They can: Give basic medical help; Provide foil blankets, lolly pops, flip flops; Call ambulances or police if needed

Trussell Trust

- Set up by Paddy Henderson in Salisbury a food bank for the needy.
- Professionals such as police, social services, doctors **recommend** people in need.
- People are given **vouchers** to spend at food banks
- Food is donated by supermarkets and the public

Evangelism: UK and World based

- Evangelism is the **spread of the Christian faith**. Many Christians want to spread Christianity so more people find God which they believe can help them in their lives in many ways.
- These people that spread the Christian faith are called **missionaries.** Missionaries want to spread the word of God so they can embrace God into their lives. They believe this spirituality can give them support, hope and guidance in their lives. It can also bring people together in a community.

These 2 groups are evangelism groups that have spread the word of God by helping communities:

Christian Army: in the UK

- Run clubs for Children, provide opportunity for troubled / vulnerable teenagers to go on adventure activities
- Work with drug addicts
- Provide lunch clubs for the elderly and lonely
- Provide chaplains in Hospitals and prisons

SIM: Abroad

- Send mission workers into **70** countries around the world
- SIM have helped in **West Africa** with children suffering from malnutrition
- In **Nigeria** SIM Christians have helped Christians who have faced discrimination and violence.

BVT
Christian Church

Christian Charity against Poverty: World based

Christian Aid
- Holds Christian Aid week around the UK for fund raising.
- Responds in short term aid for natural disasters around the world.
- Long term projects to give poor countries their independence.
- Working in Burma – helping fight against Malaria.

Cafod
- Provides aid after natural disasters – short term, but also long term by putting disaster risk reduction strategies in place.
- Long term projects are to develop sustainability and confidence in the people for their future.
- In Zambia they have helped provide clean water pumps and schools.

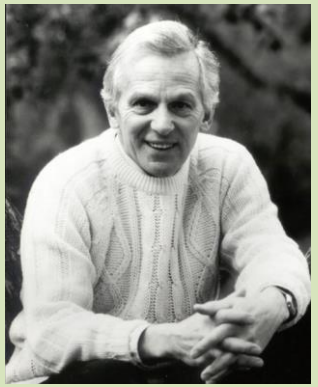
Key vocabulary

Christian Aid
Cafod
Discrimination
Persecution
Brother Andrew
James and Stephen Smith
Interfaith Dialogue
Corrymeela
Andrew White Vicar of Baghdad

Christian support against Discrimination / persecution: World based

Brother Andrew
- Lived in Poland while Christians were being persecuted.
- He smuggled in bibles for them.
- After Poland he worked with 125 other countries helping persecuted Christians.

James and Stephen Smith
- Opened a memorial centre in Rwanda which helped victims of the genocide there.
- They provided medical, counselling, financial and education support to widows and orphans .



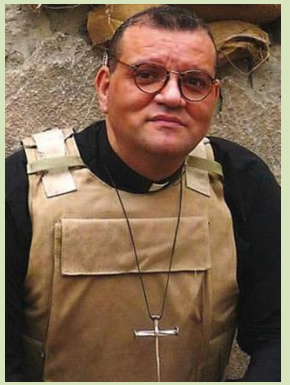
Brother Andrew

Christian work to bring peace and reconciliation: UK and World based

Both these people / groups below encourage **interfaith dialogue** which means bringing people of 2 faiths together and talking / getting along

Corrymeela: UK (Northern Ireland)
- Christian group that works to get Protestants and Catholics in Ireland talking and building reconciliation, during the Irish troubles.
- It focuses on working with families and children and those that were affected by the troubles/violence in Ireland.
- It was awarded the Noble Peace Prize in 1997 for work towards world peace.

Andrew White - Vicar of Baghdad
- The Vicar works in the Middle East working for peace between religious groups.
- He has worked in Israel between Jews and Muslims, in Iraq with Sunni and Shi'a Muslims to bring reconciliation during wars.
- He has also worked with leaders to try to bring peace, risking his life in war zone areas.



Andrew White - Vicar of Baghdad

<u>Présente-toi</u> *(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)*

<u>Comment est ta famille?</u> *(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 <u>qui</u> s'appelle… *(I have a brother /sister / step-brother <u>who</u> is called…)*

je suis fille /fils unique *(I'm an only child)*

mon père / ma mère / mes parents *(my dad / mum / parents)*

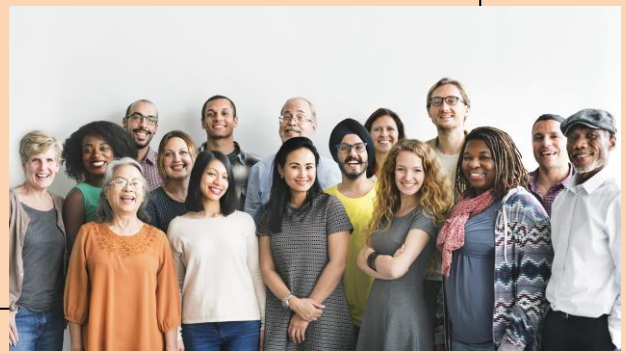
il / elle est *(he / she is)*

ils / elles sont *(they are)*

il / elle a *(he/ she has)*

ils /elles ont *(they have)*

ils s'appellent *(they are called)*



quand je suis avec mes amis *(when I'm with my friends)*

quand je suis au collège *(when I'm at school)*

quand je suis chez moi *(when I'm at home)*

selon mes parents *(according to my parents)*

selon mes profs *(according to my teachers)*

je peux être *(I can be)*

il peut être *(he can be)*

quelquefois *(sometimes)*

toujours *(always)*

des fois *(at times)*

ne...jamais *(never)*

je ne suis jamais... *(I am never...)*

s'il fait chaud *(if it's hot)*

si j'ai beucoup de devoirs *(if I have lots of homework)*

Est-ce qu'on se dispute? *(Do you / do people argue [in your house])*

on se dispute quand / si… *(we argue when / if…)*

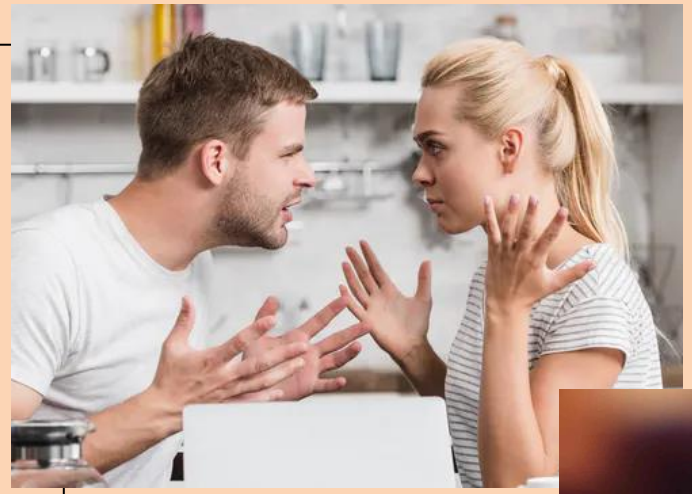
on s'entend bien *(we get on well)*

on ne s'entend pas bien *(we don't get on well)*

je m'entends bien avec… *(I get on well with…)*

je ne me dispute pas... *(I don't argue)*

je ne me dispute jamais... *(I never argue)*



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 ne vais pas me marier *(I'm not going to get married)*

Je ne marierai jamais! *(I will never get married)*

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)*

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).

These go AFTER the noun

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)
funny	amusant(s)	amusante(s)
naughty	méchant(s)	méchante(s)

These go BEFORE the noun

Adjective	*masculine*	*feminine*
big	grand(s)	grande(s)
small	petit(s)	petite(s)
good	bon(s)	bonne(s)
bad	mauvais	mauvaise (s)
beautiful	beau(x)	belle(s)
young	jeune(s)	jeune(s)
old	vieux / vieil	vieille(s)
fat	gros	grosse(s)
pretty	joli(s)	jolie (s)

Examples:

j'ai les cheveux **noirs** = I have **black** hair

mon **grand** frère a les yeux **bleus** = my **big** brother has **blue** eyes

nous avons un **jeune** chien **intelligent** et **amusant** = we have a **young**, **clever** and **funny** dog

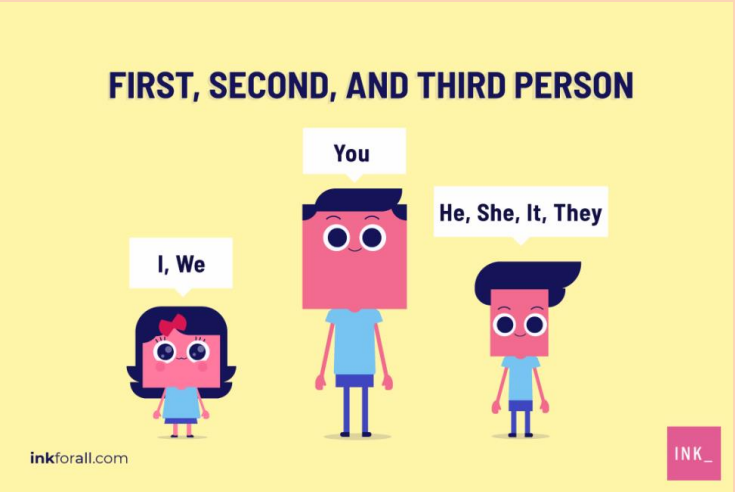
OR we could say

nous avons un jeune chien **qui** est intelligent et amusant = we have a young dog **who** is clever and funny

Key Grammar

Describing yourself – using key basic verbs

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)

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**

Examples:
je m'entends bien avec mes soeurs = *I get on well with my sisters*
mon oncle se dispute souvent avec la police = *my uncle often argues with the police*
mes cousins s'entendent bien avec leurs voisins = *my cousins get on well with their cousins*
nous nous disputons toujours = *we always argue*

GCSE FRENCH YEAR 10: FREE TIME and HEALTH

Quels sont tes hobbys / Que fais-tu pendant tes heures libres?
Quand il fait beau / froid / chaud *(when it's nice / cold / hot)*
Pendant mes heures libres *(during my free time)*
Samedi / dimanche / pendant la semaine *(on Saturday / Sunday / during the week)*
Quelquefois / normalement / parfois *(sometimes / normally / occasionally)*

je joue / je fais / je lis / ... *(I play / do / read...)*

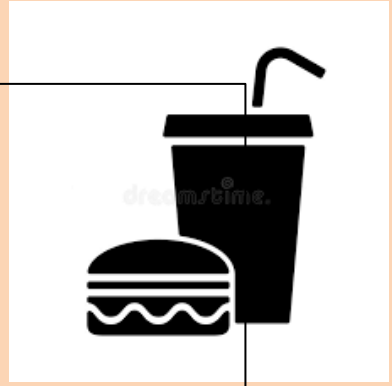
j'aime / je préfère… Je n'aime pas tellement *(I like / I prefer / I don't really like)*
mon sport préféré *(my favourite sport)*
faire de l'équitation *(to do horseriding)*
faire du vélo *(to do cycling)*
faire de la natation *(to do swimming)*
jouer au foot *(to play football)*
jouer au badminton *(to play badminton)*
aller en ville *(to go to town)*
lire *(to read)*
écouter de la musique *(to listen to music)*

R* – *range
O* – *opinions
T* – *tenses
A* – *adjectives
T* – *tie together
E* - *extend

Qu'est-ce que tu as fait le weekend dernier?
samedi (matin / après-midi / soir) *(Saturday morning / afternoon / evening)*
J'ai fait / j'ai joué *(I did / I played)*
J'ai lu *(I read)*
J'ai écouté *(I listened)*
J'ai visité (*I visited)*
J'ai aidé à la maison *(I helped at home)*
J'ai promené le chien *(I walked the dog)*
J'ai rendu visite chez… *(I visited [people])*
J'ai regardé *(I watched)*
Je suis allé(e) *(I went)*
Je suis resté(e) *(I stayed)*

Qu'est-ce que tu vas faire ce weekend?
je vais / on va *(I'm going / we are going)*
j'ai l'intention de / je veux / *(I intend / I want)*
aller (to go)
jouer (to play)

je ferai *(I will do)*
j'irai *(I will go)*
j'aurai *(I will have)*
e jouerai *(I will play)*

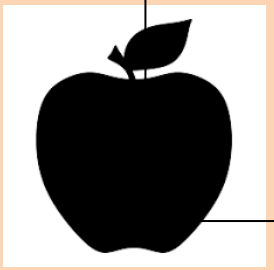


Qu’est-ce que tu aimes manger et boire?
je mange / bois *(I eat / drink)*
j’aime / je préfère manger / boire *(I like to eat /drink)*
mon repas préféré *(my favourite meal)*
au petit déj / à midi *(for breakfast)*
le soir etc *(in the evening)*
du pain *(bread)*
du fromage *(cheese)*
de la confiture *(jam)*
de la viande *(meat)*
des choux de Bruxelles *(sprouts)*
de l’eau *(water)*
de l’aubergine *(aubergine)*

je ne mange jamais de... (I never eat)

nous mangeons dans le jardin / la salle à manger / la cuisine *(we eat in the garden / the dining room / the kitchen)*

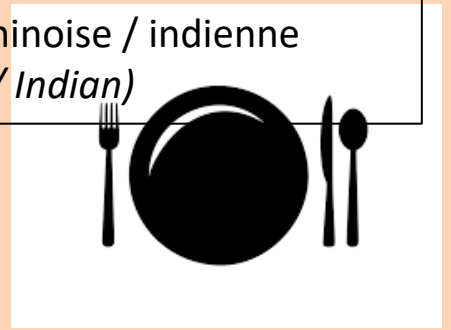
avoir faim / soif *(to be [have] hungry / thirsty)*



délicieux *(delicious)*
dégueulasse *(revolting)*
dégoûtant *(disgusting)*
savoreux *(tasty)*
très / trop / un peu *(very / too / a little*)
salé / sucré / amer / acide / croustillant *(salty / sweet / bitter / acidic / crusty)*

la semaine dernière/ le weekend dernier / samedi *(last week / last weekend / on Saturday)*
je suis allé(e) à / nous avons visité *(I went to / we visited)*
un restaurant / McDo
c’était l’anniversaire de X / mon anniversaire *(it was X ’s birthday / my birthday)*

la cuisine française / anglaise / chinoise / indienne *(French food / English / Chinese / Indian)*



Les opinions

je pense que / à mon avis / en ce qui concerne / quant à moi / je suis d'avis que / de mon façon de voir / selon moi, mon ami

(I think that / in my opinion / with regards to / when it comes to me / I'm of the opinion that / from my point of view / according to me / my friend)

quand j'etais plus jeune… *(when I was younger)*
quand j'avais … ans *(when I was ... years old)*
je mangeais *(I used to eat)*
je buvais *(I used to drink)*
je faisais *(I used to do)*
j'aimais *(I used to like)*

R* – *range
O* – *opinions
T* – *tenses
A* – *adjectives
T* – *tie together
E* - *extend

Qu'est-ce qu'on devrait faire pour rester en forme / bonne santé

on doit *(you / one must)*
on devrait *(you / one should)*
je vais *(I'm going to)*
il faut *(you must / one must)*
c'est important de *(it's important to)*
toujours *(always)*
ne...pas *(not)*
ne...jamais *(never)*
éviter *(to avoid)*
fumer *(to smoke)*
boire *(to drink)*

se droguer *(to take drugs)*
se lever *(to get up)*
se coucher *(to go to bed)*
se relaxer *(to relax)*
se détendre *(to relax / unwind)*

Hablame de tu mismo *(Tell me about yourself)*
me llamo *(my name is / I'm called)*
tengo ... años (I'm … years old)
tengo el pelo rubio / moreno, castaño / corto / largo *(I've go blonde / brown / short / long hair)*
tengo los ojos azules / verdes *(I've got blue / green eyes)*
soy timido / tranquilo / inteligente, listo *(I'm shy / quiet / clever)*

cuando estoy con mis amigos *(when I'm with my friends)*
cuando estoy en mi insti *(when I'm at school)*
cuando estoy en mi casa / con mi familia *(when I'm at home)*
según mis padres *(according to my parents)*
según mis profesores *(according to my teachers)*
puedo ser *(I can be)*
(él) puede ser *(he can be)*
a veces *(sometimes)*
siempre *(always)*
de vez en cuando *(occasionally)*
nunca *(never)*
si hace calor *(if it's hot)*
si tengo muchos deberes *(if I have lots of homework)*

¿Cómo es 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 / una hermanastra que se llama... *(I have a brother /sister / step-brother who is called…)*
soy hijo único / hija única *(I'm an only child)*
mi padre / mi madre / mis padres *(my dad / mum / parents)*
son *(they are)*
tiene *(he/ she has)*
tienen *(they have)*
se llaman *(they are called)*

¿Te llevas bien con tu famlia y tus amigos? *(Do you / do people argue [in your house])*

nos peleamos cuando / si… *(we argue when / if…)*

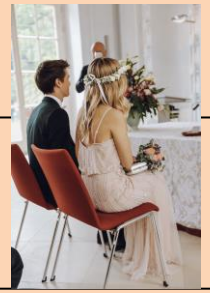
nos llevamos bien *(we get on well)*

no nos llevamos bien *(we don't get on well)*

me llevo bien con *(I get on well with…)*

no me peleo … *(I don't argue)*

me peleo nunca… *(I never argue)*



¿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…)*
no voy a casarme *(I'm not going to get married)*
¡me casaré nunca! *(I will never get married)*
pienso que el matrimonio es… *(I think that marriage is…)*
si / cuando *(if / when)*
la pareja / el hombre / la mujer de mis sueños *(the partner / man / woman of my dreams)*
sería / tendría *(would be / would have)*

¿Tienes una fiesta favorita?
¿Prefieres las fiestas ingléses o españoles?
(Do you have a favourite festival? Do you prefer English or Spanish festivals?)

me gusta / me encanta / prefiero *(I like / love / I prefer)*

mi fiesta favorita es … *(my favourite festival is…)*

Navidad / Pascua *(Christmas / Easter)*

prefiero *(I prefer)*

porque / ya que / como *(as / because / since)*

se come / se bebe / se va *(people eat / people drink / people go)*

recibo regalos de… *(I get presents from…)*

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 'el' or 'un' word), FEMININE (a 'la' or 'una' word) or PLURAL (more than one).

These go AFTER the noun

Adjective	*masculine*	*feminine*
white	blanco(s)	blanca(s)
black	negro(s)	negra(s)
green	verde (s)	verde(s)
red	rojo(s)	roja(s)
blue	azul(es)	azul(es)
fun	divertido (s)	divertida (s)
clever	intelligente(s)	intelligente(s)
funny	gracioso (s)	graciosa(s)
naughty	travieso (s)	traviesa (s)

Adjective	*masculine*	*feminine*
big	grande(s)	grande(s)
small	pequeño (s)	pequeña(s)
good	bueno (s)	buena (s)
bad	malo (s)	mala (s)
beautiful	hermoso (s)	hermosa (s)
young	jóven (es)	jóven (es)
old	viejo (s)	vieja (s)
fat	gordo (s)	gorda (s)
pretty	bonito (s)	bonita (s)

Examples:

tengo el pelo **negro** = I have **black** hair

mi hermano **mayor** tiene los ojos azules = my **big** *(age)* brother has **blue** eyes

tenemos un perro **jóven** , **inteligente** y **gracioso** = we have a **young**, **clever** and **funny** dog

OR we could say

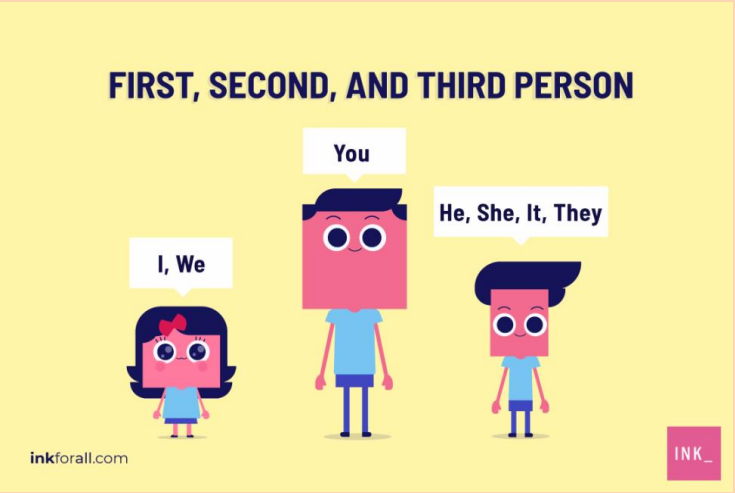
tenemos un perro jóven **que** es inteligente y gracioso = we have a young dog **who** is clever and funny

Key Grammar

Describing yourself – using key basic verbs

In Spanish, you normally don't bother using the words for 'I', 'you', 'he' etc

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 / Usted *(he/she /you)*	**es** *(is)*	**tiene** *(has)*	**se llama** *(is called)*
nosotros *(we)*	**somos** *(are)*	**tenemos** *(have)*	**nos llamamos** *(are called)*
vosotros *(you)*	**soís** *(are)*	**tenéis** *(have)*	**os llamáis** *(are called)*
ellos / ellas *(they)*	**son** *(are)*	**tienen** *(have)*	**se llaman** *(are called)*



NB:

tú *(you)* = you (informal; talking to younger people, people you know)

Usted = you (formal; talking to older people, adults, people you don't know)

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)*	**pelearse** *(to argue)*
yo *(I)*	**me llevo**	**me peleo**
tú *(you)*	**te llevas**	**te peleas**
él / ella / Usted *(he/she /you)*	**se lleva**	**se pelea**
nosotros *(we)*	**nos llevamos**	**nos peleamos**
vosotros *(you)*	**os lleváis**	**os peleáis**
ellos / ellas *(they)*	**se llevan**	**se pelean**

Examples:

me llevo bien con mis hermanas = *I get on well with my sisters*
mi tío se pelea a menudo con la policía = *my uncle often argues with the police*
mis primos se llevan bien con sus padres = *my cousins get on well with their parents*
nos peleamos siempre = *we always argue*

GCSE SPANISH YEAR 10: FREE TIME and HEALTH

¿Cuáles son tus pasatiempos? / ¿Qué haces en tus ratos libres?
cuando hace buen tiempo / frío/calor *(when it's nice / cold / hot)*
durante mis ratos libres *(during my free time)*
sábado / domingo / duranre la semana*(on Saturday / Sunday / during the week)*
a veces / normalmente / algunas veces *(sometimes / normally / occasionally)*

juego/ hago/ leo / ... *(I play / do / read...)*

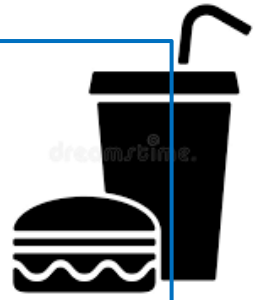
me gusta / prefiero… no me gusta mucho *(I like / I prefer / I don't really like)*
mi deporte favorito *(my favourite sport)*
montar a caballo *(to do horseriding)*
hacer ciclismo *(to do cycling)*
nadar *(to swim)*
jugar al fútbol *(to play football)*
jugar al badminton *(to play badminton)*
ir al centro *(to go to town)*
leer *(to read)*
escuchar música *(to listen to music)*

R* – *range
O* – *opinions
T* – *tenses
A* – *adjectives
T* – *tie together
E* - *extend

¿Qué hiciste el fin de semana pasada?
sábado (mañana / tarde / noche) *Saturday (morning / afternoon / evening)*
hice / jugué *(I did / I played)*
leí*(I read)*
escuché*(I listened)*
visité (*I visited)*
ayudé en casa *(I helped at home)*
pasé al perro *(I walked the dog)*
visité… *(I visited [people])*
ví *(I watched)*
fui *(I went)*
me quedé*(I stayed)*

¿Qué vas a hacer este fin de semana?
voy a / vamos a *(I'm going / we are going)*
intento/ quiero/ *(I intend / I want)*
ir (to go)
jugar (to play)

haré*(I will do)*
iré *(I will go)*
tendré *(I will have)*
Jugaré *(I will play)*

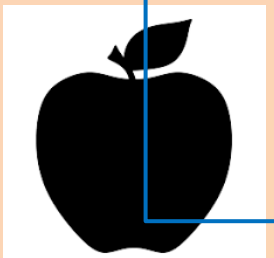


¿Qué te gusta comer y beber?
como/ bebo *(I eat / drink)*
me gusta / prefiero comer / beber *(I like to eat /drink)*
mi plato favorito *(my favourite meal)*
desayuno/ almuerzo *(for breakfast/lunch i eat)*
por la tarde etc *(in the evening)*
el pan *(bread)*
el queso *(cheese)*
la mantequilla *(jam)*
el carne *(meat)*
coles de Bruselas *(sprouts)*
aqua *(water)*
berenjena *(aubergine)*

unca como ... (I never eat)

comemos en / el jardín /el comedor/ la cocina *(we eat in the garden / the dining room / the kitchen)*

Tener hambre/ sed *(to be [have] hungry / thirsty)*



delicioso *(delicious)*
asco *(revolting)*
repugnante *(disgusting)*
saboroso *(tasty)*
muy / demasiado / un poco *(very / too / a little*)
salado / azucarado / amargo / ácido / crujiente *(salty / sweet / bitter / acidic / crusty)*

la semana pasada/ el fin de semana pasado/ sábado *(last week / last weekend / on Saturday)*
fui a / visitemos*(I went to / we visited)*
un restaurante / McDonald's
fue el cumpleaños de X / mi cumpleaños *(it was X 's birthday / my birthday)*

la comida española/ inglés / china / india *(French food / English / Chinese / Indian)*

Les opiniónes
Pienso que/ en mi opinión/
en lo que concierne/ en cuanto a mi/ a mi modo de ver / según yo/mi amigo

(I think that / in my opinion / with regards to / when it comes to me / from my point of view / according to me / my friend)

Cuando era más jóven… *(when I was younger)*
Cuando tenía… años *(when I was ... years old)*
Comía *(I used to eat)*
Bebía *(I used to drink)*
Hacía *(I used to do)*
Me gustaba *(I used to like)*

R* – *range
O* – *opinions
T* – *tenses
A* – *adjectives
T* – *tie together
E* - *extend

Qu'est-ce qu'on devrait faire pour rester en forme / bonne santé
Se debe *(you / one must)*
Se debería *(you / one should)*
Voy a *(I'm going to)*
Tiene que *(you must / one must)*
Es importante *(it's important to)*
siempre *(always)*
No *(not)*
Nunca *(never)*
evitar *(to avoid)*
fumar *(to smoke)*
beber *(to drink)*

drogarse*(to take drugs)*
Levantarse *(to get up)*
Acostarse *(to go to bed)*
Relajarse *(to relax)*
descansar *(to relax / unwind)*

KEY GRAMMAR

Present tense conjugation

THE **INFINITIVE** WILL END IN –AR (most common), -ER OR –IR

The infinitive starts with 'to' in English.

jugar= to play; comer = to eat; vivir = to live

-ar verbs

Juego = I play
jueges
juege
jugamos
jugáis
juegen

-re verbs

como= I eat
comes
come
comemos
coméis
comen

-ir verbs

vivo= I live
vives
vive
vivimos
vivís
viven

Preterite tense

The preterite tense is used for single events that happened in the past **at a definite time**. To form the preterite, you have to take the ending (ar, er or ir) off the infinitive and add the following endings:

-ar verbs	**-er and –ir verbs**
habl**é**	com**í**
habl**as**	comiste
habl**ó**	com**ió**
habl**amos**	com**imos**
habl**asteis**	com**isteis**
habl**aron**	com**ieron**

Imperfect tense

The imperfect tense is used for events that happened in the past *(used to/was)* **over a period of time**. To form the imperfect, you have to take the ending (**ar, er** or **ir**) off the infinitive and add the following endings:

ar verbs	**-er** and **–ir verbs**
habl**aba**	com**ía**
habl**abas**	com**ías**
habl**aba**	com**ía**
habl**ábamos**	com**íamos**
habl**abais**	com**íais**
habl**aban**	com**ían**

Near future

ir + infinitive (just like in English...!)

Voy a hacer= I'm going to do
Vamos a comer= we're going to eat
Vamos a jugar = we're going to play

Simple future

This is when we want to say 'I **will** do x, y, z'

Most of the time put these endings on to the **INFINITIVE**

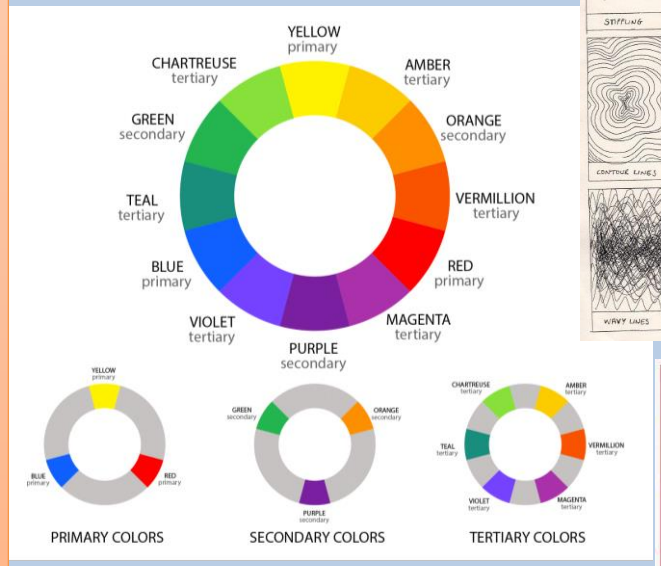
(yo)	hablar-**é**
tú)	hablar-**ás**
(él/ella)	hablar-**á**
(nosotros)	hablar-**emos**
(vosotros)	hablar-**éis**
(ellos/ellas)	hablar-**án**

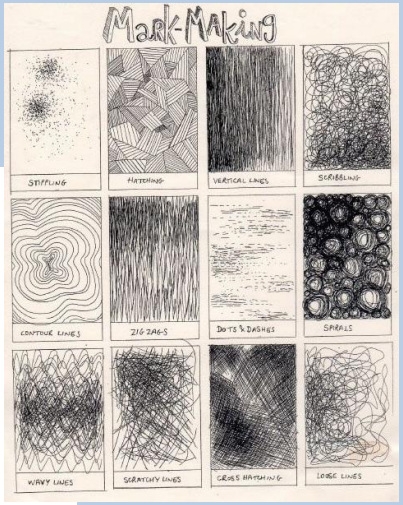
Note: tendr**é** (I will have), har**é** (I will do) saldr**é** (I will go) , dir**é** (I will say), volver**é** (I will return)

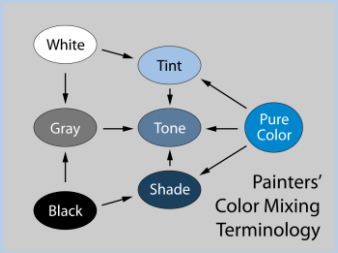
The Fundamentals of Art

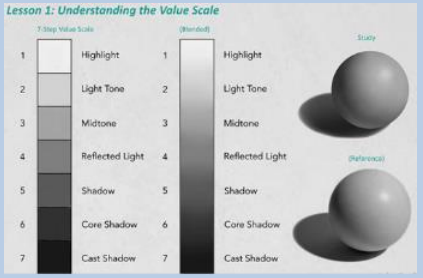
ESSENTIAL EQUIPMENT:
- PENCIL PACK (2B, 4B, 6B ETC)
- ERASER
- SHARPENER
- SKETCHBOOK

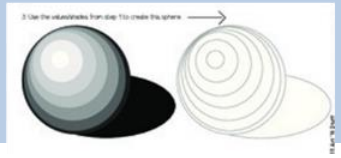
OPTIONAL EQUIPMENT:
- DRAWING PENS
- WATERCOLOUR SET
- WATERCOLOUR PENCILS
- PAINTBRUSHES

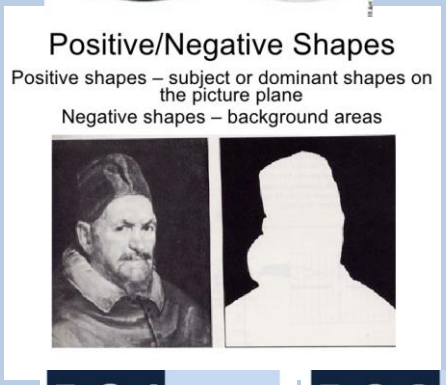












ATTITUDE
Be positive and try your best!

RESPECT
Respect others, work and the room

THINK
Understand and demonstrate.

IMAGIINE
Be creative, use you imagination!

SPOTLESS
Tidy up after yourself.

TARGET
Follow directions.

COLOUR	LINE	SHAPE/FORM/SPACE	PATTERN AND TEXTURE	TONE
BRIGHT	FLUENT	CLOSED	REPEATED	BRIGHT
BOLD	CONTINUOUS	OPEN	UNIFORM	DARK
VIBRANT	CONTROLLED	DISTORTED	GEOMETRIC	FADED
PRIMARY	LOOSE	FLAT	RANDOM	SMOOTH
SECONDARY	POWERFUL	ORGANIC	SYMMETRICAL	HARSH
TERTIARY	STRONG	POSITIVE	SOFT	CONTRASTING
RADIANT	ANGULAR	NEGATIVE	IRREGULAR	INTENSE
VIVID	FLOWING	FOREGROUND	UNEVEN	SOMBRE
DULL	LIGHT	BACKGROUND	ROUGH	STRONG
CONTRASTING	DELICATE	COMPOSITION	BROKEN	POWERFUL
COMPLIMENTARY	SIMPLE	ELONGATED	GRID	LIGHT
HARMONIOUS	THICK	LARGE	FLAT	MEDIUM
MONOCHROME	THIN	SMALL	WOVEN	DARK
NATUARL	BROKEN	2D	ORGANIC	LAYERED
SATURATED	OVERLAPPING	3D	SMOOTH	DEPTH
PASTEL	LAYERED	TWISTED	ABSTRACTED	DEVELOPED
COOL	MARK MAKING	JAGGED		SOFT
WARM				

ART ANALYSIS GUIDE

CONTENT/DESCRIPTOPN OF AN IMAGE

- What is it? (portrait/landscape/painting/mixed media etc)
- What is it about? What is happening? (describe the contents)
- Type of image? (black and white/colour/pencil etc)
- What is the theme of the image? Is there a greater meaning to the image?
- What message does the image communicate?
- Do you the year of the piece? What was happening in the world at the time? Does that have an influence on the piece?

PERSONAL OPINION

- What was your first reaction?
- What is the mood of the image?
- What is the message of the image?
- What do you like or dislike and why? Use art specific language and justify your opinions.
- How does the image make you feel? Why do you think you feel like this?
- Does the colour, texture, form, detail, tone or theme of the image affect your mood? How and why?

PROCESS

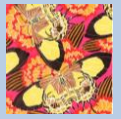
- What type and direction of light was used/created? (harsh, soft, artificial lamp/natural lighting)
- How was this image 'built'?
- What kind of patterns and/or textures are in the image? How would you describe them?
- Describe the use of tone/texture/detail/scale/ perspective/composition/colour within the image.

FORM/VISUAL ANALYSIS

- What do you look at first?
- How does your eye move around the frame?
- How is the image composed: lines, shapes, areas of tone?
- What was the artist's viewpoint? (worms eye view/birds eye view)
- Tone – is the image high or low contrast? How and why?
- Line – describe the lines in the image? How have they been positioned in relation to the rest of the composition? What effect does his have?

NATURAL FORMS

TERM 3 & 4





Artists you could research:
Billy Kidd
Rocio Montoya
Georgia O'Keeffe
Karl Blossfeldt
Ellsworth Kelly
Ernst Haeckel
Christian La Croix
Helen Ahpornsiri
Kate Malone
Micheal Brennand-Wood
Angie Lewin
Henry Moore
Polly Morgan

LINE

A **LINE** is the path left by a moving point, eg. A pencil or a brush dipped in paint. A **LINE** can take many forms, eg.
Horizontal, diagonal or curved.
A **LINE** can be used to show contours,
movements, feelings and expressions.

TONE

TONE means the lightness or darkness of something. This could be a shade or how dark or light a colour appears.

COLOUR

There are 3 primary **COLOURS**: RED, YELLOW, BLUE

By mixing any 2 **PRIMARY COLOURS** together you create **SECONDARY COLOURS**; ORANGE, GREEN, PURPLE

TEXTURE

TEXTURE is the surface quality of something, the way something feels or looks like it feels. There are two types of texture: **ACTUCAL TEXTURE** and **VISUAL TEXTURE**.
ACTUAL TEXTURE: really exists so you can feel it and touch it
VISUAL TEXTURE: created using different marks that represent actual **TEXTURE**

PATTERN

PATTERN is a design that is created by repeating **LINES**, **SHAPES**, **TONES** or **COLOURS.**

Patterns can be manmade or natural.

SHAPE/FORM

A **SHAPE** is an area enclosed by a **LINE**. It could be just an outline or it could be shaded in.
FORM is a three dimensional shape such as a sphere, cube or a cone.

Sculpture and 3D design are about creating **FORMS**

Natural forms are organic objects found in nature.

This includes;

- Shells, seaweed, fish, sea life
- Plants, flowers, seedpods, leaves, trees
- Skulls, bones, DNA
- People, portraits, figures
- Patterns found in nature
- Fruit, vegetables, roots
- Animals, insects, birds, wings, feathers

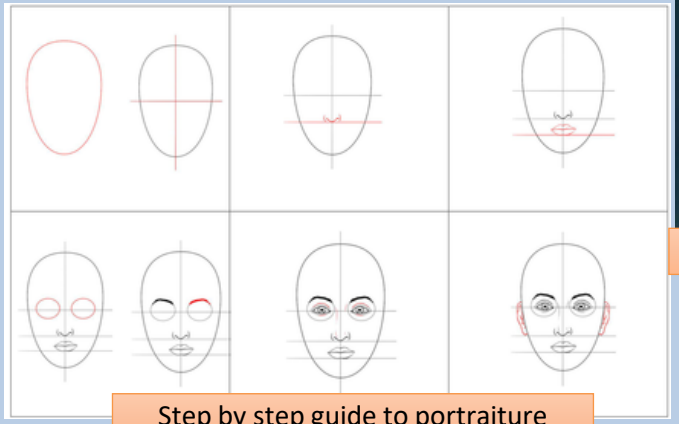




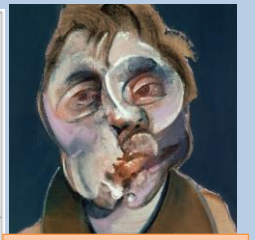




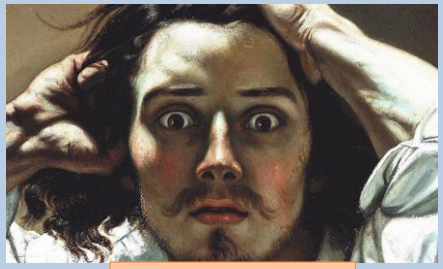

NATURAL FORMS AND IDENTITY



Step by step guide to portraiture

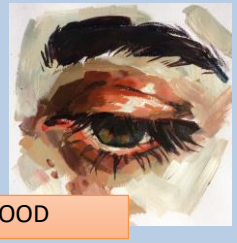


FRANCIS BACON



GUSTAVE COUTBET

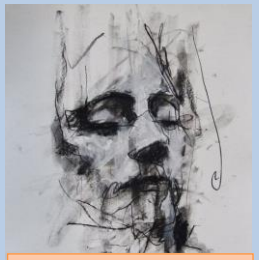
TAI-SHAN SCHEIRENBURG



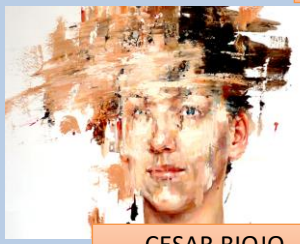
ELLY SMALLWOOD

SHIRIN NESHAT

JONATHAN YEO



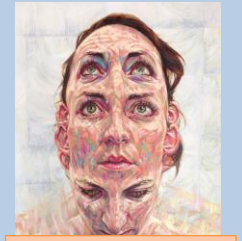
GUY DENNING



CESAR BIOJO

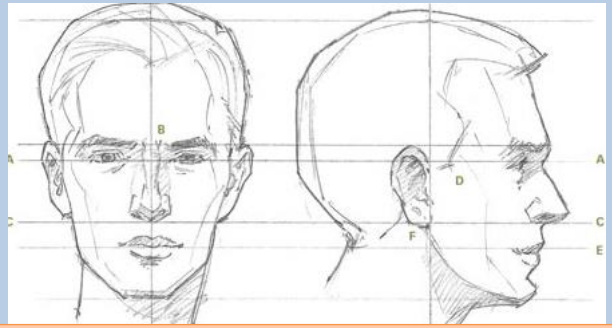
JOHN EVERETT MILLAIS

NIKOS GYFTAKIS

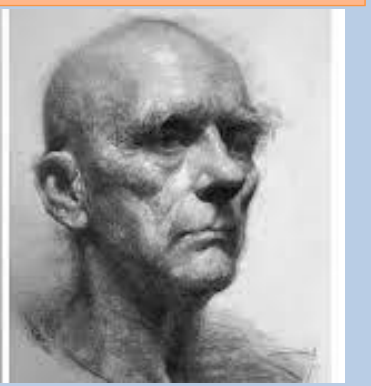


DAVID THERON

KEHINDE WILEY



By adding tone to your outlines and contour lines, you can make your portraits more realistic.



Rocio Montoya

Montoya is a Spanish artist and photographer.

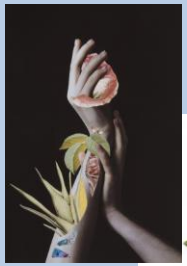
Montoya's work is mostly focused on conceptual photography, linking beauty and fashion using experimental photography and collage techniques.

There is an element of surrealism and abstraction within her work.

Montoya abstracts her subject matter through a mixture of digital and manual manipulations.

I think my work is quite symbolic, oblivious to reality. I'm always looking to find beauty in everything and everywhere and capture this search through aesthetic experiences..

- Rocio Montoya -



GCSE Business Studies (Edexcel)

BUSINESS: ***Creating informed, discerning employees, consumers and future leaders***

Topic 1.3.1 Business Aims & Objectives

Core Knowledge

What is an Aim?

Aims are long term goals. Objectives are more specific measurable, time constrained steps. The best objectives are **SMART**.

SMART – **S**pecific, **M**easurable, **A**chievable, **R**ealistic, **T**ime-framed

Examples of Aims:

Financial Aims: Survival, maximise or increase profit, growth, increase dividends to shareholders
Non-financial aims: ethical, e.g. no animal testing, achieve customer satisfaction, achieve a personal challenge or independence

Why set objectives?

Objectives help a business to have a focus, allow them to monitor progress, and to set individual objectives for employees to motivate them

Topic 1.3.3 Cashflow Forecasting

Core Knowledge

A business will **predict** the amount of money that will enter and leave the business each month.

This allows the business to identify any periods of shortfall, to plan how to deal with this.

Businesses need cash to pay suppliers, employees and all the overheads.

Difficulty can arise if businesses allow customers to pay on **credit**.

Cash needs to be managed by arranging an overdraft, keeping costs down, keeping inflows up

Improve cash flow by cutting stock levels, increase credit from suppliers, reduce credit to customers

	Aug	Sept
Cash inflows	0	85
Cash outflows	185	75
(A) Net cash flow	-185	10
(C) Opening Balance	250	65
(B) Closing balance	65	75

(A) Net cash flow = inflows - outflows

(C) Closing Balance = Opening + Net Cash flow

(B) Opening Balance = last month's closing balance

Topic 1.3.2a Revenue, Costs & Profit

Core Knowledge

Fixed costs	Variable costs
Rent Rates Electricity / heating / phone bills Salaries	Raw materials Packaging Delivery costs

Revenue = Number of items sold x Selling price per unit

Total Variable cost = variable cost per item x number sold

Total costs = Total variable cost + fixed costs

Interest charged = amount borrowed x (interest rate ÷ 100)

Total amount repaid = amount borrowed + interest charged

Monthly payments = Total amount repaid ÷ (years of loan x 12)

% interest charged = (total repayment – borrowed amount) ÷ borrowed amount x 100

Topic 1.3.3 Sources of Finance

Core Knowledge

A business will need finance at three key times:

- At start-up to help fund start-up costs, e.g. initial stock
- During periods of expansion to fund new buildings, legal costs, etc
- During periods when cash flow is poor

Short term finance (trade credit and overdraft) are for small amounts and short periods of time. Long term sources are for longer periods and larger amounts.

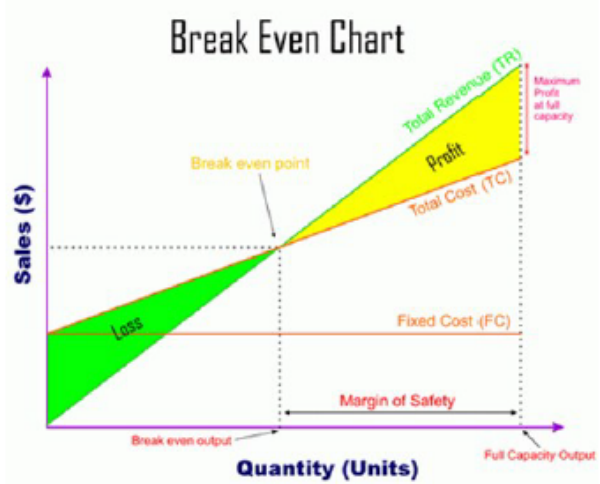
	Benefit	Limitation
Overdraft	Flexible – only use what you need when you need	High interest rates
Trade Credit	Free; helps cash flow	Might not be granted
Personal savings	No interest to repay	Might not have enough
Retained profits	No interest to repay	New businesses won't have any
Venture capital	Advise and support provided	Have to share profit
Share capital	No need to repay	Have to share profit
Loan	Fixed monthly payments helps cash flow	Time to arrange and may not be granted
Crowdfunding	Risk is shared among many people	May not raise enough

Topic 1.3.2a Breakeven

Core Knowledge

Calculating breakeven allows a business to use all its costs to calculate how many products it must sell to cover ALL costs.

The contribution method is a quicker, more accurate way to calculate breakeven:



Break-even = Fixed costs ÷ (Selling price – variable cost)

GCSE Business Studies (Edexcel)

Topic 1.4.1 Business Ownership

BUSINESS: *Creating informed, discerning employees, consumers and future*

Core Knowledge

There are various ways a business can be owned, amongst them

Sole traders
Partnerships
Private limited companies
Franchise

	Advantages	Disadvantages
Sole trader	Easy to set up Keep all profits Make all decisions	Unlimited liability Long hours and few holidays Unincorporated
Partnership	More ideas Can share workload / specialise More start-up capital	Unlimited liability Unincorporated Possibility of disagreements Need to share profits
LTD	Incorporated Limited liability Easier to raise capital	More expensive to set up Must publish accounts every year Profits shared between shareholders
Franchise	Already successful Support with training	Rules about what you can sell and how Start-up fee and % of revenue have to be paid to franchisor

Topic 1.4.2 Business Location

Core Knowledge

Business location is where the business operates. This may be a fixed location on online.

For some businesses the location is more important than others. A business will need to consider

The nature of the business
What sector it operates in
The market / customers' needs
Type and amount of labour required, i.e. near to labour if skilled labour is needed, and concentrated in a specific area
Type, size, amount of materials required to produce the product
Competitors – locate close when customers visit an area for a specific purpose, e.g. a town centre for a night out
Costs – city centre locations are more expensive than out of town locations

The internet has had a significant impact on location. Small businesses can now use online sites such as ebay and etsy.

Using e-commerce can reduce fixed costs, and allow a business to offer a greater choice, but the business must have efficient distribution systems and an effective returns service

Topic 1.4.3 Marketing Mix

Core Knowledge

Also referred to as the 4Ps. All factors must work together to enable a product to be successful.

Product – this must meet the customer needs and be developed based on market research. A business will need to consider its range, brand and USP. The design, aesthetics and function must all work together
Price – what will be charged. This must be appropriate for the target market, and quality of the product. Usually high quality products have higher prices.
Promotion – the combination of activities that create awareness, boost sales, build a brand and communicate features, including advertising, special offers, publicity and public relations
Place – the methods that are used to get the product from the manufacturer to the consumer, for example through a specialist shop, the internet or a general retailer

Changing customer needs will impact on a marketing mix. For example, an increase in customers wanting plant-based food, will mean that food manufacturers will need to develop new products.

Changes in technology, have impacted on all aspects of the marketing mix: a business can use social media to conduct research to develop products; customers can compare prices more easily; promotion can be digital.

Topic 1.4.4 Business Plans

Core Knowledge

Why plan?	Contents
To reduce risk of failure	The business idea
To encourage investors	Aims and Objectives of the business
Forces the entrepreneur to consider all aspects of the business	Target market
Provides something to refer to and provide direction	Forecast revenue, costs and profit
	Cash flow forecast
	Sources of finance
	Location
	Marketing Mix

Limitations

Planning does not guarantee success

Problems can arise if the plan is not flexible and include contingency plans

GCSE Business Studies (Edexcel)

Topic 1.5.1 Stakeholders

Core Knowledge

Stakeholders are anyone interested in the activities of a business.

Each group is interested for different reasons.

Stakeholders are affected by business activity, e.g. local community is affected by the noise, pollution and traffic congestion, but may gain job opportunities or community sponsorship.

Each stakeholder group can influence a business, e.g. customers can write reviews of the business

Stakeholder groups may want different things and so there may be conflict between their needs. A business will need to manage this to try to satisfy as many stakeholder groups as possible.

Topic 1.5.2 Technology

Core Knowledge

Technology has enabled businesses to develop in three main areas:

Trading – being able to buy and sell online through their own websites or websites of a third part, allowing a business to reach a wider market
Communicating – using websites, email, video conferencing allow business to communicate more regularly with consumers
Payments – businesses can accept payments in more ways, attracting more consumers than before

Impact on Sales – businesses are likely to sell more because they can reach a wider market, BUT it is easier for consumers to compare prices, so small local businesses may suffer

Impact on costs – keeping up-to-date and installing technology is expensive and so increases costs, especially in the short term. BUT if a business can replace stores or staff with technology this can reduce costs in the long run

Impact on Marketing Mix

- **Product** – innovation needs to increase to keep up with changes
- **Price** – greater efficiency can reduce prices; consumers can compare so a business must be competitive
- **Place** – a business does not need a physical store. Trading can now be 24/7 365 days a year
- **Promotion** – quicker and cheaper; social media can be used; a business may encourage viral marketing

Topic 1.5.3 Legislation

BUSINESS: *Creating informed, discerning employees, consumers and future leaders*

Core Knowledge

Employment legislation protects the rights of employees from any actions of their employers. Consumer legislation protects the rights of consumers from any harm that might be caused by using or consuming a product or service. Businesses must pay at least the minimum wage, or they are breaking the law. This can increase costs. BUT paying a rate above the minimum can lead to good publicity and more staff wanting to work for you.

All goods must be **fit for purpose**, **match the description** and be of **satisfactory quality.** If they are not, the consumer can ask for a **Refund**, **Repair** or **Replacement**.

Impact on costs - Meeting legal requirements increases costs – better quality materials, checking adverts are correct, extra time for staff to complete and check paperwork, training staff

Impact on sales – meeting or going above legal requirements can improve reputation and therefore increase sales through recommendations, repeat custom and positive reviews

Consequences – breaking the law can lead to fines, bad publicity or even a jail term

Topic 1.5.4 Economic Influences

Core Knowledge

The more a country produces, the more consumers can buy – this makes the economy stronger. Consumers will spend more when they have a higher income. As incomes rise more money is spend on luxury goods.
Unemployment is bad for the economy. High unemployment means less people have jobs, so incomes are lower. Businesses will sell less, employ less people and invest less. The government will receive less taxes and pay more benefits.

There are 3 main types of taxes:

- Those businesses pay – corporation tax
- Those the employees pay – National Insurance and Income Tax
- Those consumers pay – council tax, VAT, Duties, Road Fund Licence, etc

Increases in taxes reduce consumer spending and raise costs for businesses, but do raise finance for the government

An increase in interest rates will raise the cost of borrowing, so reduce consumer income, leading to a fall in consumer spending

Inflation is an increase in prices, so in *real terms*, consumers will be worse off if income does not rise at least as much as inflation. So inflation will lead to a fall in consumer spending.
Exchange Rates affect the cost of importing – remember **SPICED** (**S**trong **P**ound, **I**mports **C**heaper, **E**xports **D**earer)

Topic 1.5.5 Business Response to External Influences

Core Knowledge

Responses to technology:	Responses to changes in legislation:	Responses to changes in the economic climate:
• Merge with other businesses • Install similar technology – increasing costs in short term • Change production methods or product	• Employ more staff to deal with paperwork / red tape • Cut back or scrap an area of business • Invest in technology to meet requirements	• Hire staff, invest in equipment, develop new products during good economic times • Adjust marketing mix • Spread risk: operating in more than one country or producing a variety of goods for different consumers

Year Ten Term Three Film Music

Topic 1 – The Film Industry

Main categories of films:

- Action
- Adventure
- Animation
- Biography
- Documentary
- Children's film
- Comedy
- Crime
- Disaster
- Fantasy
- Horror
- Musical
- Mystery
- Romance
- Sci-fi
- Spy
- Thriller
- War
- Western

There are 2 main categories of film music:

- **Diegetic** – The music is heard as part of the storyline, e.g. music heard on a speaker during the scene.
- **Non-Diegetic** – Back ground music that supports the on-screen action. It is only heard by the audience.

Topic 2 – Use of Musical Elements

Melody – This adds character and shape to musical ideas. It is common in film music to have a variety of different themes of equal importance. An important melodic theme will often be referred to as a **Leitmotif.**

Tempo – This will often reflect the action on the screen.

Metre - The time signature used – how many beats in each bar and what type of beats they are.

Rhythm – Different length durations of notes and rests to create a pattern. There many rhythmic devices used in film music – please refer to your film music PowerPoint resource.

Harmony – The way in which chords are used to create interest and complexity to the music.

- **Diatonic** – Chords that use notes from a specific key.
- **Chromatic** – Use of notes that are not in the key.
- **Dissonant** – Chords that use notes that do not 'fit' together well.

Intervals – The gaps between notes. Some intervals are very effective in film music in creating a certain mood, atmosphere and tension.

Fanfare – A short musical flourish or call to attention based on chords. It is often associated with an announcement or significant event.

Tonality – This refers to whether the music is Major, Minor or Atonal (no key/tone).

- **Atonal** – No sense of a tonic or 'home' key. Often use by composers to create an unsettling feeling.

Topic 3 – Musical Devices and Techniques

Leitmotif – A short musical theme or idea that is associated with a character, place, object or situation – often abbreviated to 'motif'.

Ostinato – A short repeating musical idea. In film music this could be a melody, rhythm or chord sequence. Often, other parts will be layered over the ostinato to emphasise a build up of the action or tension in the film.

Riff – Similar to the ostinato. The word riff indicates music from a popular or modern genre.

Layering - Building up the musical ideas to fill out the texture, to achieve a more powerful or interesting outcome.

Minimalism - A style of music characterised by the repetition of small cells of music, which evolve very gradually to create a hypnotic effect. Often used by film composers to establish the mood of a scene.

Star Trek Soundtracks are epic!

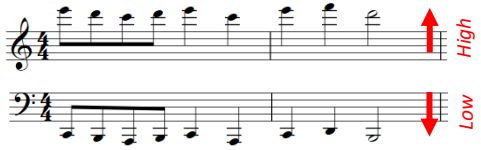
How music is used in film

- To create an atmosphere.
- To create a specific or geographic setting.
- To set the era, time or period, e.g. the use of classical music for a film set in the 18th century.
- To support the physical action and control the pace.
- To support the emotions of the characters and evoke certain emotions in the audience.
- To generate tension and build suspense.
- To support characters, situations and places through the use of a **leitmotif.**
- To predict events or inform the audience of impending events, e.g. when the *Jaws* theme is heard, but the shark has not yet been seen in the film. The audience are aware of the forthcoming danger, but the on-screen characters are not.
- To create a sense of space, breadth, depth i.e. the 'size' of something.

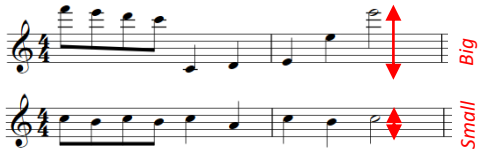
MUSIC GCSE KEY VOCABULARY

Melody – what is the lead line doing?

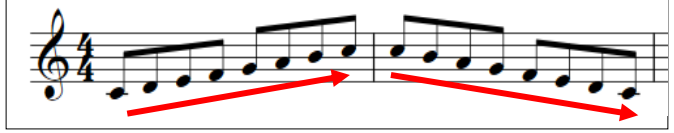
High or low. **Range**



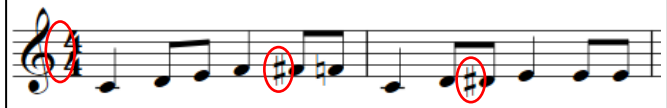
Big or Small.



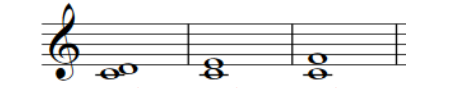
Direction = Ascending Descending

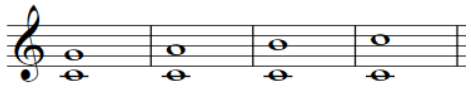


Chromatic The melody uses notes that aren't in the scale / key of the piece.



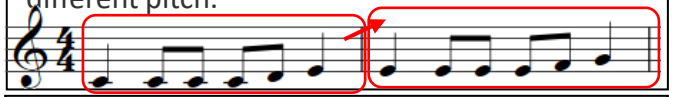
Interval The distance between two notes



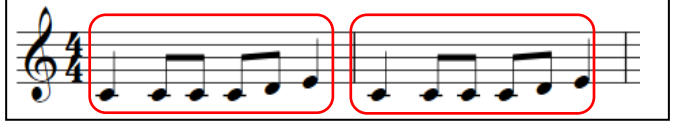


**Count the start note & end note*

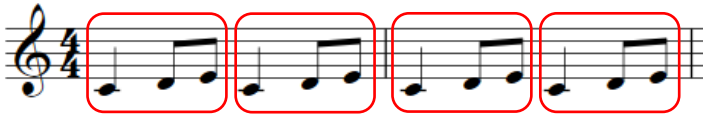
Sequence Doing the same shape idea but at a different pitch.



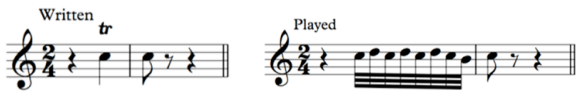
Repetition Doing the same thing again, without any changes.



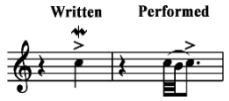
Ostinato A short repeated idea.



Ornaments Trills



Mordents



Harmony - what are the chords and the tonality?

Key Signature
The sharps or flats at the start of a piece of music, showing what key the music is in.

Modulation
Musical word for key change. Most common changes: to **Dominant** or **relative Major/Minor**.

Identifying The Tonality…

Tonal	- In a major or Minor Key
Atonal	- There is no sense of key
Modal	- Uses 'old-fashioned' scales called modes
Pentatonic	- The music only uses 5 notes

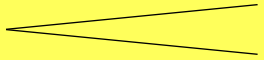
Chords
Triad - A chord with three notes (See below)
Power Chord – Only playing the Root and Fifth of a triad (used in Rock music)
Dissonance - Clashing notes played together
Chord Sequence - The order the chords in a piece of music follow (containing cadences at the ends of phrases)

Cadences
The last two chords in a phrase.
Only sounds 'complete' if ends on chord I.

Sounds Complete		
Perfect Cadence	V Dominant	I Tonic
Plagal Cadence	IV Subdominant	I Tonic
Sounds Incomplete		
Imperfect Cadence	I Tonic	V Dominant
Interrupted Cadence	V Dominant	Minor Chord

MUSIC GCSE KEY VOCABULARY

Dynamics – how loud or quiet? How is it changing?

Marking	Italian Term	Meaning
pp	Pianissimo	Very Quiet
P	Piano	Quiet
mp	Mezzo Piano	Moderately Quiet
mf	Mezzo Forte	Moderately Loud
f	Forte	Loud
ff	Fortissimo	Very Loud
	**Crescendo**	**Getting Louder**
	Diminuendo	Getting Quieter
sfz	Szorzando	Sudden Accent

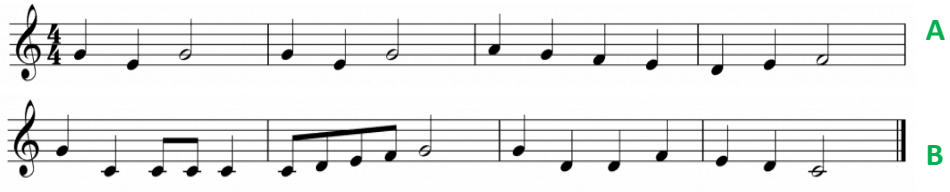
Baroque Period: Dynamics were rarely used (no crescendos and diminuendos). Use of Terraced Dynamics.
Classical Period: Some dynamics, to add contrast.
Romantic Period: Lots of crescendos & diminuendos and a large range of dynamics to add expression.

Describing What You Hear
Comment on any changes - don't sum up the whole example with one word (unless it doesn't change!)
The music starts… then… the music ends…

Structure – the way the music is built

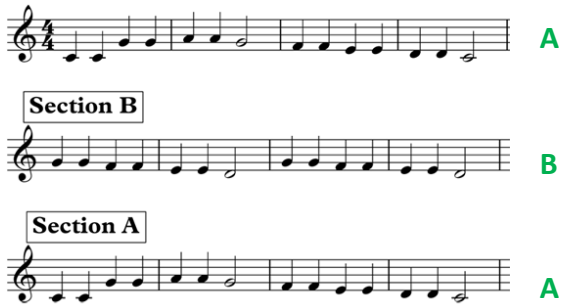
Structure – The order that things happen in.
First… then… this is followed by… at the end.

Binary Form - Music in two parts
Section A and Section B.



Section B contrasts Section A in some way. Usually both sections are repeated.

Ternary Form - Music in three parts
Section A, Section B, Section A.



The 2nd Section A can be an exact repeat of the 1st Section A, or a slightly altered version.

You must know the individual structures of each set work.

Beethoven = Sonata Form (see the set work Knowledge Organiser)

Song Form
Intro Verse Chorus Middle 8 Bridge Outro

MUSIC GCSE KEY VOCABULARY

Instrumentation: The instruments you can hear and what they are doing

Rock and Pop instruments

Electric Guitar

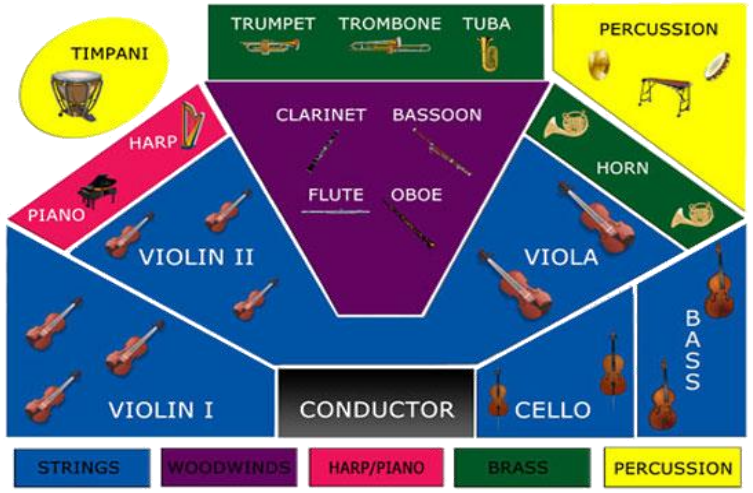
Acoustic Guitar

Bass Guitar

Drum Kit

Synthesiser/Keyboard

Instruments Of The Orchestra



Remember to revise the Gaelic and African instruments in Afro Celt

Types Of Voices

Soprano	(Female)
Treble	(Boy)
Alto	(Female)
Countertenor	(Male Alto)
Tenor	(Male)
Bass	(Male)

**SATB Choir: Soprano, Alto, Tenor & Bass*

Instrumental Ensembles

Solo - 1 performer
Duet - 2 performers
Trio - 3 performers
Quartet - 4 performers

Other Vocal Terms

A capella: Singing without any accompanying instruments.
Chorus: Music written for a choir.
Backing Vocals: Sing harmonies / support the lead singer.

Tempo and Time: The speed and the timing of the music

Working Out The Tempo

Tap your toe to the pulse of the music and think, 'how fast am I tapping'.
**Don't tap your whole foot – it could be seen as distracting others and an exam violation!*

Rubato **Translates as 'to steal time'*

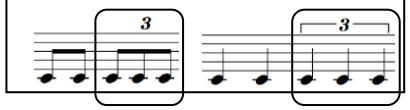
Not sticking strictly to the tempo - to add feeling *(Romantic Period – especially Beethoven!)*

Syncopation Playing off (or in-between) the beat / pulse

On The Beat
Playing on one of the beats that you would 'tap your toe' to
Off-beat
Playing in-between the beats you would 'tap your toe' to

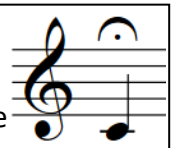
Triplet

Three notes played evenly in the space of two notes:



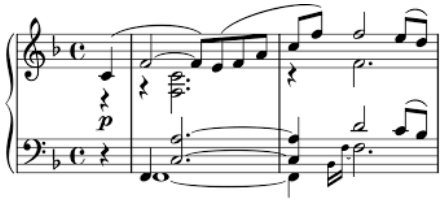
Pause

If this symbol is written, stop the pulse of the music & pause on the note.



Marking	Meaning
Allegro / Vivace	Fast or Lively
Allegretto	Quite Fast (Not as fast as Allegro)
Moderato / Andante	Moderate / A Walking Pace
Adagio / Lento	Slowly
Accelerando	Gradually Speed Up
Ritardando / Rallentando rit. rall.	Gradually Slow Down
= 60 (60 bpm)	60 beats per minute
= 120 (120 bpm)	120 beats per minute

Anacrucis: An unstressed pickup or lead-in note(s) that comes before the first beat of the bar.



The Bach starts with an Anacrucis!

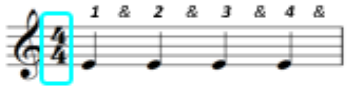
MUSIC GCSE KEY VOCABULARY

Time Signatures and Metre: How is the pulse organised?

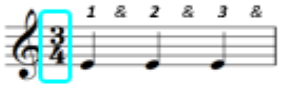
Time Signatures

Written at the start of the music (and anywhere it changes) to show how many beats there are per bar, plus what type of beat

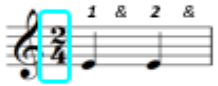
Simple Time Signatures **Each beat can be divided into two equal halves*



4 crotchet beats per bar

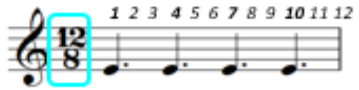


3 crotchet beats per bar

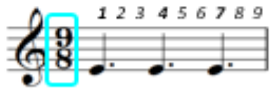


2 crotchet beats per bar

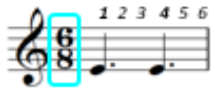
Compound Time Signatures **Each beat is dotted and can't be divided into two equal halves*



4 dotted crotchet beats per bar (12 quavers)



3 dotted crotchet beats per bar (9 quavers)



2 dotted crotchet beats per bar (6 quavers)

Listening Examples Go to Youtube to hear some examples of different metres:

2/4	Slaidburn March	**A march is usually in 2/4 (Left, Right, Left, Right… = 1, 2, 1, 2…)*
3/4	Shostakovich's Waltz No.2	**A waltz is a dance, usually in 3/4*
4/4	All That Jazz (from Chicago)	**Chicago is a Musical*
5/4	Take Five (By Dave Brubeck)	**Listen out for the jazz style*
7/4	The start of Money (By Pink Floyd)	*Listen out for the opening bass riff
6/8	We Are The Champions (By Queen)	**Queen are a famous British Rock Band*
12/8	The Way You Make Me Feel (By Michael Jackson)	**Count 1&a 2&a 3&a 4&a*

Style and Genre: Identifying the styles of music

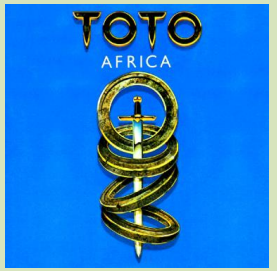
Baroque Period 1600-1750	Classical Period 1750-1810	Romantic Period 1810-1910
Bach, Vivaldi, Handel	Mozart, Haydn, Beethoven	Chopin, Schubert, Wagner
Ornaments **Terraced Dynamics** **Major** & **Minor** Keys **Harpsichord** **Small Orchestra** (Mostly Strings) **Basso Continuo**	Balanced, **regular phrases** **Alberti Bass** Wider range of **dynamics** **Pianoforte** introduced **Wider range of mood** **Orchestra got bigger** **Elegant**/Graceful style	Use of the **leitmotif** Music **more expressive** Huge range of **dynamics** Use of **chromatic** chords Unusual **Key Changes** **Large Orchestra** Use of **Rubato**

Film Music

Genre - Action, Adventure, Horror, Romance, War, Sci-fi, Western…
*Composers - John Williams, James Horner, Jerry Goldsmith
*Think, how do the **musical features represent what is happening on-screen**? E.g. Car Chase: Fast tempo, loud dynamics, sudden changes in melody direction…War Film: Military instruments, fanfare, monophonic to represent isolation…Horror Scene: Dissonant chords and use of repeated pattern to build tension…
Leitmotif - A short musical idea linked to a specific character / thing

Fusion -Mixing more than one style of music together. For example… **Bhangra** - Came to UK in 1980s. Mixing traditional Indian music & pop.

Year Ten Term Four Popular Music
'Africa' by Toto



Background

Africa is a song recorded by the American rock band Toto in 1981 for their fourth studio album entitled Toto IV.
It is a soft-rock love song with features of African music.
The song was written by band members David Paich (born June 25th 1954) and Jeff Porcaro (born April 1st 1954 and died August 5th 1992).
Africa was released as the third single from the album on September 30th 1982 through Columbia Records.
In 2012, Africa was listed by music magazine NME in 32nd place on its list of '50 Most Explosive Choruses'.

The Introduction is in **B major** and uses **3 chords:**

A G# minor C# minor

The Verse is in **B major:**

B major D#m G# m B/F# A/E C# m

The Chorus is in **A major:**

F# minor D A E

And then a slightly tricky ending before heading straight back into the introduction

C# minor E F# minor E A

The Structure

Verse / Chorus Form:

Intro	**Bars 1 – 4**	**4 bars**
Verse 1	**Bars 5 – 39**	**35 bars**
Chorus 1	**Bars 40 – 57**	**18 bars**
Link 1	**Bars 58 – 65**	**8 bars**
Verse 2	**Bars 14 – 39**	**26 bars**
Chorus 2	**Bars 40 – 57**	**18 bars**
Link 2	**Bars 58 – 65**	**8 bars**
Instrumental	**Bars 66 – 82**	**17 bars**
Chorus 3	**Bars 40 – 92**	**22 bars**
Outro	**Bars 93 – 96**	**4 bars**

Instrumental

Performed on the synthesizer.
Completely homophonic in parallel harmony
First: A descending melody using a B major pentatonic scale with the notes falling into groups of three and ending with a triplet.
Then: An ascending and descending melody using the E major scale which contains more rhythmic variety than the first. Then returns to B major.

The Outro is a repeat of the introduction.
On the recording the music repeats continually and the texture is gradually reduced each time so that by the end the music is reduced to only the rhythm track heard at the beginning of the song accompanied by the bass line of Riff A.

Dynamics

Most of the song is mezzo-forte whilst the choruses are forte.

Rhythm and Metre

Ostinato rhythms, consisting almost totally of quavers

Constant use of syncopation.

The time signature is 2/2 (split common time) throughout

Moderately fast.

Harmony

The majority of the song is in B major whilst the choruses are all in A major.

Diatonic throughout

Timbre

<u>Rock Band Line up:</u>

Drum kit with additional percussion

Lead and bass guitars

Synthesizers

Male lead vocals and male backing vocals.

African percussion used such as congas, marimbas, xylophones and cowbells.

Texture

Homophonic chords

Melody and Accompaniment

Parallel harmonies in the vocal part during the chorus

Melody

The melody is mostly conjunct (moving in step)

Includes occasional use of the pentatonic scale.

The pitch range of the vocal line is just less than two octaves on the printed score, but it is wider on the recording with the vocal improvisations towards the end of the song.

Verse 2 is accompanied by a **countermelody** or descant, played on a flute-like instrument, which can be heard across the top of the texture. It changes pitch conjunctly, moving at the same speed as the harmonic rhythm.

Pop & Rock Music

*__Pop__ - Commercial music which appeals to lots of people

*__Rock__ - Generally ‘more aggressive’ but also includes rock-ballads.

*__Instruments__ - (See instruments sheet!)

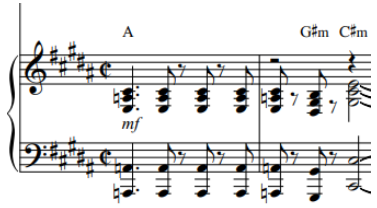
Rock/Pop Song structure:

Intro	The beginning. Sets the mood & style. Usually just instruments.
Verse	Tells the story. Lyrics change each time but tune stays the same.
Chorus	The main message of the song. Same words and tune each time.
Bridge	A section that links two other sections.
Middle 8	A contrasting section of new ideas – usually 8 bars long.
Outro	Extra bit of music to finish off the song.

‘Africa’ by Toto

Melodic Analysis

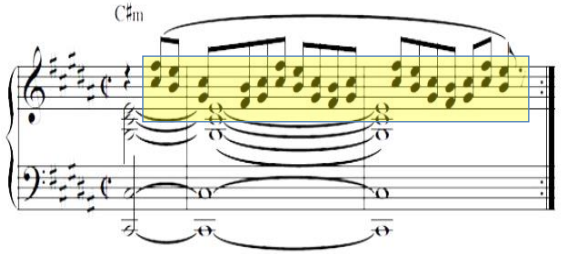
Riff A – bars 1 & 2: A distinctive syncopated rhythm pattern mostly repeating chord IV and concluding with chords vi and ii:



Riff A

With the exception of the Chorus, Riff A makes an appearance in every other section of the song.

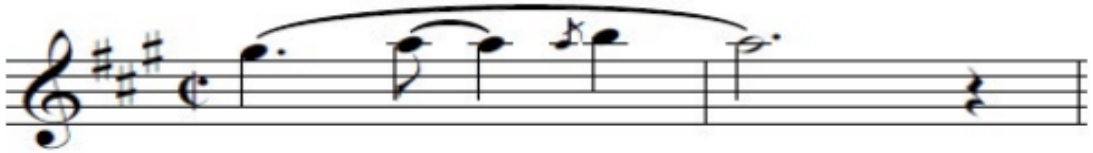
Riff B – bars 3 & 4: starts with an anacrusis and is an ostinato pattern of five notes – based on the E major pentatonic scale – over a sustained chord ii:



Riff B

Chorus 3

A new electric guitar riff is heard on the recording in the last bar of each phrase:



African Influences

Riff A and B:

- Use of syncopation
- pentatonic scale
- Irregular ostinato groupings that cut across the 2/2 time signature.

The instrumental sonorities:

- Xylophones and marimbas – suggest the sounds of pitched percussion instruments which originate from the various countries of the African continent.
- Polyrhythms created

Start of the song:

- An additional eight bar introduction, performed only by unpitched percussion instruments. This is heard before the vocal score begins and contains African influence in its use of layered rhythm parts and ostinatos.

Vocals

- Homophonic texture in the vocal parts – movement in parallel harmony

Introduction (instrumental) X4

Verse 1:

B D#m G#m

I hear the drums echoing tonight

B/F# A/E C#m G#m (INTRO)
But she hears only whispers of some quiet conversation

B D#m G#m
She's coming in, 12:30 flight

B/F# A/E C#m G#m (INTRO)
The moonlit wings reflect the stars that guide me towards salvation

B D#m G#m
I stopped an old man along the way

B/F# A/E C#m G#m (INTRO)
Hoping to find some old forgotten words or ancient melodies

B D#m G#m (INTRO)
He turned to me as if to say, "Hurry boy, it's waiting there for you“

Chorus:

F#m D A E

It's gonna take a lot to drag me away from you
F#m D A E

There's nothing that a hundred men or more could ever do
F#m D A E

I bless the rains down in Africa
F#m D A (C#m E F#m E)

Gonna take some time to do the things we never had (ooh, ooh)

Introduction (instrumental) X2

Verse 2:

The wild dogs cry out in the night
As they grow restless, longing for some solitary company
I know that I must do what's right
As sure as Kilimanjaro rises like Olympus above the Serengeti
I seek to cure what's deep inside, frightened of this thing that I've become

Chorus 2 (same as chorus 1)

Introduction (instrumental) X2

Synthesizer solo
B / D#m / G#m / B / A / C#m / G#m /
B / D#m / G#m / / / (INTRO)

Hurry boy, she's waiting there for you

Chorus 3

It's gonna take a lot to drag me away from you
There's nothing that a hundred men or more could ever do
I bless the rains down in Africa **x 5**

Gonna take some time to do the things we never had (ooh)

Outro (same as introduction) x 8

AQA GCSE PE
Paper 1
Chapter 2: Movement Analysis
2.1 Types of Levers

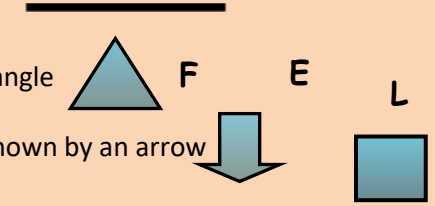
Keywords

Lever: Is a bone and shown as a straight line

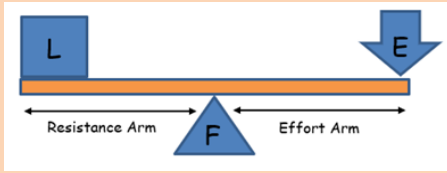
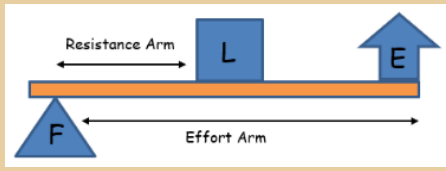
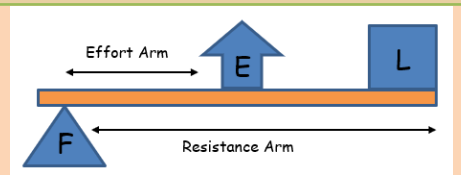
Fulcrum: Is a pivot or joint and shown as a triangle

Effort: Is a force provided by muscles and is shown by an arrow

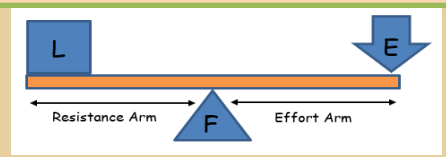
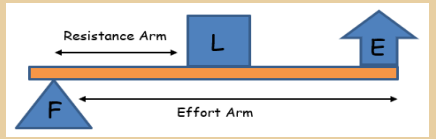
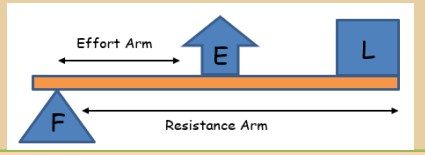
Load: Is the weight of the body/ object being moved, it is shown as a square



Lever systems

1st Class Lever		**The fulcrum is surrounded by the effort and the load**	 Heading a ball
2nd Class Lever		The load is surrounded by the fulcrum and the effort	 Calf raises
3rd Class Lever		The load is surrounded by the fulcrum and the effort	 Bicep curl

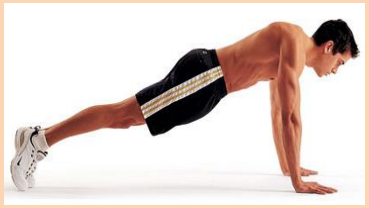
Mechanical Advantage

1st Class Lever	Advantage – High or Low
	Will vary depending on the distance of the load and the effort from the fulcrum
2nd Class Lever	Advantage - High
	Able to lift heavier loads owing to its large effort arm
3rd Class Lever	Advantage - Low
	Provides speed and wide range of movement owing to a long resistance arm

Each lever system can be identified by the component in the middle:

One	Two	Three
F	L	E
(fulcrum)	(load)	(effort)

Effort = Biceps
Load = water
Fulcrum = hand/oars
1st class lever
(fulcrum in the middle)



Effort = Triceps
Load = Body weight
Fulcrum = Feet
2nd class lever
(load in the middle)

Effort = muscles
Load = bat/ball
Fulcrum = shoulders
3rd class lever
(effort in the middle)

2.3 Planes of movement and Axes of rotation

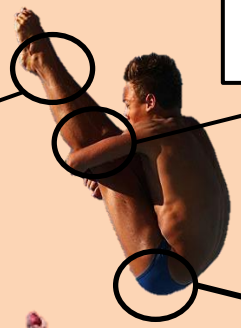
We move in planes around axes.

Plane: Is an imaginary line that movement direction occurs in

Axis: IS a line about which the body or boy part can turn.

2.2 Basic Movements

Analysis of basic movements in sporting movements:



Knee: Hinge joint
Type of movement: Extension

Ankle: Hinge joint
Type of movement: Plantar Flexion

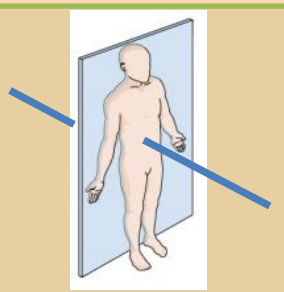
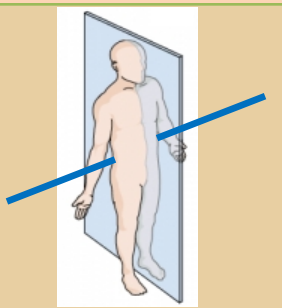
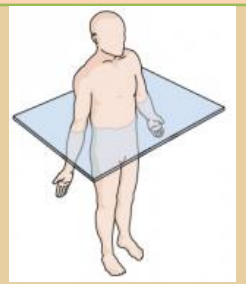
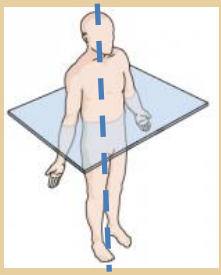
Hip: Ball & socket
Type of movement: Flexion

Shoulder: Hinge joint
Type of movement: Rotation

Knee: Hinge joint
Type of movement: Flexion

Hip: Ball & socket
Type of movement: Flexion

Ankle: Hinge joint
Type of movement: Plantar Flexion

Plane of movement	Axes of Rotation	Sporting example
		
Frontal Plane Separates the front and the back of the body	Sagittal Axis Goes from the front to the back of the body	Cartwheel The only movements are abduction and adduction
		
Sagittal Plane Separates the left and the right side of the body	Frontal Axis Goes from one side to the other side of the body	Somersault The only movements are flexion and extension
		
Transverse Plane Separates the top and the bottom of the body	Longitudinal Axis Goes from the top of the body to the bottom of the body	Full Twist The only movements are rotating and twisting

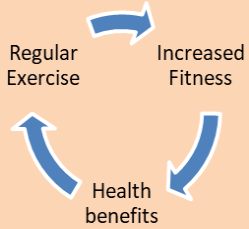
3.1 Health and Fitness

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:

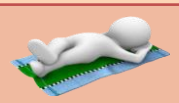
Max Heart rate = 220 - age
Aerobic target zone: 60% - 80% of MHR
Anaerobic training zone: 80% - 90% of MHR

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
Sporting Example	**Sporting Example**	**Sporting Example**	**Sporting Example**	**Sporting Example**	**Sporting Example**	**Sporting Example**
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

<u>High Altitude training as a form of aerobic training</u>:

- 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

<u>Benefits of high-altitude training</u>:

- 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

<u>Limitations of high-altitude training</u>:

- 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:

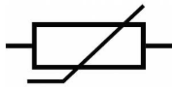
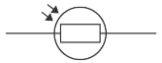
Phase 1 Light exercise
e.g. slow jogging at a much lower intensity you have been working

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

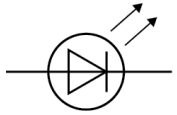
Design and Technology Timbers

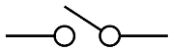
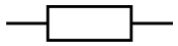
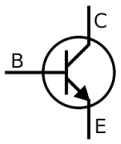
Electronic systems can have singular or multiple input and output devices, and sometimes they have a controller between them. The system reads the input signals and controls the output signals according to the instructions in the program it has been given:
INPUT DEVICE - CONTROL - OUTPUT DEVICE
For example, when you use a computer you move a mouse or press buttons on a keyboard. These are input devices that give information to the computer. The computer controller reads the inputs, and its program tells it what to do. The output devices could be the screen, a printer, a laser cutter, or a very complicated robot in a huge factory.
To design an electronic system, you need to know about the input devices and output devices you could use.

Sensors A sensor is affected by the conditions around it. Sensors are good input devices because they can give an input signal to an electronic system.	
A **thermistor** is a temperature-dependent resistor. Its resistance changes with temperature. • When it is hot, the resistance is low. • When it is cold, the resistance is higher. Some electronic thermometers use a thermistor. As the temperature changes, the system measures the resistance of the thermistor and turns it into a number to display on a screen.	
Light-dependent resistor When light falls on the sensing area of a light-dependent resistor (LDR) its resistance changes: • In the light resistance is low, so electricity flows. • In the dark resistance is high, so not much electricity flows.	

Key terms

Input device: something that can give an input signal to the system.
Output device: something that responds to an instruction of change in control elements.
Input signal: information given to the system by an input device.
Output signal: an instruction the system gives to an output device.
Program: a set of instructions the system controller has been given to make the electronic system do what it is supposed to do.
If a transistor is used, there is no program, just a simple switching action due to the rise in voltage on the base of the transistor above 0.6 volts.
Resistance: an electrical quantity that is a measure of how the device or wire reduces the electric current flow through it.

Outputs In an electronic system, output devices are controlled by the system. They can be simple things like lights that are turned on and off or complex things like computer screens that output a lot of information.	
Buzzer A buzzer makes a sound. Buzzers can be useful in a sensing device to give people a warning that something needs their attention.	
Light-emitting diodes A light-emitting diode (LED) gives out light when electricity is passed through it. LEDs can be small coloured indicator lights or bright enough to light up a room in a house.	

Control devices and components. As well as sensors, there are some other components that can be used to give an input signal to an electronic circuit.	
A single-throw switch has a button that switches between on and off. It is a simple control device that the user can operate to turn a circuit on or off.	
A resistor is a component that can be added to a circuit to change its resistance. This means it can Limit the flow of electricity through part of the circuit. Resistors can be used to: • protect delicate components by stopping too much electricity flowing through them • help control the flow of electricity around a circuit.	
A transistor acts like a tiny electronic switch. It has three connections. A small voltage at the base connection turns it on and lets a larger current flow into the collector and out of the emitter. Transistors are useful in sensing circuits to amplify (make bigger) the small current you get from some sensors. A transistor is a semi-conductor that acts Like an electronic switch depending upon the voltage across the base and emitter. You can get a single transistor to build into your own circuits. Transistors can be made extremely small by etching them onto silicon wafers known as silicon chips.	

Programmable components are used in a variety of applications, for example alarm systems. In school they allow you to add intelligence to your projects. There are many types of PIC (Programmable Interface Controllers) micro-controllers available, for example the GENIE range. These are programmed and tested by software that makes use of flowcharts.

- A flowchart is a good way to plan a computer program.
- A flowchart uses instructions and yes/no questions to create a program.
- Analogue inputs give a range of values to the controller.
- Time delays and counts are useful in a program.
- Feedback loops allow a program to monitor a sensor.

A rectangular box is an instruction, so it tells the program to do something.

A diamond-shaped box is a question, so the program can decide something.

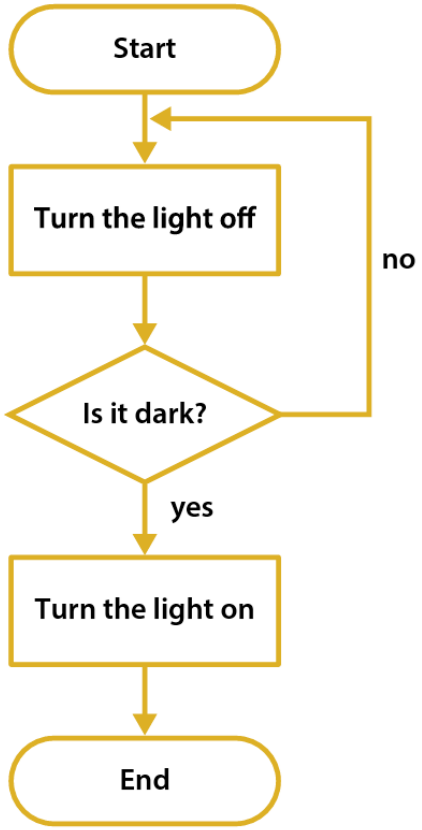
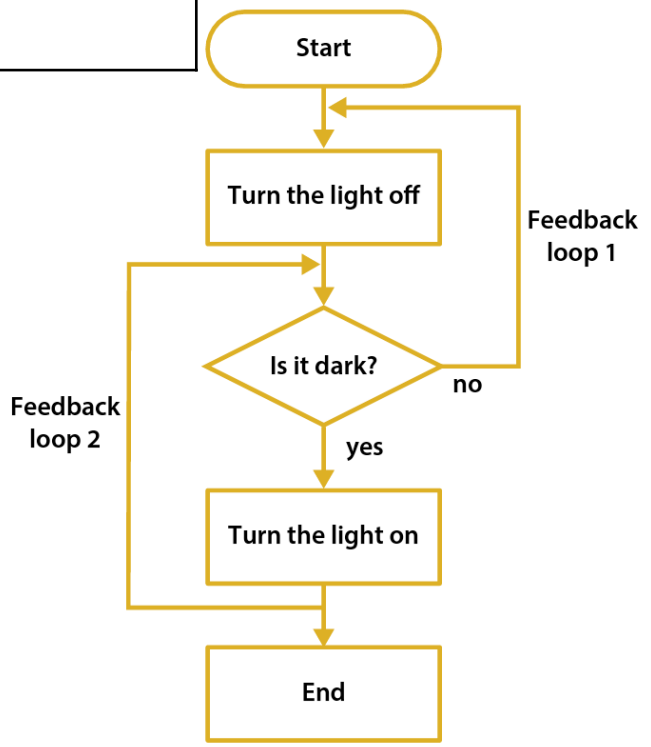


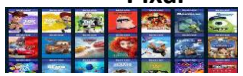
Figure 1.7.1 A flowchart for a simple outside light that comes on in the dark. The light is off to start with, comes on when it gets dark and just stays on forever

Inputs and decisions: switching outputs on or off.
An electronic system uses the questions in its program to make decisions. These decisions tell its output devices what to do. When the control program detects an input, it moves to the next part of the program, and follows the instructions to make an output happen. It is important for a designer to know exactly what they want a product to do, and then break it down into a set of simple steps that can be put into a flowchart.

How to process and respond to analogue inputs
Some sensors give out an analogue signal. This means they can give a range of values. LDRs and thermistors are analogue devices. Their resistance goes up and down as Levels or temperatures change. This means a system can be programmed to respond to different Levels. The outside light has a variable resistor that lets you change the light level at which the Light turns on.

How to use simple routines to control outputs
There are some simple routines that can be added to a program to change what happens:
- **Time delay**. A program instruction that says 'wait 10' means the program will wait 10 seconds then go on to the next instruction. You could use this to make a light flash on and off as quickly or slowly as you want.
- **Count**. A program can be told to count how many times it gets an input, and perhaps give an output every ten pushes of a button.
- **Feedback loop**. This sends the program back to an earlier point to do the same thing repeatedly. This is how a system monitors a sensor - it goes around in a loop asking the same question until the answer changes. The flowchart below shows a second feedback loop added to the circuit. Now the light comes on in the dark and goes off when it gets light.



Name	Who are they?	Known For	Why they are influential
	Company, established in Italy in 1921	Designer and mass producer of functional but visually appealing homeware and kitchen products	Uses famous designers, such as Philippe Starck, to create iconic kitchen products such as the iconic spider like Juicy Salif lemon squeezer and retro kettles, setting a standard for other homeware companies
Apple 	Company, established in the USA in 1976	Producer of consumer electronics and software using cutting-edge technologies, e.g. iPad, iWatch, iPod, iPhone, iTunes	• Ground-breaking design: products looked completely different to anything before • Breaking with tradition and legacy, Apple's iPod made digital music mainstream • A loyal customer base
Heatherwick Studio 	Design studio, established in the UK in 1994	Around 200 designers, architects and makers have worked on projects from perfume bottles to Routemaster buses and Singapore University buildings	Stretches the boundaries of materials, craftsmanship and artistic thinking, showing that products and buildings can be unusual, experimental and interesting
 **Joe Casely-Hayford**	Fashion designer, born 1956	Noted for his original but wearable designs that push barriers of conformity, made by master craftspeople using traditional English tailoring methods	Sets standards for British tailoring that combines style with character and is popular with celebrities
Pixar 	Animation studio, established in the USA in 1979	Among the first to develop computer-animated feature films	Uses new techniques and technologies to make popular and successful films, including *Toy Story* and *Finding Nemo*
Raymond Loewy 	Industrial designer (1893–1986)	'The father of modern design' • Emphasised the importance of combining simplicity with functionality, working with more than 200 companies on designs ranging from refrigerators to planes, trains and spacecraft	• Introduced the idea that if two products have the same price, function and quality, the products with better aesthetics will be more popular • His designs are recognisable today, including the Coca-Cola bottle, Le Creuset Coquelle dish and logos for Shell and BP
Tesla 	Automotive and energy storage company, established in the USA in 2008	Produces electric cars that don't compromise on power or quality, have zero emissions, are affordable and can be charged at home	Leads electric car design and technology, including the *Tesla* Model *X* SUV (2016)
Zaha Hadid 	Architect (1950–2016)	• Integrated geometric forms with expressive, sweeping fluid forms • Promoted architecture as a visual art form, with buildings intended to give aesthetic pleasure	• Overcame racial and gender barriers to establish an architecture practice that has designed more than 1000 iconic buildings worldwide

Polymers have a wide range of uses in everyday life. A synthetic polymer is usually made from oil based petrochemicals, but coal and gas can also be used. The crude oil is refined and mixed with other chemicals and can be used to produce many types of polymer.
A wide range of polymers is available, with engineers continuing to develop the range to meet the requirements of designers and manufacturers. There are two main categories of polymer that you need to know about, thermoforming polymers and thermosetting polymers.

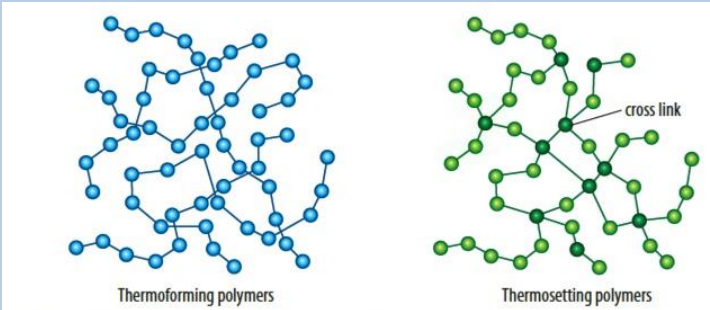


Figure 1.10.1 Structure of thermoforming and thermosetting polymers. Consider how cross-linking of molecule chains prevents the recycling of thermosetting polymers

Thermoforming polymers

- Thermoforming polymers are commonly used to make everyday products. They can offer a wide range of properties that make them suitable for an extensive array of uses. One of the biggest advantages of thermoforming polymers is that they can be recycled, which offers huge benefits to the manufacturer in reducing waste, as well as being attractive to the consumer because it helps to conserve non-renewable resources and prevents more waste going to landfill.

Thermosetting polymers

- Thermosetting polymers set hard once heated and cooled. Unlike thermoforming plastic, a thermosetting plastic shape, once formed, cannot be altered through reheating. These plastics cannot be recycled and are often used in applications where they will be subjected to heat, chemicals or solvents. The molecule chains in thermosetting polymers set differently once heated and cooled, with cross-linking of the chains preventing further forming and recycling.

Thermoforming polymer	Thermosetting polymer	Properties
Acrylic	Polyester resin	Insulator of heat
High Impact polystyrene	Urea formaldehyde	Insulator of electricity
Biopol		Toughness

Paper consists of fine cellulose fibres, usually from wood but also hemp, flax, cotton or bamboo, pressed together with water and then dried. To achieve the required texture and surface finish, chemicals are added to the pulp – brightening bleaches, for example. It may also be coated with an agent that fills the minuscule pits between the fibres, for a smooth, flat surface with better opacity, lustre and colour-absorption.

In Europe, paper and board is measured in grams per square metre (gsm), which means the number of grams a 1 m × 1 m sheet weighs. Paper usually weighs 80–220 gsm. Thicker paper suggests higher quality – copier sheets are often 80 gsm, whereas writing paper is typically 120 gsm

Papers weighing more than 220gsm are generally classified as **boards.** Their thickness is measured in microns which is 1/1000 of a millimetre. A two-ply (layer) board is 200 microns thick.

Paper – is a thin, flat material made from natural fibres, weighing less than 220gsm

Board – thick paper or layers of paper more than 220gsm

Paper	Board	Properties
Copier paper 80gsm	Folding boxboard	Flexibility
Cartridge paper 120-150gsm	Corrugated board	Printability
Tracing paper 60-90gsm	Solid white board	Biodegradability

Modern materials do not occur naturally, but are existing materials that have been altered to improve their properties

Smart materials are existing or modern materials with physical properties that can be varied by an external input such as temperature, light, moisture, force or electrical current. They sense and respond to conditions in their environment and some can return to their original state when the conditions change.

Smart and Modern Materials
Shape memory alloys (SMAs)
Nanomaterials
Photochromic glass
Reactive Glass
Piezoelectric materials
Temperature responsive polymers, e.g. poly N-isopropyacrylamide (PNIPAM)
Conductive inks

Composite Material
Concrete
Plywood
Carbon/Glass fibre
Reinforced polymers
Robotic materials

A **composite** consists of reinforcing material(s) and a bonding agent called a matrix. The new material has enhanced properties than the original material(s). Most **composites** have excellent strength to weight ratios, they are stronger than other materials of the same weight or mass.

Technical textiles are developed for their functions rather than appearance. They can be strong, lightweight, waterproof, tough, breathable, biodegradable and versatile and are increasingly economical.

Technical textiles
Agrotextiles
Construction textiles
Geotextiles
Domestic textiles
Environmentally friendly textiles
Protective textiles
Sports textiles

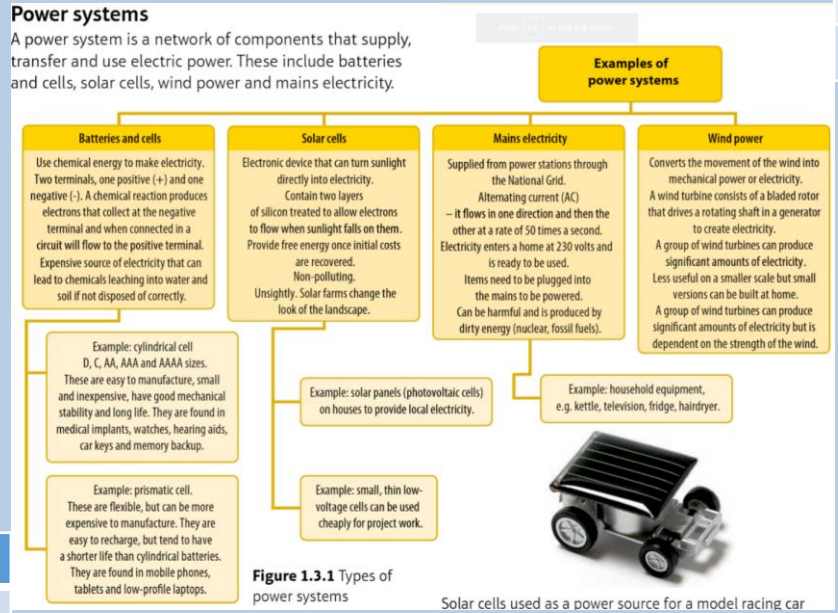


Figure 1.3.1 Types of power systems

Solar cells used as a power source for a model racing car

Sources, generation and storage of energy

Non-renewable energy sources are fossil fuels that were formed from the remains of animals and plants that lived millions of years ago. They cannot be replenished quickly and will eventually run out. Renewable energy sources use natural energy to make electricity. Renewable energy sources produce 20% of the UK's electricity (and rising) and are important for reducing carbon emissions.

Renewable
Biomass
Biodiesel
Tidal
Wind
Solar
Hydroelectric

Non renewable
Coal
Oil
Gas

Choosing appropriate energy sources for products and power systems. Here are some examples of factors that designers may need to consider.

- **Portability of the power source:** remote working requires access to devices (computers, phones, medical aids) with a power source that does not need to be plugged into mains electricity. Such devices can be portable and compact as they do not need power converters.
- **Environmental impact:** no entirely clean energy source exists. The impact may be active, like fossil fuel emissions or the destruction of habitats through extraction. Passive impacts include the sound of generators or the appearance of wind farms. Other environmental factors include the impact of transportation or waste disposal.
- **Power output:** a generator's output may vary according to conditions at the power plant, fuel costs or the electric power grid operator. Many renewables do not produce electricity predictably or consistently; for example the output of solar panels relies on the strength of the sunshine, which depend on the time of day and cloud cover. Renewables are therefore often backed up by other forms of electricity generation. A designer must select an electricity supply capable of reliably delivering the required power.
- **Circuit/system connections:** when considering alternative power sources, a designer will need to consider how the circuit or system will be connected to it, for example the use of available plugs, connectors and terminals.
- **Cost:** the choice of the energy supply, for example batteries or a mains electricity power pack, will impact the running costs of alternative power supplies must be considered carefully by a designer

TEXTILES – All flexible fabrics created from FIBRES. These are fine hair like structures that can be WOVEN, KNITTED or FELTED into a variety of FABRICS. These FIBRES can be either NATURAL – from plants or animals – or SYNTHETIC – man-made from chemicals.

Natural Fibres - plant sources include COTTON, HEMP, FLAX,JUTE, BAMBOO, COCONUT. Animal sources include wool and silk.

	Properties/characteristics	Advantages/Disadvantages	What is it used for?
Animal eg. WOOL	From an animal fleece. Each fibre has a a kink or crimp that allows it to trap air. This makes it warm and insulating. Made from porotein molecules.	Warm, absorbant, breathable, durable, repels rain, creases drop out. Dries slowly. Susceptible to moth attack. Can feel itchy. Can shrink when wet.	Coats, jumpers, blankets, rugs and carpets.
Plant eg.COTTON	Bolls are harvested from the cotton plant and the waste is removed. The cotton fibres are plant cellulose which is naturally strong and absorbent.	Cool and absorbent, soft, resists abrasion. Can resist washing and ironing at high temperatures. Static and cling resistent.	Towels, various fabrics such a T-shirt fabric, denim and calico. Socks and underwear.

Synthetic Fibres – man-made/artificial fibres are usually made from coal, oil or other petro-based chemicals. Examples include POLYESTER, ACRYLIC, POLYAMIDE (nylon), ELASTANE(Lycra) and KEVLAR.

Polyester	Simple chemical chains (monomers) are joined to make polymers which are then spun into yarn. Can be used or their own or spun with other fibres such as cotton.	Strong when wet or dry. Easy care, dries quickly and does not need ironing. Stain resistent. Can be recycled or made from recycled plastics. Does not breath, poor absorbancy.	Fleece jackets, raincoats,Work clothes and uniforms.
Acrylic	Formed by polymerisation where the molecules form a chain.	Warm, dries quickly, good drape, durable,easy care. Poor absorbancy, feels stiff, can irritate skin.	Imitation wool knitwear, upholstery fabrics,fleece jackets, blankets.

Woven Textiles – weaving turns fibres into LENGTHS of fabric on a loom where vertical WARP threads are held under tension and horizontal WEFT threads loop back and forth to create a non-fraying edge.

Plain weave eg. Calico	A simple cotton cloth with very little stretch It may be soft or coarse, bleached or unbleached..	Strong, hardwearing, wears well, same both sides, Good for printing on and embellishing. Can vary in quality.	Shirts, bags, bedding ,textile crafts.
Twill weave - denim	The weft yarn crosses over two or more threadson alternate rows creating a diagonal effect. The warp is blue but the weft is white.	Hardwearing, strong, more interesting when wears or fades. Can be thick and heavy to use without softening treatments.	Jeans, jackets, utiliy clothing, blankets, soft furnishings.

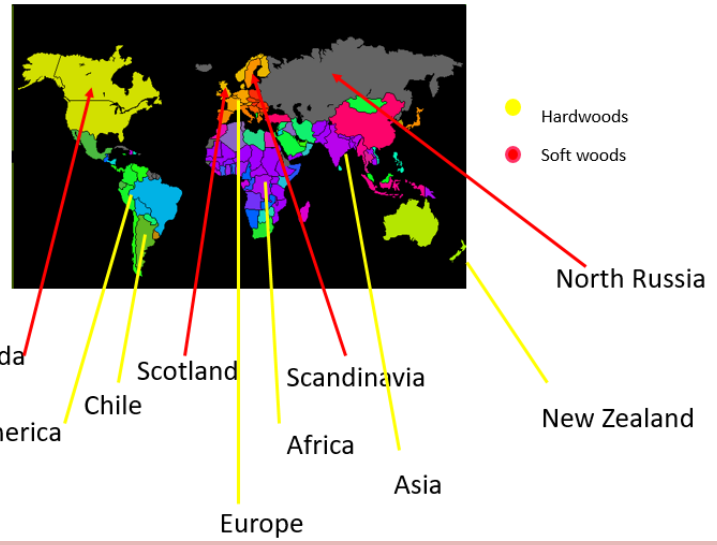
Non – Woven Textiles – short fibres are layered at angles to form a web, joined by FELTING or BONDED with a heat and/or glue.

Felted wool fabric	Scaly fibres of wool become matted when wet and rubbed together.	Resists chemicals and fire, does not unravel or fray. Excellent sound insulator, sustainable. Expensive, no drape, deforms when wet.	Hats, pool table surfaces, slippers, wall hangings, art material.
Bonded fibres/web	Can be produced quickly and cheaply in a range of weights from short fibres.	Stable, retains shape and can be bonded to lightweight fabrics to add strength. Not strong, cannot be repeatedly washed.	Wetwipes, disposable overalls, bondaweb.

Knitted Textiles – Knitted textiles are constructed from interlocking loops of yarn. These can be WARP knitted or WEFT knitted. To make a stretchy malleable fabric.

AQA Design & Technology 8552
Materials and their working properties - Timbers part 1

World sources of timbers



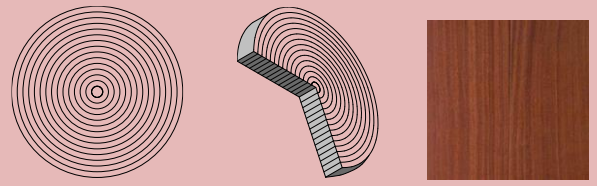
Hardwoods come from **Deciduous Trees.** These trees loose leaves in winter and grow fruit and flowers in spring.		
Material	**Key info**	**Examples**
Ash	Flexible, tough and shock resistant	Sports equipment Tool Handles
Beech	Fine finish, tough and durable	Toys, furniture and veneers
Mahogany	Easily worked, durable, high quality finish	High-end furniture
Balsa	Very soft and spongy. Light	Modelling
Oak	Tough, durable and hard	Flooring, furniture and veneers

Natural Timbers

Softwoods are generally cheaper than hardwoods as they are more available, since they grow quicker.
But because man-made boards are manufactured they are cheaper than timbers.
Man-made boards also come in a better variety of sizes since they don't depend on tree growth.

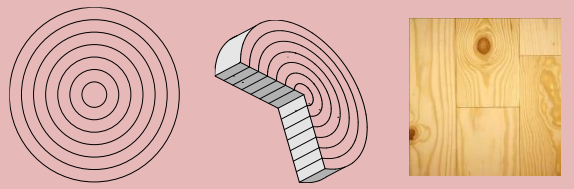
Stock forms for both include; sheets, dowel, planks, etc.

HARD WOOD tress **GROW SLOWER** so the **GROWTH RINGS** are **SMALLER**, which makes the **GRAIN CLOSER** and **MORE DENSE**.



Closer wood grain

SOFTWOOD trees **GROW QUICKLY** their **GROWTH RINGS** are **WIDER**, which makes the **GRAIN WIDER**. The timber is **LESS DENSE**.



Wider wood grain

DECIDUOUS trees have **FLAT BROAD LEAVES** that change colour during the year and usually **LOSE THEIR LEAVES IN WINTER.**

There are a few exceptions to the rule, such as **HOLLY**, which is a **HARDWOOD** but **KEEPS ITS LEAVES ALL YEAR ROUND.**

DECIDUOUS trees take a **LONG TIME TO MATURE** and as a result, tend to be more **EXPENSIVE than SOFTWOODS**.

AQA Design & Technology 8552
Materials and their working properties – Timbers part 2

Softwoods come from **Coniferous Trees.** These have thin, needle-like leaves and grow all year round. Often have pine cones and sometimes nuts and seeds.		
Material	**Key info**	**Examples**
Larch	Durable, tough, good water resistance and finishes well	Furniture, flooring and used outdoors
Pine	Light, easy to work with but can split	Cheap furniture, construction and decking
Spruce	Easy to work with, high stiffness but can decay quickly	Furniture, musical instruments and construction

LARCH

They can be identified their **CONES**, **NEEDLE-SHAPED LEAVES** and their **TRIANGULAR SHAPE.**

CONIFEROUS trees are **QUICK GROWING** and take around **10 YEARS** to **REACH MATURITY** before being felled.

PINE

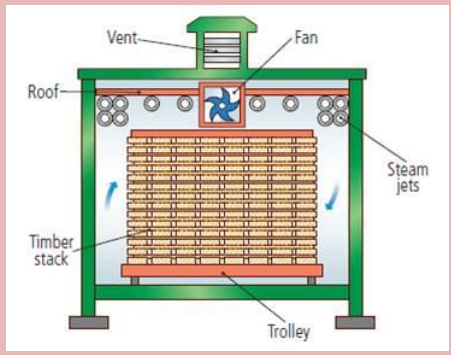
This makes **CONIFEROUS** trees extremely **SUSTAINABLE** as they are **RENEWABLE**.

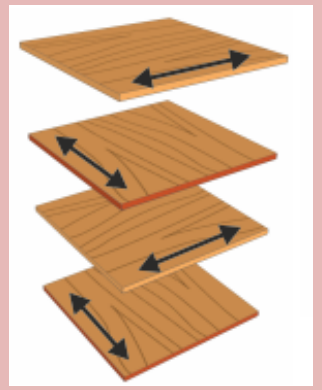
Manufactured boards are made from wood chips/dust/ layers and glue.		
Material	**Key info**	**Examples**
Chipboard	Prone to chipping but good compressive strength. Not-water resistant	Flooring, low-end furniture, flat-pack
MDF	Rigid and stable. Easy to finish. Absorbs liquid easily	Flat-pack furniture and kitchen unites
Plywood	Very stable. Exterior veneer can be used from more expensive woods	Shelving, furniture, toys

Primary Processing of Papers and Boards

Trees are cut then converted into planks by cut using saws
It is then seasoned to reduce the moisture in the wood. This is done by either:

Air-drying – Planks are stacked and air allowed to circulate; causing evaporation
Kiln-drying – Where planks are put into a kiln and dried rapidly. This process is more costly than air-drying





Manufactured boards can be either be made by lamination or compression

Lamination – Layers of woods and adhesive are layered and compressed together. Usually with a more expensive wooden veneer on the top

Compression – Wood is shredded, heated and compressed with adhesive under extreme pressure

AQA Design & Technology 8552
Timber Based Materials
Sources, origins and properties part 1

1.1 Timber Conversion

After a tree is felled (chopped down) and then cut into manageable lengths, it is then converted into planks. At this point is in known as timber. Timber is supplied in two main types of finish. **Rough Sawn** or **planed all round (PAR).** Rough sawn timber is not planed and is rough all around to touch. It is often used for exterior tasks or where the finish is not important. PAR has a much smother finish as it has been planed down on all sides. It is used for furniture and internal features such as windows or doors. Finishes such as varnish or paint can be easily applied. Planed timber is less absorbent than rough sawn timber.

Timber is available in many different shapes and sizes, standardized to enable different varieties to be used together.

1.2 Seasoning

Once timber is converted into a workable form, it is **seasoned** in order to reduce the moisture content. Typically a newly felled tree will have a moisture content of over 50% and is known as green timber. The moisture content needs to be reduced to below 20% for most exterior applications, below 15% for interior work and below 10% for interior areas that are constantly heated.

Uneven evaporation of the water content can cause some common faults such as twisting, cupping and bowing which can render the timber useless for many tasks. If the end grain dries too quickly, it can cause the plank to split.

There are two methods of seasoning; air-drying or kiln drying . Air dried timber is stacked so that air can circulate around the planks and evaporation can take place. It takes approximately one year per 25mm of plank thickness to season and in the UK the moisture content typically reduces to around 18%.

Kiln-dried timber (A kiln is basically a Giant Oven) can have a much lower moisture content and it is a much faster process, meaning the timber can be sold much sooner. It costs more then air drying, as heat and pressure is used but no additional land is required to store the timber while seasoning takes place. Kiln dried timber is less prone to faults and the heat also kills off bacteria and insects that may attack the timber.

1.3 Manufactured Board

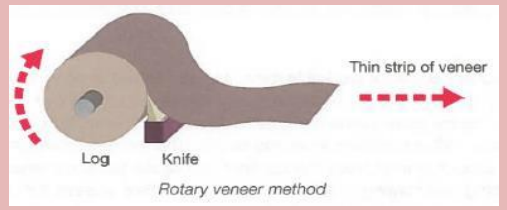
Natural timber is combined with the adhesive to make manufactured boards. They can be made from waste, low-grade and recycled timber and are usually produced in pale brown natural finish. Each manufactured board is produced in a slightly different way, the two main process used are **lamination** and **compression.**

Plywood and block board use the lamination method where layers of wood are bonded together using an adhesive. Medium Density Fibreboard (MDF), chipboard, oriented strand board (OSB) and hardboard use the compression method where wood is shredded, chipped or pulped, then heated and compressed under high pressure, in most cases using adhesives to bond the particles together.

Ply Wood MDF OSB Chipboard

1.4 Veneer

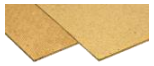
Some manufactured boards are covered in a thin slice of natural timber called a **veneer.** These natural wood slices are taken from the trunk of a tree and are bonded to the surface of cheaper sheet materials. Veneers are commonly seen on medium density fiberboard (MDF) and plywood. There are two methods of veneer production; rotary and knife cut. Rotational veneer production produces the longest sheets and involves rotating a whole trunk on an industrial machine similar to a wood turning lathe. It is a bit like a huge pencil sharpener creating one long ribbon of veneer.



AQA Design & Technology 8552 Specialist Technical Principles Timber Based Materials
Sources, origins and properties part 2.

Advantages and disadvantages of manufactured boards

Manufactured Boards	
Advantages	Disadvantages
Available in large sheets, very stable which saves time and energy joining arrow planks together.	Adhesives used to bond the boards can contain hazardous particles that can cause cancer.
No defects such as warping. Twisting, cupping and splitting which occur in natural wood, meaning less waste.	Machining and sanding some boards especially MDF, causes very small particles of dust to be released, easily breathed in, even through a mask.
They do not have knots or resin pockets which can be hard to work around, avoiding waste and protecting tools from damage.	Tools can blunt easily owing to the adhesives in the boards.
Smooth finish which requires very little preparation.	Many traditional wood joints cannot be used effectively with manufactured board.
Makes use of low grade, recycled and waste wood.	Edges can be hard to finish.
Available in many different finishes, veneers and laminates.	Most boards are prone to absorb moisture if not treated.

Name	Characteristics	Uses
Blockboard 	Stable, tough, relatively heavy, finishes well, indoor use owing to adhesives used.	Furniture, doors, shelving, indoor construction.
Hardboard 	Flexible in large sheets, even strength, easily damaged by water unless treated. Inexpensive.	Furniture and picture frame backings. Internal panelling.
Oriented Strand Board (OSB)	Rigid and even strength in all directions, good water resistance.	Construction hoarding, interior and exterior house building.

Additional Soft Woods

Name	Characteristics	Uses
Redwood 	Easy to work and machines well. Some rot resistance.	Outdoor furniture, beams, posts, decking, veneers.
Cedar 	Easy to work, can blunt tools, finishes well, naturally resistant to rot.	Outdoor furniture, fences cladding for buildings, roof shingles.

Wood is considered to be a sustainable product, as new trees can be grown to replace those used for timber and fuel.

The main issue facing timber production is that in many parts of the world, it is being used at a far greater rate than it is being replanted. The result is an unsustainable supply of timber, which is frequently illegally obtained. This is causing many problems to the land in the countries where it is happening.

Some countries are suffering from **DESERTIFICATION** due to **DEFORESTATION**. This activity is also thought to be a contributing factor in **GLOBAL WARMING.**

PEFC PEFC/09-31-004 Promoting Sustainable Forest Management www.pefc.org

FSC FORESTS FOR ALL FOREVER™

FSC runs a global forest certification system with two key components:
- **Forest Management**
- **Chain of Custody**

This system allows consumers to identify, purchase and use wood, paper and other forest products produced from well-managed forests and/or recycled materials.

FSC's "tick tree" logo is used to indicate that products are certified under the FSC system. When you see the FSC logo on a label, you can buy forest products with confidence that you are helping to ensure our forests are alive for generations to come.

What is the FSC? http://www.fsc-uk.org/en-uk/about-fsc/what-is-fsc/fsc-principles

AQA Design & Technology 8552
Materials and Working Properties
Papers and Boards.

1. Paper

Type	Description and uses
Layout paper	• lightweight, thin white paper • used for initial ideas • takes colour media well • low cost
Tracing paper	• thin, translucent paper • making copies of drawings • high cost
Cartridge paper	• good quality white paper • available in different weights • general purpose work • can be used to make simple models • medium cost
Bleedproof paper	• smooth, hard paper • used with water-based and spirit-based felt-tip pens • medium cost
Grid paper	• printed square and isometric grids in different sizes • a guide for quick sketches and working drawings • low cost

2. Selection of materials or components

When selecting materials and components considering the factors listed below:

- Functionality: application of use, ease of working
- Aesthetics: surface finish, texture and colour.
- Environmental factors: recyclable or reused materials, product mileage.
- Availability: ease of sourcing and purchase.
- Cost: bulk buying.
- Social factors: social responsibility.
- Cultural factors: sensitive to cultural influences.
- Ethical factors: purchased from ethical sources such as FSC.

3 Boards

Type	Description and uses
Corrugated card	• strong and lightweight • used for packaging protection and point of sale stands • available in different thicknesses
Duplex board	• large foam-based board • different finishes available including metallic and hologrammatic • used for food packaging, e.g. take-away pizza boxes.
Foil lined board	• quality cardboard with a aluminium foil lining • ideal for ready made meals or take away meal cartons • The foil retains the heat and helps keep the food warm
Foam core board	• very light, very stiff and very flat. • It has a white, rigid polystyrene foam centre, with smooth white paper laminated onto both faces. • It is easy to cut with a knife, a mount cutter or on a wall cutter • great for modelling
Ink jet card	• Has been treated so that it will give a high quality finish with inkjet ink • available in matt and gloss
Solid white board	• top quality cardboard made from quality bleached wood pulp. • used for hard backed books and more expensive items • excellent print finish

4. Paper and Boards- Stock sizes and weights

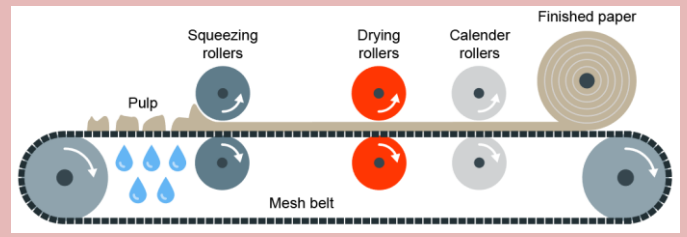
Paper and board is available in sizes from A0 (biggest) to A7 (smallest). The most common size is A4.

Each size is half the one before, e.g. A4 is half the size of A3.

They are also sold by weight: GSM –grams per square metre. **Card** thickness or caliper is traditionally measured in **Microns**. 1000 **Microns** = 1mm, so the higher the value, the thicker the **card** or paper.

Type	Weight or thickness	Uses	Relative cost (10=high)
Newsprint	50gsm	Newspapers	1
Layout Paper	60gsm	Sketches and tracing	3
Tracing Paper	70 gsm	Tracing	4
Sugar Paper	90gsm	Cheap mounting work	2
Inkjet/Photo paper	150-230gsm	Photos/Presentations	9
Board (Card)	230-750 microns	Model-making	5
Mount Board	230-1000 microns	Model-making, High picture quality mounting	9
Corrugated Card	3000-5000 microns	Packaging protection	5

Primary Processing of Papers and Boards



Paper is made by first making pulp. Pulp is a mix of tree fibres and water. This is cooked and bleached white, and adding any other additives.
The pulp is then drained and goes through **Calendering** where the pulp is drained and goes through rollers to convert it to its stock forms

AQA Design & Technology 8552
Materials and Working Properties – The 6 Rs

The 6 R's

The 6 Rs are an important checklist. They are used by designers to reduce the environmental impact of products. They can also be used to evaluate the environmental impact of other products.
The hierarchy of sustainability places the strategies that are best for the planet about those that have a greater negative impact on the environment.

1 . Reduce

Reduction is often the result of having re-thought a design or action. Materials and energy are saved due to efficient manufacturing practices and the use of clever design, incorporating sustainable materials.

- Modern materials that are lighter and stronger than traditional ones have contributed to the miniaturisation of products, saving material and energy in manufacture and use.
- Reducing the complexity or number of parts a product uses and reducing the number of different materials in a product makes recycling easier.

2 . Reuse

Reusing products multiple times for the same purpose is also known as **primary recycling.**
Reusing a product in a different way from the one it was designed for is known as **secondary recycling.**
The classic glass milk bottle is reused many times before it reaches the end of its useful life, as which point it is recycled. A plastic milk bottle, however, is intended to be used only one, although it can have many different subsequent uses.
Donating to and buying from charity shops extends the life of products and in recent years there has been a resurgence of in products having second lives, thanks to websites such as eBay, Freecycle or Gum tree.
It is also becoming popular for furniture and other household items to be **upcycled** with a coat of paint and some minor repairs or adaptations, extending their useful life by many years.

3. Recycle

Tertiary recycling, although a very important stage, is lower down the hierarchy of preferred options because most materials that are recycled this way tend to be of lower quality than the original material. It takes a lot of energy to recycle materials.
This form of recycling requires the reprocessing of the material and in many cases involves chemicals and/or heat to recover the recycled materials. In an ideal world, tertiary recycling would remove all recyclable materials from our household waste so that only biodegradable materials would be left. Only very few parts of the world are set up to cope with this level of processing.

4. Rethink

Consumers have a growing number of choices to make about where and on what they spend their income. Greener and more sustainable options are not always the cheapest or the best, but making informed decision and rethinking ones spending power can play a huge part in conserving resources.
Deciding on the design of a product, e.g. the materials being used in its production, will directly affect its sustainability. The types of questions designers need to ask are:

- Are the materials locally sourced?
- Are they sustainably produced?
- Is it essential to use this material, of which there is a finite supply?

By rethinking how the product is likely to be made, the product can often be redesigned in a more responsible way.

5 . Refuse

The first stage in the process is to ask whether the proposed product, part, purchase or even journey is required at all. Asking the question 'Is it really necessary?' can play a major role in reducing the demand on materials. Simply not using something saves 100% of what you have chosen not to use. Example include:

- Using your own carrier bag rather than purchasing a new one.
- Walking or cycling to school instead of being driven.
- Not using products such as some pesticides that are known to be harmful tothe environment.
- Not eating (or using) products that are over-farmed, over-fished or on the endangered list.

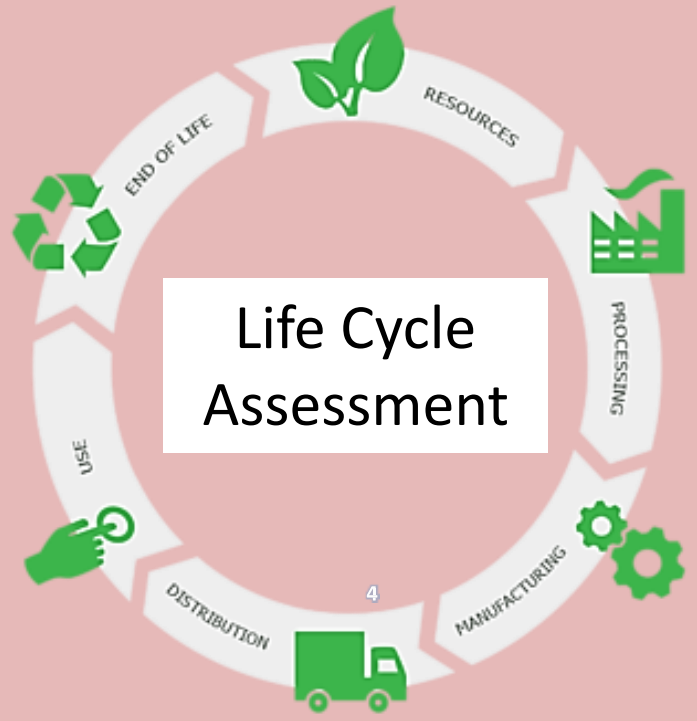
6 . Repair

Being able to repair a product when it is broken or worn is a way of extending its life and delaying the purchase of a new one. Repairing is a positive option over replacement as it means that only some parts of the product are replaced. This creates jobs for skilled people who conduct repairs and stimulates a spare parts market.
Unfortunately, repairing products has become harder over years. Growing number of products are not design to be repaired. There are a number of reasons why items may be designed this way, but it is usually because they are cheaper to replace than repair. Some products, especially modern electronic products, are designed to last only a few years as technology dates quickly and older products will be superseded by newer, faster, more efficient models. This is called **planned obsolescence.**

Life Cycle Assessment

This is when a designer looks at the environmental impact a product makes over its life time and how it could be reduced. Including:

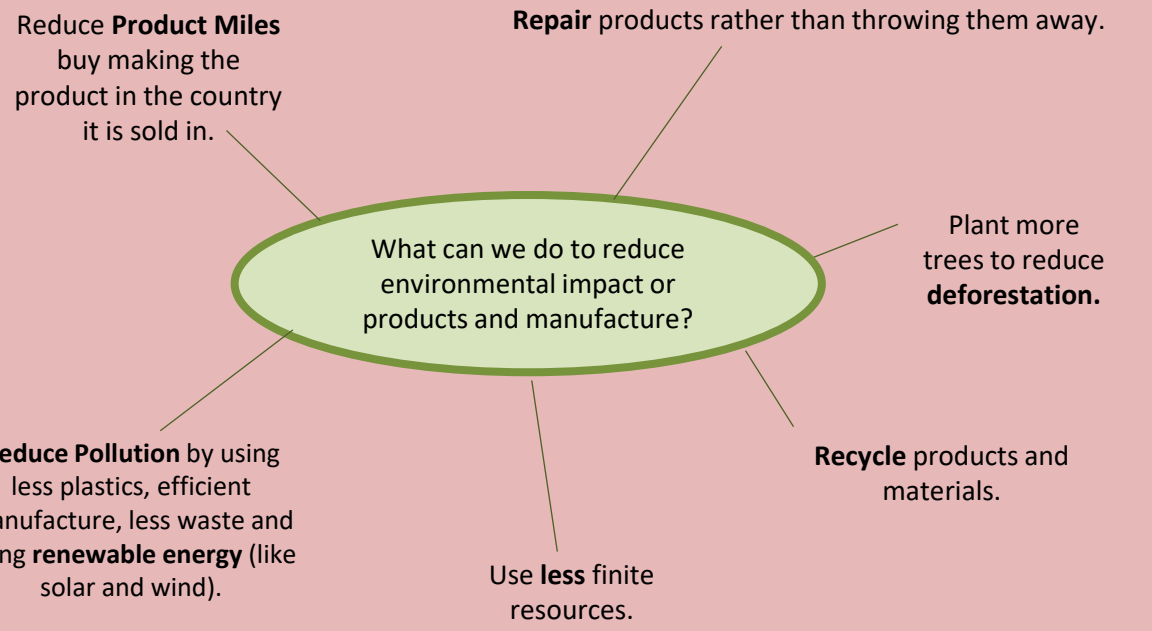
- Impact of materials
- Impact of processes
- Product Miles (how far a product has to travel to get from factory to consumer)
- Impact while in use
- Impact when disposed of (6Rs)



Planned obsolescence - Planned obsolescence is when a product is deliberately designed to have a specific life span e.g. disposable cups, mobile phones, lightbulbs, printer Ink, disposable cameras for example. This can have a big environmental impact as customers are throwing away lots of products, and resources are being used to create new ones.

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.

Disposability – Some products are designed to be disposable.



Renewable materials from managed resources.

Technologies that have a POSITIVE impact:

- Use of renewable energy.
- Using recyclable materials.
- Consideration to the 6r's.
- Designing products with low power consumption.
- Designing products with fewer components and reduced weight.
- Designing products that are upgradable extending their life.
- Creating products that are sourced, produced and sold locally.

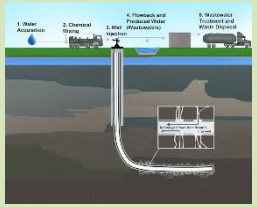
Technologies that have a NEGATIVE impact:

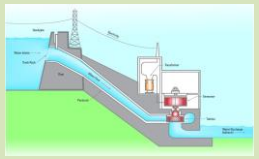
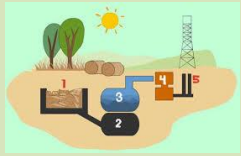
- Use of components that are hard to repair.
- Use of fossil fuels for power.
- Products with high power consumption.
- Products that have built in **planned obsolescence.**
- Components that are shipped globally.

Sustainability is maintaining our planet and its resources and making a minimal negative impact	
Finite Resources *Will run out of eventually*	**Infinite Resources** *Can be re-grown and re-bread. Will not run out of*
Plastics	Paper
Metals	Boards
Synthetic/Polymers (Textiles)	Natural Timbers
	Cotton
	Leather

AQA Design & Technology 8552 Energy, Materials, Systems and Devices
Energy Generation and Storage.

Power can be generated from renewable and non- renewable sources. Non-renewable power is generated from fossil fuels. Most electricity is created by rotating a turbine which turns a generator. Fossil fuels are burnt to create heat which superheats the water. The steam rotates the turbine which is linked to the generator to supply the electricity.

Non-Renewable Energy Sources	This is when certain sources of energy will run out eventually	
Fossil Fuels 	• Coal, Oil and Gas • Burned to create steam, turned in turbines to create electricity.	• Burning creates C02 which adds to **Global Warming** • Non-**renewable**. • **Unsustainable.**
Nuclear Power 	• Nuclear Fission controls the reactor (that creates the electricity). This requires **Uranium** which is non-renewable.	• **Radiation poisoning** can be fatal and cause physical deformations • Nuclear waste has to be disposed of properly and is hazardous for thousands of years. • Accidents and waste can severely damage the environment and cause radiation poisoning.
Fracking 	• Shale gas is trapped within the earths crust. • Fracking is the process which removes it so it can then be burnt to create electricity. • It involves drilling the earths crust and sending high pressure water, sand and chemical mixtures into the rock to release the gas.	• Contamination of groundwater. • Air pollution due to the toxic chemicals. • Large volume water use in water-deficient regions. • Fracking-induced earthquakes.

Renewable Energy Sources	Energy that comes from the plants non-finite resources is renewable. It includes:	
Solar 	• Low maintenance costs. • Improvements in technology mean the efficiency is always improving.	• Only produce energy during daytime. • Production is less in winter. – fewer daylight hours.
Wind 	• Low cost • Produce more power in winter when demand is higher.	• Do not create power when not enough wind or it is too windy. • Harmful to wildlife. • Ugly.
Hydro-Electrical 	• Is a form of energy that harnesses the power of water in motion. • has the ability to generate electricity without emitting greenhouse gasses.	• High set up costs both financially and environmentally. • Has to be created by flooding land – damaging wildlife habitats.
Tidal 	• **Tidal** energy comes from using energy from waves • Predictable and consistent.	• Machinery has to be located some distance from land making repair and maintenance difficult.
Biomass 	• This is fuel from natural sources e.g. crops, scrap woods and animal waste. • Growing biomass crops produces oxygen and uses up C02.	• Vast amounts of land and water needed to produce the crops which contribute to food shortages in developing countries. • It is a very expensive.

Storing Energy

Pneumatics: A form of compression is used to store gas or air under pressure. They are commonly used to controlling production lines. They are accurate, efficient and low maintenance..

Hydraulics: Very similar to Pneumatics but uses a liquid, most commonly Oil. Extremely powerful and using in manufacturing industrial applications.E.g. Wheelchair lifts.

Kinetic: Energy that is generated by movement. This is stored by items like springs in a “clickable” pen or balloons,

Batteries: Electrical power can be stored in batteries. Battery technology has vastly improved alongside the power consumption of modern electronic devices helping save valuable finite resources. Rechargeable batteries are capable of being charge d and discharged thousands of times reducing the resources needed. The time it takes for rechargeable batteries to reach full charge has also improved in recent years making their use much more convenient.

Disposal of Batteries – Batteries must be disposed of correctly as they contain toxic electro chemicals. If placed in the normal bin and they end up in land fill sites, it will degrade over time and release harmful chemicals and metals into the soil and water.

Unit 1: 1.1.1 – Types of Hospitality & Catering Provisions

Hospitality & Catering Providers
You must understand, be able to name and explain the two different provisions in H&C.
Commercial: the business aims to **make a profit** from the provision they provide.
Non-commercial: the service provider **doesn't aim** to make a profit from the service they provide.

Commercial (residential)

Commercial (residential): meaning the hospitality and catering provision aims to create a from the service they provide, but also offers accommodation.

For example:
- Hotels, motels & hostels
- B&B, guest houses and Airbnb
- Holiday parks, lodges, pods and cabins
- Campsites and caravan parks

Commercial (residential)

Non-commercial (residential): the hospitality and catering provision offers accommodation but does not aim to make a profit from the service they provide.

For example:
- Hospitals, hospices and care homes
- Armed forces
- Prisons
- Boarding schools, colleges and university residences

Commercial (non-residential)

Commercial (non-residential): catering establishments that aim to make a profit from their service, but no accommodation is provided.

For example:
- Restaurants, pop up restaurants and bistros
- Cafes, tea rooms and coffee shops
- Takeaways
- Fast food outlets
- Pubs and bars
- Airlines, cruise ships and long distance trains
- Food and drink provided by stadiums, concert halls & tourist attractions
- Mobile food vans and street food trucks
- Vending machines

Commercial (residential)

Non-commercial (non-residential): catering establishments with no accommodation provided and don't aim to make a profit from their service.

For example:
- Schools, colleges and universities
- Meals on wheels
- Canteen in working establishments (subsidised)
- Charity run food providers

Unit 1: 1.1.1 – Types of service in commercial and non-commercial provisions

Types of service in commercial and non-commercial provision
You need to be able to understand and know the different types of service within commercial and non-commercial provision. They are split into two main categories of food service and residential service.

Food service

The different types of food services in the sector are listed below. You should know the meaning of each one and be able to provide examples .For instance;

Table service
- Plate: the food is put on plates in the kitchen and served by wait staff. Good portion control and food presentation consistent.
- Silver: a waiter will transfer food from a serving dish to the customers plate using a silver spoon and fork at their table.
- Banquet: a range of foods suitable for large catered events such as weddings, parties or award ceremonies.
- Family style: the food is placed in serving bowls on the customers table for customers to share between them.
- Gueridon: is served from a trolley to the customers table, the food is then cooked and/or finished and presented in front of the customer. Creates an atmosphere of sophistication and entertainment.

Counter service
- Cafeteria: all types of food and drink are shown on a long counter for customers to move along with a tray for them to choose what they want to eat.
- Fast food: the food and drink is displayed on a menu behind the counter, often with pictures. Quick ,simple and usually served with disposable packaging.
- Buffet: a range of foods served on a large table where customers walk up to where customers collect a plate and help themselves to food and drink. The food can be hot or cold and some items could be served by wait staff.

Personal service
- Tray or trolley: the meals are served on trays from a trolley and sometimes can order in advance.
- Home delivery: customers order is made over the phone or online and then delivered to the customers home address.
- Takeaway: food that's cooked by a business' premises and eaten elsewhere.

Residential service

Listed below are the different types of residential types of service in the hospitality and catering sector. You should know the different types of service offered in various hospitality provisions**.**

Rooms:
- Single/double/king/family
- Suite (en-suite bath/ shower room/shared facilities)

Refreshments:
- Breakfast/lunch/evening meal
- S4-hour room service/restaurant available

Leisure facilities:
- Spa
- Gym
- Swimming pool

Conference and function facilities:
- Large rooms
- Overhead projector and computer
- Pens and paper provided
- Refreshments available

Unit 1: 1.1.1 – Standards and ratings

Standards and ratings
You will need to be able to know the importance od standards and rating within the hospitality and catering industry, they are hotel and guest house standards and restaurant standards.

Hotel and guest house standards

Hotel and guest houses standards are awarded and given star ratings. You should know wat criteria is needed to be met for an establishment to receive each star rating.

Star rating 1 = Basic and acceptable accommodation and facilities. Simple rooms with no room service offered.

Star rating 2 = Average accommodation and facilities, a small establishment and would not offer room service or have a restaurant.

Star rating 3 = Good accommodation and facilities. One restaurant in the establishment, room service available between certain hours and Wi-Fi in selected areas are provided. The establishment could have a pool and gym.

Star rating 4 = Very good accommodation and facilities. Large hotel and reception area of a very good standard. Certain hours of room service with a swimming pool and valet parking offered.

Star rating 5 = Excellent standard of accommodation, facilities and cuisine. Offers valet parking, 24 hour room service, spa, swimming pool/gym and concierge services.

Restaurant standards

Restaurant standards have three main possible awards or ratings that you should know. They are listed below and to the right:

AA Rosette award

Ratings between one and five rosettes could be awarded based o the following:

- Different types and variety of foods offered
- Quality ingredients used
- Where the ingredients are sourced
- How the food is cooked, presented ad tastes
- Skill level and techniques used as well as the creativity of the chef

Michelin star

A rating between one and three Michelin stars could be awarded based on the following:

- Quality of ingredients used
- Cooking and presentation techniques
- Taste of the dishes
- Standard of the cuisine
- Value for money

Good food guide

A rating of between one and ten could be awarded based on the following criteria:

- Cooking skills
- Quality of ingredients
- Techniques and cooking skills shown

Unit 1: 1.1.2 – Types of employment roles and responsibilities within the industry

Types of employment roles and responsibilities within the industry
There are four main areas within the industry that you should know the roles and responsibilities within. They are listed below:

Front of house

Front of House manager: oversees all staff at the restaurant, provides training, hires staff and ensures good customer service.
Head Waiter: oversees the wait staff of the restaurant in high end establishments**.**
Waiting Staff: greets customers, shows them to their table, takes food and drink orders from customers and serves them their order. Makes sure customers needs are met and the food order has been made correctly.
Concierge: advises and helps customers with trips and tourist attractions. Books taxis for customers and parks customer cars.
Receptionist: takes bookings, deals with questions and complaints from customers, checks-in customers, takes payment and provides room keys.
Maitre d'hote: oversees the service of food and drinks to customers. They greet customers, check bookings, reservations and supervise wait staff.

Kitchen brigade

Executive chef: in charge of the whole kitchen. Develops menus, writes rotas, ordering and completes kitchen admin and overlooking the rest of the staff.
Sous-Chef: the deputy in the kitchen and in charge when the executive chef isn't available. In charge of production in the kitchen.
Chef de partie: in charge of a specific area/station in the kitchen.
Commis chef: learning different skills in all areas of the kitchen. Helps every chef in the kitchen. Answers to the Sous Chef.
Pastry chef: prepares all desserts, pastry dishes, breads and bakes.
Kitchen assistant: helps with the peeling, chopping, washing, cutting of ingredients and helps washing dishes and making sure they're stored correctly.
Apprentice: an individual in training in the kitchen and helps chef prepare and cook dishes.
Kitchen porter/plongeur: washes the dishes and other cleaning duties.

Housekeeping

Chambermaid: cleans guests' rooms when they leave and restock products that have been used. They also provide new bedding and towels.
Cleaner: cleans hallways and the public areas of the establishment.
Maintenance: repairs and maintains the establishment's machines and equipment such as heating and air conditioning. These responsibilities could also include painting, electrical and flooring repairs.
Caretaker: carries out the day to day maintenance of the establishment.

Management

Food and beverage: responsible for the provision of food and drink in the establishment which will include breakfast, lunch, dinner and conferences**.**
Housekeeping: ensuring laundering of bed lines & towels, ordering of cleaning products and overseeing housekeeping staff duties.
Marketing: promotes events and offers to increase custom at the establishment and is responsible for the revenue of the business.

Unit 1: 1.1.3 – Working conditions in the Hospitality and Catering industry

Types of employment contracts and working hours

You need to know the following types of employment contacts and working hours.

Casual: this type of contact could be provided through an agency and used to cover employees that are absent from work due to illness. There is no sick pay or holiday entitlement with this type of employment. and working hours.

Full-time (permanent): working hours including start and finishing times are fixed and stated in this type of contract. A contact of this nature allows the employee to have sick pay and holiday entitlement.

Part-time (permanent): working hours mean that the employee works on certain days of the week. Work times are stated in the contract, including the starting and finishing times that are fixed in this type of contract. The employee has sick pay and holiday entitlement in this type of contract.

Seasonal: this type of contact is used when a business needs more staff due to busy times throughout the year, such as the Christmas period. The contracts will state for the employee to work for a specific time frame only. Also, the contract would not expect further or regular work after the contract is complete.

Zero hours contract: this type of contract is chosen between the employer and the employee. This means that the employee can sign an agreement to be available for work when the employer needs staff. No number of days or hours is stated in the contract and the employer doesn't require to ask the employee to work and neither does the employee have to accept the work offered. No sick pay or holiday entitlement is offered for this type of contract.

Pay and benefits in the industry

The following pay and benefits are what you should be aware of in the industry.

A salary: this type of pay is a fixed amount of money paid by employer monthly, but is often shown as an annual sum on the contract.

Holiday entitlement: Employees are entitled to 28 days paid a year. Part time contracts are entitled less depending to their contracts hours.

Sickness pay: money paid o the employee with certain contracts when they are unable to go to work due to illness.

Rates of pay: national minimum wage should lawfully be offered to all employees over 18 years of age. This rate is per hour and is reviewed each year by the government.
Tips: money given to an employee as a 'thank you' reward for good service from the customer.

Bonus and rewards: given from an employer to the employee as a way of rewarding all the hard work shown from the employee throughout the year, and helping make the business a success. Also known as remuneration

Working hours

The working hours directive in the UK states that employees on average cannot work more than 48 hours which is worked out over a period of 17 weeks. Employees can choose not to follow this and work more hours if they want to.

People under the age of 18 cannot work more than eight hours a day and 40 hours a week..

Employees that work six hours or more a day must have a break of 20 minutes, and have the right to have at least one day off every week.

Unit 1-1.3.1 - Health and safety in Hospitality and Catering provisions

Control of Substances Hazardous to Health Regulations (COSHH) 2022

What employers need to do by law	What paid employees need to do
Control substances that are dangerous to health.	Attend all training sessions regarding COSHH.
Provide correct storage for those substances and appropriate training for staff.	Follow instructions carefully when using the substances.
Some examples of substances that are dangerous to health include cleaning products, gases, powders & dust, fumes, vapours of cleaning products and biological agents	Know the different types of symbols used to know different types of substances and how they can harm users and others when used incorrectly.

Health and Safety at Work Act 1974 HASAWA

What employers need to do by law	What paid employees need to do
Protect the health, wellbeing and safety of employees, customers and others.	Take reasonable care of their own health and safety and the health and safety of others.
Review and assess the risks that could cause injuries.	Follow instructions from the employer and inform them of any faulty equipment.
Provide training for workers to deal with the risks.	Attend health and safety training sessions.
Inform staff of the risks in the workplace.	Not to misuse equipment.

Risks to health and security including the level of risk (low, medium or high) in relation to employers, employees, suppliers and customers.

Review and assess level of risks in the workplace e.g. slips, trips, falls, burns etc by completing a risk assessment to avoid them from happening.

Personal Protective Equipment at Work Regulations (PPER) 1992

What employers need to do by law	What paid employees need to do
Provide PPE e.g. masks, hats, glasses and protective clothes.	Attend training and wear PPE such as chef's jacket, protective footwear and gloves when using cleaning chemicals
Provide signs to remind employees to wear PPE.	
Provide quality PPE and ensure that it is stored correctly.	

Report of injuries, Diseases and dangerous Occurrences Regulations (RIDDOR) 2013

What employers need to do by law	What paid employees need to do
Inform the Health and Safety Executive (HSE) of any accidents, dangerous events, injuries or diseases that happen in the workplace.	Report any concerns of health and safety matters to the employer immediately. If nothing is resolved, then inform the HSE.
Keep a record of any injuries, dangerous events or diseases that happen in the workplace.	Record any injury in the accident report book.

Manual Handling Operations Regulations 1992

What employers need to do by law	What paid employees need to do
Provide training for staff.	Ask for help if needed.
Assess and review any lifting and carrying activities that cannot be avoided.	Squat with feet either side of the item. Keep back straight as you start to lift. Keep the tem close to your body whilst walking. Make sure you can see where you are going.
Store heavy equipment on the floor or on low shelves.	
Provide lifting and carrying equipment where possible.	

Hazard Analysis and Critical Control Points (HACCP)

Every food business lawfully needs to ensure health and safety of customers whilst visiting their establishment. To ensure this, the need to take reasonable measures to avoid risks to health. HACCP is a food safety management system which is used in business to ensure dangers and risks are noted and how to avoid them.

All food businesses are required to:

- Review and assess food safety risks
- Identify critical control points to reduce or remove the risk from happening.
- Ensure that procedures are followed by all members of staff
- Keep records as evidence to show that the procedures in place are working.

Food Hazards

A food hazard is something that makes food unfit or unsafe to eat that could cause harm or illness to the consumer. There are three main types of food safety hazards:

- Chemical – from substances or chemical contamination e.g. cleaning products.
- Physical – objects found in food e.g. metal or plastic.
- (Micro)Biological – harmful bacteria e.g. bacterial food poisoning such as Salmonella

HACCP table

Here is an example of a HACCP table – it states some risks to food safety and some control points.

Hazard	Analysis	Critical Control Point
Receipt of food	Food items damaged when delivered/perishable food items are at room temperature/frozen food that is thawed on delivery.	Check the temperature of high-risk foods are between 0°c and 5°c and frozen are between -18°c and -22°c. Refuse any items that are not up to standard.
Food storage (dried/chilled/frozen)	Food poisoning/cross contamination/named food hazards/stored incorrectly or incorrect temperature/ out of date foods.	Keep high risk foods on the correct shelf in fridge. Stock rotation – FIFO. Log temperatures regularly.
Food preparation	Growth of food poisoning in food preparation area/cross contamination of ready to eat and high-risk foods/using out of date food.	Use colour coded chopping boards. Wash hands to prevent cross-contamination. Check dates of food regularly. Mark dates on containers.
Cooking foods	Contamination of physical, (micro) biological and chemical such as hair, bleach, blood etc. high risk foods may not be cooked properly.	Good personal hygiene and wearing no jewellery. Use a food probe to check the core temperature is 75°c. Surface area and equipment cleaned properly.
Serving food	Hot foods not being held at the correct temperature. Foods being held too long and risk of food poisoning. Physical/cross contamination from servers.	Keep food hot at 63°c for no more than 2 hours. Make sure staff serve with colour coded tongs or different spoons to handle the food. Cold food served at 5°c or below. Food covered until needed.

Unit 2: 2.1.1 – Nutrition at different life stages & special dietary needs

Nutrition at different life-stages

Adults:

Early – Growth in regard to height of the body continues to develop until 21 years of age. Therefore, all micro-nutrients and macro-nutrients especially carbohydrates, protein, fats, vitamins, calcium and iron are needed for strength, to avoid diseases and to maintain being healthy.

Middle – The metabolic rate starts to slow down at this stage, and it is very easy to gain weight if the energy intake is unbalanced and there isn't enough physical activity.

Elderly – The body's systems start to slow down with age and a risk of blood pressure can increase as well as decrease in appetite, vision and long-term memory. Because of this, it is essential to keep the body strong and free from disease by continuing to eat a healthy, balanced diet.

Children:

Babies – All nutrients are essential and important in babies, especially protein as growth and development of the body is very quick at this stage. Vitamins and minerals are also important. You should try to limit the amount of salt and free sugars in the diet.

Toddlers – All nutrients remain very important in the diet at this stage as growth remains. A variety of foods are needed for toddlers to have all the micro-nutrients and macro-nutrients the body needs to develop.

Teenagers – The body grows at a fast pace at different times at this stage as the body develops from a child to an adult, therefore all nutrients are essential within proportions. Girls start their menstruation which can sometimes lead to anaemia due to not having enough iron in the body.

Special Dietary Needs

Different energy requirements based on:

Lifestyles / Occupation / Age / Activity level
The amount of energy the body needs is determined with each of the above factors e.g. active lifestyle or physical activity level would need more energy compared to a person being sedentary.

Medical conditions:

Allergens – Examples of food allergies include milk, eggs, nuts and seafood.

Lactose intolerance – Unable to digest lactose which is mainly found in milk and dairy products.

Gluten intolerance – Follows a gluten free diet and eats alternatives to food containing wheat, barley and rye.

Diabetes (Type 2) – High level of glucose in the blood, therefore changes include reducing the amount of fat, salt and sugar in the diet.

Cardiovascular disorder – Needing a balanced, healthy diet with low levels of salt, sugar and fat.

Iron deficiency – Needing to eat more dark green leafy vegetables, fortified cereals and dried fruit.

Dietary requirements:

Religious beliefs – Different religions have different dietary requirements.

Vegetarian – Avoids eating meats and fish but does eat dairy products and protein alternatives such as quorn and tofu.

Vegan – Avoids all animal foods and products but can eat all plant-based foods and protein alternatives such as tofu and tempeh.

Pescatarian – Follows a vegetarian diet but does eat fish products and seafood.

Unit 2: 2.1.1 – Understanding the importance of nutrition

The importance of nutrition

Listed below are the macro-nutrients and micro-nutrients. You need to know their function in the body and know examples of food items for each. You need to know why they are needed in the diet and why there is a need for a balanced/varied diet.

Nutrition at different life-stages

Carbohydrates - Carbohydrates are mainly used in the body for energy. *There are two types of carbohydrates which are:*
- Starch - Examples include bread, pasta, rice, potatoes and cereals.
- Sugar - Examples include sweets, cakes, biscuits & fizzy drinks.

Fat - This is needed to insulate the body, for energy, to protect bones and arteries from physical damage and provides fat soluble vitamins. *There are two main types of fat which are:*
- Saturated fat - Examples include butter, lard, meat and cheese.
- Unsaturated fat - Examples include avocados, plant oils such as sunflower oil, seeds and oily fish.

Protein - Protein is mainly used for growth and repair in the body and cell maintenance. *There are two types of protein which are:*
- High biological value (HBV) protein - Includes meat, fish, poultry, eggs, milk, cheese, yogurt, soya and quinoa.
- Low biological value (LBV) protein - Includes cereals, nuts, seeds and pulses.

Special Dietary Needs

Vitamins

Fat soluble vitamin A - Main functions include keeping the skin healthy, helps vision in weak light and helps children grow. ***Examples include:*** *leafy vegetables, eggs, oily fish and orange/yellow fruits.*
Fat soluble vitamin D - The main function of this micro-nutrient is to help the body absorb calcium during digestion. ***Examples include:*** *eggs, oily fish, fortified cereals and margarine.*
Water soluble vitamin B group - Helps absorbs minerals in the body, release energy from nutrients and helps to create red blood cells. ***Examples include:*** *wholegrain foods, milk and eggs.*
Water soluble vitamin C - Helps absorb iron in the body during digestion, supports the immune system and helps support connective tissue in the body which bind cells in the body together. ***Examples include:*** *citrus fruits, kiwi fruit, cabbage, broccoli, potatoes and liver.*

Minerals

Calcium - Needed for strengthening teeth and bones. ***Examples include:*** *dairy products, soya and green leafy vegetables.*
Iron - To make haemoglobin in red blood cells to carry oxygen around the body. ***Examples include****: nuts, beans, red meat and green leafy vegetables.*
Sodium - Controls how much water is in the body and helps with the function of nerves and muscles. ***Examples include:*** *salt, processed foods and cured meats.*
Potassium - Helps the heart muscle to work correctly and regulates the balance of fluid in the body. ***Examples include:*** *bananas, broccoli, parsnips, beans, nuts and fish.*
Magnesium - Helps convert food into energy. ***Examples include:*** *wholemeal bread, nuts and spinach.*
Dietary fibre (NSP) - Helps digestion and prevents constipation. ***Examples include:*** *wholegrain foods (wholemeal pasta, bread and cereals), brown rice, lentils, beans and pulses.*
Water - Helps control temperature of the body, helps get rid of waste products from the body and prevents dehydration. *Foods that contain water naturally include fruits and vegetables, milk and eggs.*

Unit 2: 2.1.2 – How cooking methods can impact on nutritional value

Boiling

- Up to 50% of vitamin C is lost boiling green vegetables in water.
- The vitamin B group is damaged and lost in heat.

Roasting

- Roasting is a method of cooking in high temperatures and so this will destroy most of the group C vitamins and some of the group B vitamins.

Poaching

- The vitamin B group are damaged in heat and dissolve in water.

Frying

- Using fat whilst frying increases the amount of vitamin A the body can absorb from some vegetables
- Cooking in fat will increase the calorie count of food e.g. deep fat frying foods.

Steaming

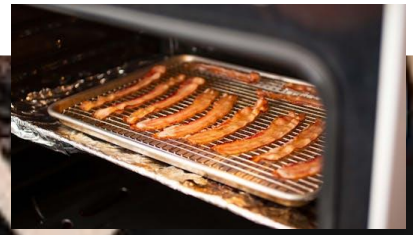
- Steaming is the best cooking method for keeping vitamin C in foods.
- Only up to 15% of vitamin C is lost as the foods do not come into contact with water.

Stir-frying

- The small amount of fat used whilst stir-frying increases the amount of vitamin A the body can absorb from some vegetables.
- Some vitamin C and B are lost due to cooking in heat for a short amount of time.

Grilling

- Using this cooking method can result in losing up to 40% of group B vitamins.
- It is easy to overcook protein due to the high temperature used in grilling foods.



Baking

- Due to high temperatures in the oven, it is easy to overcook protein and damage the vitamin C and B group vitamins.