



ORMISTON
SWB
ACADEMY

Knowledge Organisers Spring Term – Year 10

Name: _____

Please remember:

- It is to be kept inside your knowledge organiser book
 - It is to be brought into school every day

Regular retrieval throughout a scheme of learning (daily, weekly and monthly) has been proven to **reduce the rate of forgetting**, supporting you to **retain more** in long term memory- making assessments/ exams way easier! The challenge for you as a student is to make sure you use your knowledge organiser for each subject properly to help you to know more and remember more over time. We've created this walk through to support you in using your knowledge organiser- for more support speak to your subject teachers.



Using your Knowledge Organiser

1	2	3	4	5
Look	Cover	Write	Check	Repeat
Start with a small section of knowledge that you want to remember e.g <i>Henry VIII's wives in History</i> . Read through this section of the knowledge organiser (a couple of times if it helps)	Now cover up this section of your knowledge organiser with a post it note or scrap paper.	Self quiz- what can you remember and rewrite? Make sure you do this without looking back at your knowledge organiser.	Remove the post it and check for accuracy- did you get the key terminology? Was it spelt correctly? Was the order correct? If you drew a diagram, how much of this did you get correct? Most importantly- what did you miss out?	After a short break away from your knowledge organiser repeat the look, cover, write, check until you can recall all of the facts correctly without prompts . This process can be used for any new knowledge that you want to acquire. It is a good idea to do this on a regular basis, once a week.

Strategy 1- Look, cover, write, check – A really simple but effective way to use your knowledge organiser. Focus on a specific area of your knowledge organiser.

1	2	3	4	5
Focus	Big ideas	Explain it	Link it	Record it
Make it manageable by selecting an area of your KO <u>where your learning is not secure</u> . Don't waste time going off something you can already do!	Pick out the main points or the big ideas in this section.	Explain what you know about the main points (this could be written or shared verbally – a friend, a family member.	Now, see how it links to other areas within the subject. E.g <i>Eating meat – causes global warming. Cows produce methane which is a greenhouse gas.</i>	Write down as many 'think it, link it' ideas as you can in your book. See if you can beat others in your class!

Strategy 2- Think it, link it – Great for connecting the big ideas in your subject. How does 'x' relate to 'y'. What are the key factors which make an equation/ experiment/ process work? Challenge yourself to see how many links you can make!

1	2	3	4	5
Select topic	Prepare quiz	Answer it	Self check	Repeat
Decide which area you want to be quizzed on (this might build up over time)	Get someone else to prepare 10 random questions on that topic to challenge you.	Set a time limit (depending on the number of questions) and answer the questions without looking at your KO.	Now look at your KO to self check- make a note of your score. Celebrate your successes and make a note of anything you missed or got incorrect.	Return to this section in 2/3 weeks- see if you can improve your score! Re-do those questions that you missed or got incorrect.

Strategy 3- Knowledge quiz – You might try this after a few weeks of using your knowledge organiser. Get someone to set you 10 questions using your knowledge organiser. These could be spellings, key words, processes, equations etc to see how much you can remember! Record your score and see if you can beat your personal best each half term!

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KS4 – English – A Christmas Carol Plot and Key Quotations

1. The **narrator** informs the reader that Jacob Marley (former business partner) died 7 years ago.
2. Scrooge is described as mean and **miserly (d)**.
3. The weather is harsh and Bob Cratchit, Scrooge's worker, is treated harshly..
4. Scrooge is mean towards Fred, his nephew.
5. He refuses to donate money to the portly gentleman.
6. He sees the face of Jacob Marley in his door knocker.
7. He is visited by Jacob Marley (**bound in chains**) who informs him that he will be visited by three spirits.

1. **The Ghost of Christmas Past** visits Scrooge.
2. Scrooge is taken back to his childhood and sees his former self alone at school.
3. We are introduced to his sister – Fan and the poor relationship with his father.
4. Scrooge is then taken to **Fezziwig** where we see him enjoying himself at a party. He interacts with people.
5. Scrooge is then shown his former fiancée **Belle** and how they split. He becomes upset when he sees **Belle** and her family in another vision.
6. He demands to be taken home.

1. **The Ghost of Christmas Present** visits Scrooge.
2. He takes him to see Bob Cratchit and his family. Scrooge is surprised at how little the family have.
3. He is then taken to his nephew, Fred's house. Fred and his guests mock Scrooge and his **miserly (d)** ways.
4. He is then taken to a poor part of the city and introduced to **Ignorance (f)** and **Want**.
5. The spirit becomes frustrated and leaves him there.

1. **The Ghost of Yet To Come is shrouded in darkness:** silent and scary.
2. He is taken to the city and instructed to listen to a group of businessmen who are discussing the recent death of a man who was not very well-liked.
3. He is taken to **Old Joe's shop** where a dead man's belongings are being pawned.
4. He is then taken to a bedroom where he sees a corpse (h).
5. Scrooge demands to see **fenderness** surrounding the death. He is then taken to the Cratchit's and learns the death of **Tiny Tim**.
6. Scrooge wants to identify the dead man and he is taken to his grave.

1. Scrooge awakes **disorientated** and worries he has missed Christmas.
2. He is **joyful** when he learns he hasn't.
3. He orders and pays for the biggest turkey to be delivered to the Cratchit family.
4. He apologises and **donates** a healthy sum of money to the portly gentleman, to give to the poor.
5. He visits Fred and his wife and asks to join them for dinner.
6. He is **joyful the** next day, playing a trick on a terrified Bob, who arrives late to work.
7. He gives Bob a pay rise and pays for treatment for Tiny Tim.
8. Scrooge is **reformed** and is a complete contrast to Stave One!




'His **sole executor (b)**, his **sole** administrator...his **sole** friend and **sole mourner**.'

...'solitary (c) as an **oyster**.'

'...**wound** about him like a **tail**.'



'**Hard and sharp as flint**.'

'Another **idol** has **displaced** me....a **golden one**.'

'A **solitary child**, **neglected** by his friends, is left there.'

'The happiness he gives is as great as if it cost a fortune.'



'A **vacant** seat...and a crutch without an owner.'

'The boy is **ignorance (f)**. The girl is **Want**.'

'As good as gold.'



'I hope to live to be another man from what I was.'

'**Shrouded (g)** in a deep **black** garment.'

'...legs trembled beneath him.'

'Scrooge regarded **everyone with a delighted smile**.'

'I am as **light as a feather**, I am as **happy as an angel**, I am as **merry as a school boy**.'

'A merry Christmas to everybody.'

Christmas

Decline of Christmas

At the beginning of the Victorian period, the celebration of Christmas was in decline. The **Industrial Revolution, (o)** in full swing in Dickens' time, allowed workers little time for the celebration of Christmas.

Dickens describes the holidays as "a good time: a kind, **forgiving, charitable,** pleasant time: the only time I know of in the long calendar of the year, when men and women seem by one consent to open their shut-up **hearts freely,** and to think of other people below them as if they really were fellow-passengers to the grave, and not another race of creatures bound on other journeys."

Christian Values

Family

The role of the Family

The **Victorian** family was considered to be a very valuable part of the everyday life throughout the era. By today's standards, families were often considered to be very large. In 1870, you would find that the average household family contained five or six children.

Scenes of **family harmony** and cosy **firesides** in many of Charles Dickens' stories seem in stark contrast to his own family life. Later Dickens' own family was marked by strife as his relationship with his wife deteriorated and his sons seemed to have inherited their paternal grandfather's trouble handling finances.

Reflection of Dickens' life

Responsibility

1834 Poor Law

Victorian society ignored the **poverty (e)** of its poorest. On the one hand were the rich who enjoyed comfort and feasting at Christmas, and on the other were children forced to live in dreadful conditions in **workhouses.**

Dickens uses the novel to present his feelings that the **rich** must help the **poor** in order for the world to be **improved,** and that it is the **rich's responsibility** to help the **poorest** in society. He exposes the unfair treatment of the poor, and shows that the **stereotypes** that the poor are lazy are untrue, which he does by using the Cratchit's six children. The **1834 Poor Law** meant that unfortunate people were sent to prison-like conditions just because they were poor rather than getting financial help.

Stereotyping poorer citizens (r)

Redemption (i)

Role of religion

The Victorians were **religious**. Many believe that the novella (a) should be seen as an allegory (n) of the Christian concept of redemption (i). **Redemption** is the idea of being saved from sin or evil.

Because Dickens **experienced** life living in **poverty (e)** and **wealth** he wanted the **moral** message of the **novella (a)** to be that all human beings have the **opportunity** to behave in **kinder** ways towards each other. He wanted people to see the joy **redemption (i)** brings.

Performing kind deeds

	Key Terms	Definition
A	Novella	A novella or short novel is a work of narrative prose fiction, longer than a short story but shorter than a novel .
B	Executor	Someone responsible for following through on a task or duty.
C	Solitary	Existing alone.
D	Miserly	Reluctant to spend.
E	Poverty	Not having enough material possessions or income for a person's needs.
F	Ignorance	Lack of knowledge or information.
G	Shrouded	Cover or envelop so as to conceal from view.
H	Corpse	A dead body.
I	Redemption	The action of saving or being saved from sin, error, or evil.
J	Citizens	A person of that country.
K	Misanthrope	Someone who hates other humans.
L	Clerk	Someone who keeps records.
N	Allegory	A story which is about one thing but has a hidden meaning.
O	Industrial Revolution	The time in history when machines were used in factories rather than simply people.

Characters

Jacob Marley
Scrooge's old business partner who comes back as a ghost to warn him. He is **wrapped in a chain.**

Ghost of Christmas Past
A shapeshifting ghost with a **candle on top** of its head. It shows Scrooge the past.

Fezziwig

Scrooge's former boss who was nice and hosted parties for his workers.

Ghost of Christmas Present

A jolly ghost who looks **like Santa Claus**, only dressed in green. He **shows Scrooge the present and introduces him to two starving children, Ignorance (f) and Want.**

Ghost of Christmas Yet to Come

A ghost dressed in black who **looks like the Grim Reaper.** This ghost does not speak and shows Scrooge what could happen in the future if he does not change.

Employs (S.2)

Scrooge

A rich Victorian misanthrope (k).

Belle

Scrooge's old girlfriend who he rejected in favour of money. He sees a vision of her future with a family.

Fan

Scrooge's younger sister.

Fred

Scrooge's nephew who invites him to Christmas dinner.

Employs

Bob Cratchit

Scrooge's clerk.

Martha Cratchit

The eldest Cratchit child.

Belinda Cratchit

The second eldest Cratchit child.

Peter Cratchit

The third eldest Cratchit child.

Emily Cratchit

Bob's wife who hates Scrooge.

Tiny Tim

Bob's disabled son.

The twins

The youngest Cratchit children.



Start of the exam

- ✓ Use the **context box to infer (e)** information about what the text is about **and make predictions.**

Top Tips

- ✓ Use the **What/How/Why** paragraph structure,
- ✓ On questions 2 and 4, **zoom in** on words from text,
- ✓ Refer to the **steer of the question throughout** and
- ✓ Keep quotes to 5-10 words long.

1: The '4 things' Question

– List **four things** from a **specific** (a) part of the source.

You should: Select appropriate (b) **evidence from text** in response to the **statement.**



4 marks

2: The 'Language' Question

How does the writer **use language** to...? based on a specific part of the source e.g. lines 8-18.

You should: Explain or analyse the **effect of language.**



8 marks

3 The 'Structure' Question

How has the writer **structured the text to...?** Based on the whole text.

You should: Explain or analyse **the effect or how structure** interests the reader.



8 marks

4: The 'Agree' Question 20 marks

To what extent do you **agree with the statement** provided? Based on a specific part of the source.

You should:

- Judge the effect(s)** on the reader,
- Understand the **writer's methods(d),**
- Use a range of textual references and quotes and**
- Keep a relevant **focus on the question throughout.**



Active Verbs (similar to "shows")

- Connotes
 - Depicts
 - Demonstrates
 - Illustrates
 - Portrays
 - Reflects
 - Conveys
 - Exhibits
 - Emphasises
 - Implies
 - Presents
 - Suggests
- The writer (active verb) the...*



Question	Marks	% of paper	% of GCSE
1	4	5	2.5
2	8	10	5
3	8	10	5
4	20	25	12.5

Key terms Definition

A	Specific	Clearly identified or marked out
B	Appropriate	Suitable for the focus of the question
C	Structure	The way a text is put together, whether through paragraphs, subheading or flashbacks (f) etc.
D	Methods	The way something has been achieved.
E	Infer	To work out from the information available in the text.



Start of the exam

- ✓ 5 minute plan with question in mind.

Top Tips

- ✓ Keep **your tone consistent (g)** throughout: do not use words which suggest a light and playful atmosphere (b) after you have just spent 15 minutes making the scene sound scary.
- ✓ Use a variety of **structural (e) features**: flashbacks (f),
- ✓ Keep to **one or two characters and**
- ✓ 5 minutes' of checking SPaG, including paragraphing.

Punctuation to use

Question Mark	?	Exclamation Mark	!
Comma	,	Full stop	.
Semi-Colon	;	Speech Marks	“ ”
Colon	:	Apostrophe	'

5: The 'Writing for a purpose' question.

Question 5: Writing a narrative or description AO5/AO6

You will produce a story or description based on a **picture or a sentence** detailing your task.

Your local newspaper is running a creative writing competition and the best entries will be published.

Either write a story about time travel as suggested by this picture or write a story entitled 'Stranded'.

Key language devices to use:

Simile

Where you compare two things by saying they're **like something else**:

"He was as timid as an urban fox."

Metaphor

Where you compare two things by saying something **is something else** when it clearly is not.

"She was a night owl."

Pathetic fallacy

Where you use the **weather to set the atmosphere (b)**.

"The sky became cloudy and darkness fell."

Sensory Language

Where you use **vocabulary to describe** the character's five senses.

"I could taste blood streaming from my lip."

Overview of each paragraph

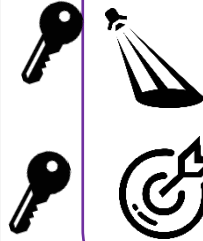
P1: Always **begin with the weather and describe the scene or setting** – decide if it's positive or negative.

P2: Character focus – introduce character – show but not tell then **lead in to a flashback. Use a symbol,** item or even to trigger the shift in time.

P3: Come back **to present moment, developing the character** in more detail. Keep something withheld!

P4: Describe the setting – **zoom out** to change focus. Include a motif (d).

P5: Cyclical (a) development – back to weather/scene/setting – **change from positive to negative or vice versa (c)**.



Key skills:

AO5: You should:

Ensure the story or description is **clear**.

AO6: You should:

Use **varied and accurate** sentence structures.



Section B: Question 5

AO	Marks	% of paper	% of GCSE
5	24	30	15
6	16	20	10

Great sentence openers

Connective	Unless, although.
Adverb	Regretfully, sadly.
Simile	Like a mouse...
Metaphor	Brave lions, they...
Feeling	Jealous, she tore up his clothes.
Verb 'ing' clause	Giggling and laughing, they ran to school.

	Key terms	Definition
A	Cyclical	Returning back to a previous point like a cycle.
B	Atmosphere	The tone or mood.
C	Vice versa	The two items can be switched around or reversed.
D	Motif	An object which is repeated and has importance to the events. E.g. a raven for death.
E	Structural	The way a text is put together, whether through paragraphs, subheading or flashbacks (f) etc.
F	Flashback	When the text goes back in time.
G	Consistent	Keeping something the same.



Start of the exam

- ✓ 5 minute plan with question in mind.

Top Tips

- ✓ Keep **your tone consistent (g)** throughout: do not use words which suggest a light and playful atmosphere (b) after you have just spent 15 minutes making the scene sound scary.
- ✓ Use a variety of **structural (e) features**: flashbacks (f),
- ✓ Keep to **one or two characters and**
- ✓ 5 minutes' of checking SPaG, including paragraphing.

Punctuation to use

Question Mark	?	Exclamation Mark	!
Comma	,	Full stop	.
Semi-Colon	;	Speech Marks	“ ”
Colon	:	Apostrophe	'

5: The 'Writing for a purpose' question.

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Overview of each paragraph

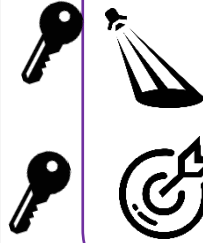
P1: Always **begin with the weather and describe the scene or setting** – decide if it's positive or negative.

P2: Character focus – introduce character – show but not tell then **lead in to a flashback. Use a symbol,** item or even to trigger the shift in time.

P3: Come back **to present moment, developing the character** in more detail. Keep something withheld!

P4: Describe the setting – **zoom out** to change focus. Include a motif (d).

P5: Cyclical (a) development – back to weather/scene/setting – **change from positive to negative or vice versa (c)**.



Key skills:

AO5: You should:

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AO6: You should:

Use **varied and accurate** sentence structures.



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G	Consistent	Keeping something the same.

Start of the exam

✓ Use the context box to infer (e) information about what the text is about and make predictions.

Top Tips

- ✓ Use the **What/How/Why** paragraph structure.
- ✓ On questions 3 and 4, **zoom in** on words from text.
- ✓ Refer to the steer (f) of the question throughout.
- ✓ Use a range of **comparison connectives**.
- ✓ Keep quotes to 5-10 words long.

1: The 'True or False' Question

✓

-Choose **four** statements which are true.

Draw a box around the lines to find the information.

Ensure to **shade** the boxes, not tick or cross.

4 marks

2: The 'Summary' Question

🍏

-Use details from both sources to write a summary of ...

Have 4 small quotes with **clear differences or similarities**.

Write 4 small paragraphs **inferring** (e) how they are different or similar.

Do not explain language devices, c).

8 marks

4: The 'Comparison' Question

🍏

Find **4-5** differences for the **question focus**.

Find a **quote** from each source for each of the differences.

Find **language or structure devices** in those quotes. Use **connectives** to link paragraphs and connect ideas.

Write 4-5 paragraphs, using **methods** (d) and focusing on the question.

16 marks

3 The 'Language' Question

✍️

-How does the writer **use language** to...? based on a specific (a) part of the source e.g. lines 8-18.

Explain or analyse the **effect of language**.

12 marks

Active Verbs (similar to "shows")

- Connotes
- Depicts
- Demonstrates
- Illustrates
- Portrays
- Reflects
- Conveys
- Exhibits
- Emphasises
- Implies
- Presents
- Suggests

The writer (active verb) the...



Question	Marks	% of Paper	% of GCSE
1	4	5	2.5
2	8	10	5
3	12	10	5
4	16	20	10

Key terms	Definition
A Specific	Clearly identified or marked out.
B Appropriate	Suitable for the focus of the question.
C Devices	A thing made for a specific purpose.
D Methods	The ways a writer achieves their aim.
E Infer	Work out from the information.
F Steer	What the examiner has asked you to focus on when answering.



Start of the exam

- ✓ 5 minute plan with question in mind.
- ✓ Underline the **audience (a), purpose (b) and form (c)** the task/question
- ✓ 35 minute response
- ✓ 5 minute checking SPaG, including paragraphing.

Top Tips

- ✓ Consider the following first: what do you **already know** about the topic?
- ✓ What is your **opinion** on the topic?
- ✓ Do you have any **personal experiences** that could support your ideas?
- ✓ What would others' opinion be?
- ✓ What is the **effect on others or society**?

5: The 'Writing for a purpose' question.

Question 5: Writing to argue AO5/AO6

You will produce a written text for a specified **audience (a), purpose (b) and form (c)**. You will give your own perspective on the theme introduced in Part A. **Example question:** "Cars are dangerous."

Write a letter to the Minister for Transport arguing your point of view on this statement.

Letter

- Dear Sir/Madam or name
- Addresses
- Date
- Paragraphs
- Yours sincerely/faithfully.

Speech

- Clear address to audience
- Use rhetorical devices throughout
- A clear sign off, e.g. 'Thank you for listening'.

Overview of each paragraph

P1: Outline your **main opinion** (big idea) and list your **three reasons** (supportive ideas). You could use a **circular structure (e) (hook)**: either open with a **descriptive hook (i)** 'Imagine a world where..' or a **questioning hook** 'Have you ever thought..' or an **anecdotal hook** 'Meet Dave...' – a made up character that is affected or not affected by the statement.

P2: **First reason** acknowledges **audience (a), purpose (b) and form (c)** and support main idea - back up with anecdotal evidence or a scenario (h).

P3: **Second reason** supports main idea - back up with anecdotal (f) evidence or a scenario.

P4: Use a **counter argument with third reason or how** might this issue impact on society?

P5: **Conclusion** – refer back to the circular structure (e). Comment on how this problem or statement might impact on others or society. **Return to 'hook' (i) from the beginning.** Imagine a world now that.. Answer question from the beginning or return to 'Dave'.

Key skills:

AO5: You should:

Ensure the story or description is **clear**.

AO6: You should:

Use **varied and accurate** sentence structures.



Article

- Clear/apt/original title
- Introductory paragraph
- Use persuasive techniques to convince reader of your viewpoint.

Leaflet

- Clear/apt/original title
- Organisational devices such as inventive subheadings or boxes
- Bullet points.



Section B: Question 5

AO	Marks	% of paper	% of GCSE
5	24	30	15
6	16	20	10

Key terms

Definition

A	Audience	This is who you are aiming your writing towards.
B	Purpose	This is why you are writing. Is it to inform, persuade, advise etc?
C	Form	This is what your writing will be in the form of i.e. a letter, speech, article, leaflet, blog etc.
D	Hook	A technique that " hooks " the reader's attention so that he or she will keep on reading.
E	Circular structure	You start and end using the same idea or message.
F	Anecdote	A short personal story adding meaning or significance to your message.
G	Counter	The opposite point of view.
H	Scenario	An imaginary situation.
I	Hook	Something which catches the reader's attention.

KS4 – Macbeth – Plot and Key Quotations

- The **witches** meet on the heath.
- Macbeth and Banquo** have fought and **won a battle**. They are praised for their bravery by the Captain.
- The witches meet Macbeth and Banquo and they make **three predictions**. They predict that Macbeth will become Thane of Cawdor and eventually king. Banquo is told that he will not become king but that his children will be. Shortly after, Macbeth is told he is the new Thane of Cawdor!
- Macbeth plans for **Duncan to stay at his castle**.
- Lady Macbeth convinces Macbeth to kill King Duncan**.
- Duncan arrives at Macbeth's castle.
- Macbeth tells Lady Macbeth he will not murder Duncan. However, **she convinces him to go ahead with the murder**.

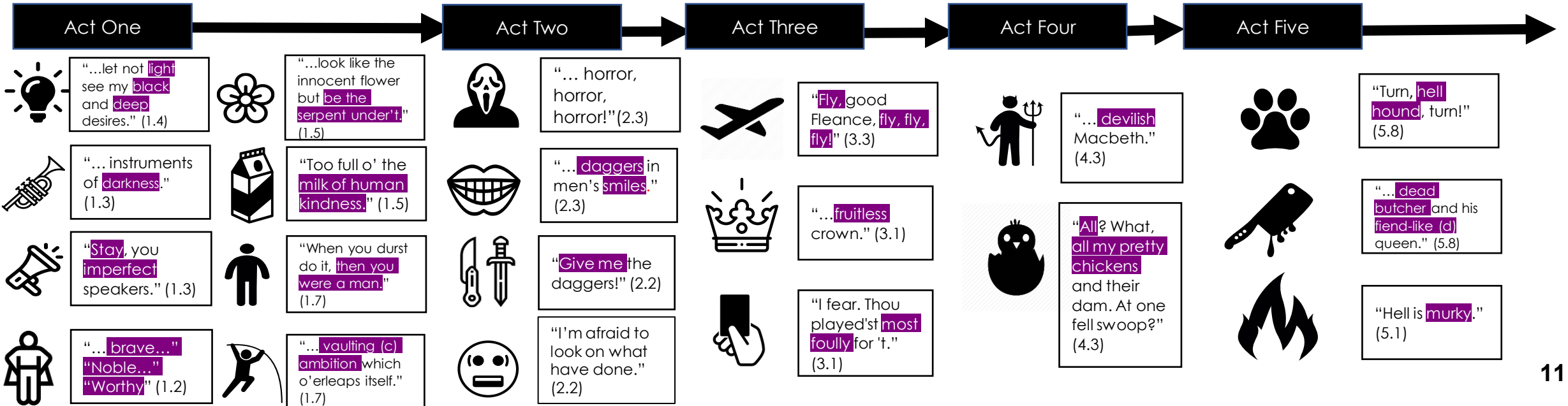
- Macbeth sees a dagger** in front of him on his way to go and kill King Duncan.
- Macbeth murders King Duncan. Macbeth's guilt** is apparent as he appears covered in blood. Lady Macbeth feels no guilt and places the daggers on Duncan's guards.
- The dead body is discovered by Macduff. Duncan's sons, **Malcolm and Donalbain, run away**: one to England and one to Ireland.
- Macbeth and his wife **become king and queen of Scotland**.

1. Macbeth questions Banquo. He is suspicious of Banquo. As a result, he plans his murder with the help of murderers.

- Banquo is murdered** by the hired murderers but his son, Fleance, manages to escape.
- At the coronation (a) banquet, **Macbeth sees the ghost of Banquo** at the table. Lady Macbeth persuades everyone that Macbeth is ill and they must leave and is furious at Macbeth.
- Hecate, the witches's leader, is angry that the witches meddled with Macbeth without her permission.
- Lennox shares his suspicions about Macbeth.

- The witches share **three more prophecies (b)**:
- Macbeth is told that: he must fear Macduff; that he will **not be harmed by anyone born of a woman** and that he will never be defeated until **Birnam Wood moves to 'High Dunsinane Hill'**. They also share a vision of Banquo.
- Macbeth has **Macduff's wife and children murdered**.
- In England, Malcolm tests Macduff's loyalty and checks they are on the same side, wanting the same things.

- Lady Macbeth sleepwalks**: she is overcome with guilt and loneliness.
- The rebels discuss the impending battle.
- Macbeth declares he has nothing to fear from the battle. He appears **confident**.
- The doctor reports on Lady Macbeth's condition. Macbeth orders him to cure her.
- Malcolm and Macduff's forces march to Dunsinane castle, **disguising themselves with branches** from the trees of Birnam Wood.
- Lady Macbeth dies off stage**.
- Macbeth realises that he is not going to win but decides to at least die fighting.
- Malcolm prepares for battle.
- Macbeth kills young Siward.
- Both **Macduff and Macbeth fight and Macbeth is killed**. His head displayed on a spike, as he was a **traitor**, Macduff is able to kill him as he reveals he was born by **caesarean (k) section**.
- Malcolm is crowned the new king of Scotland**.



KS4 – Macbeth – Context, Themes and Characters

Kingship

The Great Chain of Being

People believed that God set out an order for everything in the universe. This was known as **the Great Chain of Being**. On Earth, God created a social order for everybody and chose where you belonged. In other words, the king or queen was in charge because God put them there and they were only answerable to God (the **Divine Right of Kings**). This meant that **disobeying (n) the King was a sin**.

The Divine Right of Kings

King James I

Supernatural

One of the most active centres of **witch hunting** was Scotland, where up to 4,000 people were burnt. This was due to royal witch-hunter King James I. **King James I wrote a book called 'Daemonologie'** in which he supported and encouraged the trials of witches. He believed the witches were controlled by the devil and he **described witchcraft as "high treason (e) against God"**.

Witchcraft

Gender

Men assumed a **dominant** position in the society; making it **patriarchal (f)**. The main responsibility of married women was to take care of the household matters and raise children. Before marriage, a girl was under the control of her father, after marriage her husband and after the death of her husband, her son. **Women** were made to depend on their male relatives throughout their lives and had **no power**.

Gender stereotypes

The Role of Women

King James I

Gunpowder Plot

King James did not tolerate **Catholics** and this led a group of them to plot to kill him and everyone sitting in the Houses of Parliament on **November 5th, 1605**. This was **known as the Gunpowder Plot** which had failed. Shakespeare's Macbeth was likely written in 1606 in the aftermath of the Gunpowder **Treason**. Along with its responsive nature, it is known that Shakespeare wrote the play with the intent of honouring and displaying loyalty to King James I as a **cautionary (g) tale**.

Treachery and Regicide

Religion
Ambition

Appearance vs. Reality
Fate vs. Freewill

Masculinity
Ambition

Religion
Revenge

Characters

Hecate
The leader of the witches' coven (l).

Three Witches
They meet Macbeth on the heath after his first battle and give Macbeth and Banquo prophecies (b) about their lives.

Banquo
The loyal friend of Macbeth who witnesses the Witches' original prophecies (b) with him. His suspicions about Duncan's death lead Macbeth to act.

Fleance
Banquo's son or "seed".

Macbeth
Originally the Thane of Glamis...

Duncan
The original King of Scotland.

Malcolm
Duncan's first son who is eventually crowned King of Scotland. He flees to England when his father is murdered.

Donalbain
Donalbain is Duncan's second son who flees to Ireland once his father is murdered.

Lady Macbeth
The manipulative wife of Macbeth. We never know her name...
She eventually succumbs (m) to madness and kills herself.

Macduff
The Thane of Fife who did not attend Macbeth's coronation (a). He forms an alliance with Malcolm when the truth comes out and eventually kills Macbeth.

Lady Macduff
She is murdered along with her children when Macbeth cannot find Macduff.

Macduff's Children
Macbeth orders their murder when he cannot find Macduff.

Minor Characters

Lennox
A young Thane of the Scottish kingdom.

Ross
Macbeth's cousin who is initially loyal to the Thane of Glamis.

Influences A1.s3

Kills A3.s4

Kills A2.s2

Kills A5.s8

Join forces A4.s3

Key terms

	Key terms	Definition
A	Coronation	Where the king or queen is officially crowned.
B	Prophecies	A prediction of what will happen.
C	Vaulting	High and leaping over something.
D	Fiend	An evil spirit or demon.
E	Treason	Betraying your country.
F	Patriarchy/al	Men being dominant in society.
G	Cautionary	Something to make you take notice and perhaps stop.
H	Tyrannical	Being cruel with power.
I	Regicide	The act of killing the king.
J	Righteous	Behaving in the 'right' way or being morally good.
K	Caesarean	Being cut from the womb rather than a natural birth.
L	Coven	A group of witches.
M	Succumbs	Being unable to stop something negative happening.
N	Disobey	To go against orders.



Romantic era (g)



Imperialism (d)



Global Conflict



Global Conflict



Global Displacement (e)



Poems:

1. London
2. Extracts from the Prelude
3. Ozymandias

Key ideas:

- Poems are not about love. **Poems are about personal growth** and appreciating nature during the Industrial Revolution (f).
- Poets sometimes fought back against what they **thought were tyrannical (a) rulers who oppressed (c) normal people.**
- This made them considered radical (b).

Poems:

4. My Last Duchess
5. Charge of the Light Brigade

Key ideas:

- 1 in 5 people in the world called Queen Victoria of Great Britain their governor (j).
- People were very poor.
- People lacked rights.
- The social **hierarchy (h)** still defined who had **power.**

Poems:

6. Exposure
7. Bayonet Charge

Key ideas:

- In the First World War:
- 20 million people died.
- It was **fought from trenches** (holes in the ground) in Europe.

Poems:

11. Kamikaze

Key ideas:

- In the Second World War:
- 75 million people died.
- It was fought across the globe.
- Pearl Harbour in the USA was attacked in December 1941. **Japanese pilots were trained to bomb ships by flying into them. This meant they killed themselves for their country.**
- Following this, America came into the war on Britain's side, changing which side had the upper hand in the war.

Poems:

8. Storm on the Island
9. War Photographer
10. The Emigree
12. Tissue
- 13 Checkin' Out Me History
14. Remains
15. Poppies

Key ideas

- **Wars were often fought against smaller countries to stop tyrants (a) or terrorists (i).**
- Locals thought Western countries invaded for oil and other resources.
- Many locals were still loyal to the tyrants (a).

	Keyword	Definition
A	Tyrannical	Being cruel with power.
B	Radical	A person who wants to change society.
C	Oppressed	Being treated harshly, often by rulers.
D	Imperialism	Pushing your country's ideas on others.
E	Displace	Taking over the place or role.
F	Industrial Revolution	The use of machines in factories.
G	Romantic era	Poems about nature and its impact in a changing industrial (f) world.
H	Hierarchy	A system where people or items are ranked by status or power.
I	Terrorists	A person or group who uses violence to achieve their goals to change world.
J	Governor	The person in charge.

War and conflict

Power of nature

Power of the state

7 1957

"He lugged a rifle
numb as a smashed arm."

The simile (k) of the rifle being like a broken limb, slowing him down, shows how the army weighs heavily.

9 1985

"A hundred agonies in black and white."

The juxtaposition (n) of agony as a fairly plain image shows the contrast between the victims and speaker.

8 1966

"We are **bombarded** by the empty air."

The air is personified (l) as being like a bomber plane.

2 1799

"A huge peak, black and huge... **upreared its head.**"

The peak personified (l) as rising its 'huge' head shows how powerful nature appears, scaring the speaker.

13 2005

"**Dem tell me** wha **dem want to tell me.**"

The repetition (p) of 'dem tell me' shows the control the state has to control what the speaker knows.

5 1854

"...into the jaws of death/ into the **mouth of hell.**"

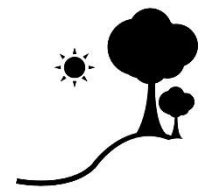
The personification (l) of death having 'jaws' shows it can kill like wild animals.



6 1917

"Tonight **this frost will fasten** on this mud and us."

The metaphor (j) 'fasten' shows how the weather has power to hold them down.

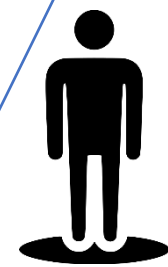
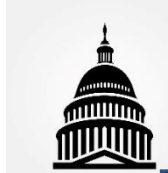


Power of the individual/ authority

10 1993

"There **once was a country**... I left it as a child."

The war between tyrants (a) has forced the Emigré (a) to leave, making their country in the past tense.



Power of humans

14 2008

"...his **blood shadow** stays on the street."

The imagery (o) of the blood being a shadow could imply it's following him, like his memories.

15 2009

"I **traced the inscriptions** on the war memorial."

The grieving speaker is visualising how her child could have joined the war-dead with the verb 'traced'.

11 2000s

"A shaven head full of **powerful incantations.**"

The word 'incantations' implies the kamikaze pilot is under a spell and being controlled against their will.

4 1842

"I **choose** never to stoop."

The personal pronoun (m) 'I' shows how the Duke feels he is always central and most important.



3 1817

"My name is **Ozymandias, king of kings.**"

The metaphor (j) 'king of kings' implies the tyrant (a) feels he is more powerful than all other rulers.

12 2000s

"Fine slips from grocery shops... **might fly our lives like paper kites.**"

The simile (k) of 'paper kites' shows how fragile our lives truly are being controlled by outside forces.

Number on context page.

When written

Quote

"**blood shadow** stays on the street"

Analysis of quote

The metaphor (j) 'king of kings' implies the tyrant feels he is above all of rulers.

Keyword	Definition
J	Comparing two unlike things by saying something is something else.
K	Comparing two things by saying something is like something else.
L	Giving non-human things human qualities.
M	Words which replace names: I, you, he, she, it, we, they, me, him, her, us, and them .
N	Where two things are placed together solely to compare them.
O	Descriptive language which helps to create an image for the reader.
P	Where a word or idea is reused often for a particular meaning.
Q	A person who has left their country for another. Often, they have been forced out.

Step-by-step approach for Q1

Step 1: Read the question: what is the **steer** (a)?



Step 2: Where can you find the steer (a) in the poem?

- Start with the **title**
- Beginning/middle/end
- **ONLY** things that **link to the steer** (a) or focus.



Step 3: Link your methods or ideas

- 1 overarching **thesis** (d) statement that **addresses the steer** (a).
- 3 supporting ideas or methods.
- language and structure



Step 4: **Explode the effects** of these three methods OR ideas in the poem.



Step 5: Structure this in three paragraphs.

- Idea, meaning, method (language and /or structure), connotations (words), effect (on a reader), **alternative** (b) **interpretations** (c) and secondary reference.



In 'Give', how does the poet present the speaker's attitude to **generosity**? (24 marks)

Thesis:
The speaker wants people to be kinder to those less fortunate; this kindness is not necessarily monetary.



Give

Of all the public places, dear to make a scene, I've chosen here.

Of all the doorways in the world to choose to sleep, I've chosen yours. I'm on the street, under the stars.

For coppers I can dance or sing.
For silver-swallow swords, eat fire.
For gold-escape from locks and chains.

It's not as if I'm holding out for frankincense or myrrh, just change.

You give me tea. That's big of you.
I'm on my knees. I beg of you.

Simon Armitage

Step 1:



The direct address (f) used by the speaker makes the reader feel slightly uncomfortable at their own lack of action; the speaker is holding them accountable (g) and reminding them that they also have a social responsibility.



By listing these metals in order of their value and what they would do for each of them, the speaker conveys their desperation for kindness from people. We can conclude that the speaker feels dehumanised (l) from the unkindness they have faced as they are willing to act as a performer rather than a fellow human being.



The ambiguous (h) use of the word 'change' could be a literal (i) interpretation: the speaker seeks something as insignificant (j) as spare change. Or, this could be metaphorical (k): the speaker is hoping for a change in society's attitudes to those less fortunate.



Sentence Starters:

The poet alludes to/implies/conveys/signifies/expresses/illustrates...
The poet conjures up an image of...
The reader can infer...
At the start/end of the poem, the poet...
The word '_____' accentuates/evokes...
The poet's attitude becomes apparent...
The theme of _____ is explored...
The writer has employed the use of...

	Key terms	Definition
A	Steer	Direction/focus of the question.
B	Alternative	Another option or possibility.
C	Interpretations	Explaining the meaning of something.
D	Thesis	Statement or theory as an argument to be proved.
E	Speaker	The voice or narrator of the poem.
F	Direct Address	The writer communicates a message directly to an individual or group of individuals.
G	Accountable	Required to explain their actions; be responsible for something.
H	Ambiguous	Not having a clear meaning.
I	Literal	Something in its most basic sense; not metaphorical (k).
J	Insignificant	Not important.
K	Metaphorical	When something symbolizes something else (d).
L	Dehumanised	Take away human qualities.
M	Structure	The way something is put together. E.g. Stanzas, chapters, a novel, a play etc.

Step-by-step approach for Q2

Step 1: Read the question: what is the **steer** (a)?



Step 2: Where can you find the steer (a) in this poem and the other poem?

- Start with the **title**
- Beginning/middle/end
- **ONLY** things that **link to the steer** (a) or focus.



Step 3: **Compare the methods.**

- Find examples of how the poets have used language in each poem- are they the same or different?
- Find examples of how the poets have structured the poem – are they the same or different?



Step 4: **Explode the effects** of these methods in both poems.



Step 5: Structure this in one or two paragraphs.

- Poem A – method and effect
- Similar or different?
- Poem B – method and effect



In both 'Give' and 'People Need People' the speakers describe their attitudes **towards how people treat each other.**

What are the similarities/differences between the ways the poets present these attitudes? (8 marks)



Step 1:



This links to the 'steer' of the question because it's about how people treat each other.

People need people,

To walk to

To talk to

To cry and rely on,

People will always need people.

To love and to miss

To hug and to kiss,

It's useful to have other people.

To whom to moan

If you're all alone,

It's so hard to share

When no one is there.

There's not much to do

When there's no one but you.

People will always need people.

To please

To tease

To put you at ease,

People will always need people.

To make life appealing

And give life some meaning,

It's useful to have other people.

If you need a change

To whom will you turn.

If you need a lesson

From whom will you learn.

If you need to play

You'll know why I say

People will always need people.

Step 2:



The poet has repeated this phrase throughout the poem.

Step 4:



This has been done to emphasise how much and how often we need other people.

Step 3:



On the other hand, the speaker in 'Give' uses direct address: "I'm on my knees. I beg of you"

Step 4:



This also emphasises how much people need others as the speaker has to 'beg' for human affection

Comparison Connectives	
Similarly	Contrastingly
In the same way	On the other hand
Also	However
In addition	Whereas
Tentative Phrases	
Could	Maybe
Might	Possibly
May	Perhaps
Appears	Seems to

Things to consider when comparing:

- Ideas
- Themes
- Effect on reader
- Writer's intentions
- Tone
- Mood and atmosphere
- Imagery
- Narrative voice
- Language techniques
- Structural (m) techniques
- Shift of focus
- Beginning
- End

$ax^2 + bx + c$

c = **y-intercept** (where the graph CUTS the Y axis)

A quadratic graph is called a parabola.

They are symmetrical.

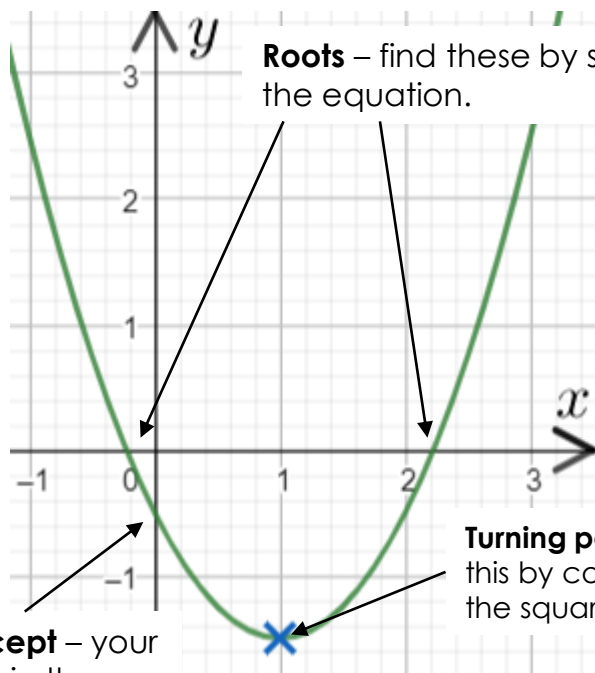
When a is positive



When a is negative



Features of a Quadratic Graph

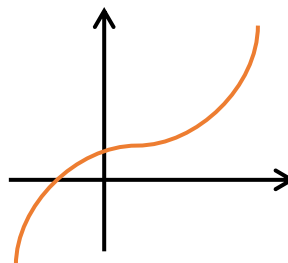


y-intercept – your c value in the equation

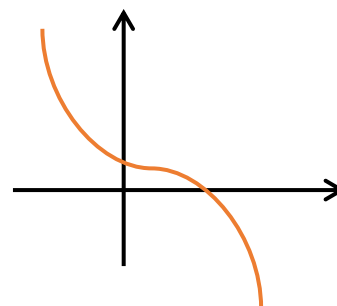
Other Graphs you Need to Know:

Cubic: $ax^3 + bx^2 + cx + d$

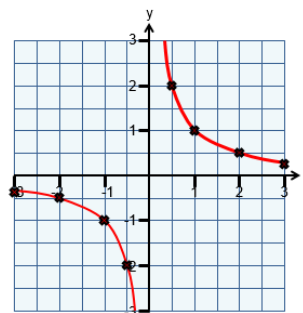
When a is positive



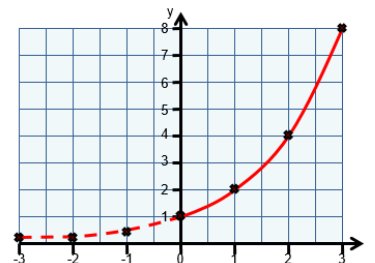
When a is negative



Reciprocal: $y = \frac{1}{x}$



Exponential: $y = 2^x$



Keyword /Skill	Definition/Tips
Quadratic	An equation that has an x^2 as the highest power.
Function	A mathematical relationship between two values.
Solve	To find a value that makes an equation true.
Expand	To multiply out one or more sets of brackets.
Factorise	To put the expression back into brackets.
Simplify	To make an expression easier by expanding or factorizing.
Graph	A drawing or diagram used to show information.
Curve	A line that is not straight
Coefficient	A number which multiplies a variable.....2 is the coefficient of x in $2x$.
Cubic	An equation that has an x^3 as the highest power.

Other Topics/Units this could appear in:

- Graphs of Trig Functions
 - Using Graphs of Circles, Cubes and Quadratics
 - Gradient and Area Under Graphs
- A-Level – Core:
- Algebra & Functions

Before progressing through this section of work, you may find it useful to look back at **Crossover Unit 19- Expand and Simplify, Unit 20 – Factorising, Unit 21 -Solving Equations** knowledge organisers.

Solving Quadratic Equations by Factorisation

You must be able to factorise quadratics in order to solve quadratic equations using this method.

Example 1

Solve $x^2 + 6x + 5 = 0$

This factorises into $(x + 5)(x + 1) = 0$

Each bracket needs to equal 0

$$\begin{array}{l} x + 5 = 0 \quad \text{or} \quad x + 1 = 0 \\ \mathbf{x = -5} \quad \text{or} \quad \mathbf{x = -1} \end{array}$$

Example 2

Solve $x^2 + 3x - 10 = 0$

This factorises into $(x + 5)(x - 2) = 0$

$$\begin{array}{l} x + 5 = 0 \quad \text{or} \quad x - 2 = 0 \\ \mathbf{x = -5} \quad \text{or} \quad \mathbf{x = 2} \end{array}$$

Example 3

Solve $x^2 - 6x + 9 = 0$

This factorises into $(x - 3)(x - 3) = 0$

This equation has repeated roots

$$\begin{array}{l} (x - 3)^2 = 0 \\ \text{This means there is only one solution, } \mathbf{x = 3} \end{array}$$

In order to solve quadratic equations, you need to be able to recognise when you can solve by factorising or when you need to use the quadratic formula or complete the square. Sometimes it will tell you which method to use in the question.

You will also need to be able to solve problems which involve solving quadratic equations too. (See 2nd slide)

Solving Quadratic Equations Using the Quadratic Formula

Example

Solve $3x^2 + 8x + 2 = 0$

Give your solutions correct to 3 significant figures.

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

You need to learn this!

This is a hint for you to use the formula as you will not be able to solve by factorising. You will need to use a calculator.

Figure out a, b and c

a = 3 b = 8 c = 2

$$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(3)(2)}}{2(3)}$$

Using brackets here for a, b and see will help to avoid calculation errors.

You will gain 1 mark for substituting in a, b and c

$$= \frac{-8 \pm \sqrt{64 - 24}}{6}$$

1 mark for simplifying

$$\begin{array}{l} \swarrow \quad \searrow \\ = \frac{-8 + \sqrt{40}}{6} \quad = \frac{-8 - \sqrt{40}}{6} \\ \swarrow \quad \searrow \\ \mathbf{x = -0.279} \quad \mathbf{x = -2.39} \end{array}$$

1 mark for both

Exam Tips

Quadratic formula questions will appear on one of the calculator papers (2 or) often worth 3 marks.

Keyword/Skill	Definition/tip
Quadratic (expression/ equation)	An expression/equation involving x^2
Factorise	An expression written as a product of it's factors.
Quadratic formula	A formula for solving quadratic equations. The solution of the equation $ax^2 + bx + c = 0$ is given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Completing the square	A method of solving quadratic equations which involves rewriting the equation $x^2 + px + q$ in the form $(x + a)^2 + b$
Solution	A value or values that we can put in place of a variable (such as x) that makes the equation true.
Coefficient	A number used to multiply a variable. Eg, $3x$ (3 is the coefficient)

Other topics/Units this could appear in:

- A-level
- Pure 1
- Quadratics
- Equations and Inequalities

Before progressing through this section of work, you may find it useful to look back at **Crossover Unit 19 - Expand and Simplify, Unit 20 – Factorising, Unit 21 - Solving Equations** knowledge organisers.

Solving quadratic equations by Completing the Square

This method can be used to give answers to a specified number of decimal places or to leave answers in surd form.

From previous learning, you may remember that;

$$(x + a)^2 = x^2 + 2ax + a^2$$

which can be rearranged to give:

$$x^2 + 2ax = (x + a)^2 - a^2$$

This is the basic principal behind completing the square.

Example 1

Rewrite the following in the form $(x \pm a) \pm b$

$x^2 + 6x - 7$
Rewrite $x^2 + 6x$ as $(x + 3)^2 - 9$

Ignore the -7 to begin with

Divide the coefficient by 2
Put it into your bracket and square it.

Bring back the -7 so
 $(x + 3)^2 - 9 - 7$

$(x + 3)^2 - 16$

Combine the constant terms to get the final answer. $(-9 - 7 = -16)$

Example 3

Solve $x^2 - 6x - 1 = 0$ by completing the square.

Leave your answer in the form $a \pm \sqrt{b}$.

$$x^2 - 6x = (x - 3)^2 - 9$$

$$(x - 3)^2 - 9 - 1$$

$$(x - 3)^2 - 10 = 0$$

Rearrange

$$(x - 3)^2 = 10$$

$$x - 3 = \pm \sqrt{10}$$

Take the square root of both sides

$$x = 3 \pm \sqrt{10}$$

Example 2

Rewrite $x^2 + 4x - 7$ in the form $(x + a)^2 - b$. Hence solve the equation $x^2 + 4x - 7 = 0$ giving your answer to 2 decimal places. (Calculator paper)

Using the same method as example 1

$$x^2 + 4x = (x + 2)^2 - 4$$

Ignore the -7 to begin with

Bring back the -7 so

Divide the coefficient by 2
Put it into your bracket and square it.

$$(x + 2)^2 - 4 - 7 \text{ giving}$$

$$(x + 2)^2 - 11$$

Combine the constant terms to get the final answer. $(-4 - 7 = -11)$

We can now rewrite the equation in the question as;

$$(x + 2)^2 - 11 = 0$$

Rearrange

$$(x + 2)^2 = 11$$

Take the square root of both sides

$$x + 2 = \pm \sqrt{11}$$

This answer are in surd form and sometimes you may be asked to leave like this. This answer requires two decimal places.

$$x = -2 \pm \sqrt{11}$$

Use calculator

$x = 1.32$ or $x = -5.32$ (to 2 decimal places)

Exam Tips

Completing the square questions can appear on non-calculator or calculator papers depending on how they would like you to give your answer.

Keyword/Skill	Definition/tip
Quadratic (expression/ equation)	An expression/equation involving x^2
Factorise	An expression written as a product of it's factors.
Quadratic formula	A formula for solving quadratic equations. The solution of the equation $ax^2 + bx + c = 0$ is given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Completing the square	A method of solving quadratic equations which involves rewriting the equation $x^2 + px + q$ in the form $(x + a)^2 + b$
Solution	A value or values that we can put in place of a variable (such as x) that makes the equation true.
Coefficient	A number used to multiply a variable. Eg, $3x$ (3 is the coefficient)

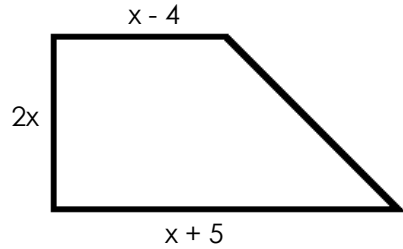
Other topics/Units this could appear in:

- A-level
- Pure 1
- Quadratics
- Equations and Inequalities

Before progressing through this section of work, you may find it useful to look back at **Crossover Unit 19- Expand and Simplify, Unit 20 – Factorising, Unit 21 -Solving Equations** knowledge organisers.

Example 1

The area of the trapezium below is 351 cm²



You need to know the formula for the area of a trapezium = $\frac{1}{2}(a + b)h$

Show that $2x^2 + x - 351 = 0$

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

Substitute in values for a and b and h

$$\frac{1}{2}(x - 4 + x + 5) 2x$$

Simplify

$$\frac{1}{2}(2x + 1)(2x)$$

Expand

$$\frac{1}{2}(4x^2 + 2x) = 351$$

÷ 2

$$2x^2 + x = 351$$

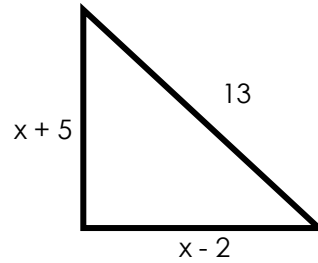
Rearrange

$$\underline{2x^2 + x - 351 = 0}$$

This is your answer as it shows the same equation as what is in the question

Example 2

Find the sides of the right angled triangle shown in the diagram.



You need to know Pythagoras theorem. $a^2 + b^2 = c^2$

$$(x + 5)^2 + (x - 2)^2 = 13^2$$

Substitute

$$(x^2 + 10x + 25) + (x^2 - 4x + 4) = 169$$

Expand

$$2x^2 + 6x + 29 = 169$$

Simplify

$$2x^2 + 6x - 140 = 0$$

Rearrange

$$x^2 + 3x - 70 = 0$$

Divide all by 2

$$(x + 10)(x - 7) = 0$$

Factorise

This gives

$$x = -10 \quad \text{or} \quad x = 7$$

Ignore the -10 as you cannot have a negative side length.

$x = 7$ give side lengths of;

5, 12 and 13

Exam Tips

Completing the square questions can appear on non-calculator or calculator papers depending on how they would like you to give your answer.

Keyword/Skill	Definition/tip
Quadratic (expression/ equation)	An expression/equation involving x^2
Factorise	An expression written as a product of it's factors.
Quadratic formula	A formula for solving quadratic equations. The solution of the equation $ax^2 + bx + c = 0$ is given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Completing the square	A method of solving quadratic equations which involves rewriting the equation $x^2 + px + q$ in the form $(x + a)^2 + b$
Solution	A value or values that we can put in place of a variable (such as x) that makes the equation true.
Coefficient	A number used to multiply a variable. Eg, $3x$ (3 is the coefficient)

Other topics/Units this could appear in:

- A-level
- Pure 1
- Quadratics
- Equations and Inequalities

Diameter and Radius of a Circle

The diameter is double the size of the radius.

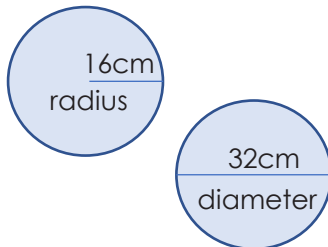
Example:

A circle has a radius of 16 cm. What is the diameter?

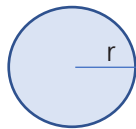
Radius = 16cm

$6\text{cm} \times 2 = 32\text{cm}$

Diameter = 32cm



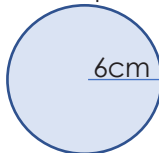
Area of a Circle



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

$$= \pi \times \text{radius}^2$$

Example: Find the area of the circle.



Radius = 6cm

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

$$= \pi \times 6^2$$

$$= 36\pi\text{cm}^2 = 113.1\text{cm}^2$$

Circumference of a Circle

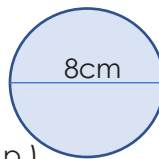
The circumference of a circle is the distance around the circle. It is the correct name for the perimeter of a circle.

$$\text{Circumference} = \pi \times \text{diameter}$$

Example: Find the circumference of this circle

Circumference = $\pi \times 8$

= 25.13cm (2d.p.)



You may be given the radius instead of the diameter, so you need to know the relationship between them (this information is stated above).

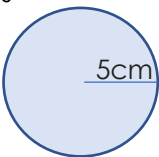
Example:

Radius = 5cm.

Diameter = $5\text{cm} \times 2 = 10\text{cm}$

Circumference = $\pi \times 10$

= 31.41cm (2d.p.)

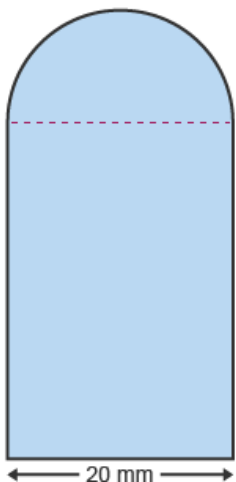


Exam!

In an exam it may ask you for your answer in terms of π . This means instead of doing the final calculation you just leave it with π in the answer e.g. $10\pi\text{cm}$

The Area of a Compound Shape

This shape is made up of a rectangle and a semicircle. To find the total area we just find the area of each part and add them together.



Area of rectangle = $l \times w$

$$= 20 \times 30$$

$$= 600\text{mm}^2$$

Area of circle = πr^2

$$= 3.14 \times 10 \times 10$$

$$= 314\text{mm}^2$$

Area of semicircle

$$= 314 \div 2 = 157\text{mm}^2$$

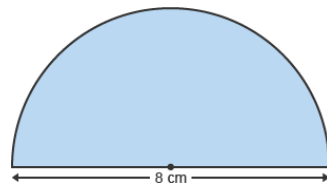
$$\text{Total area} = 600 + 157$$

$$= 757\text{mm}^2$$

Semicircles

The perimeter of a Semicircle:

Remember that the **perimeter** is the distance round the outside. A semicircle has two edges. One is half of a circumference and the other is a diameter.



$$C = \pi d$$

$$= 3.14 \times 8$$

$$= 25.12\text{cm}$$

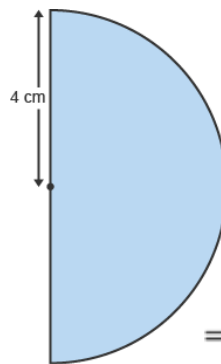
Remember this is the circumference of the whole circle, so now we need to half this answer and remember to add on the other edge.

$$25.12 \div 2 = 12.56\text{cm}$$

Total Perimeter = $12.56 + 8 = 20.56\text{cm}$

The Area of a Semicircle:

A semicircle is just half of a circle. To find the **area** of a semicircle we calculate the area of the whole circle and then half the answer.



$$A = \pi r^2$$

$$= 3.14 \times 4 \times 4$$

$$= 50.24\text{cm}^2$$

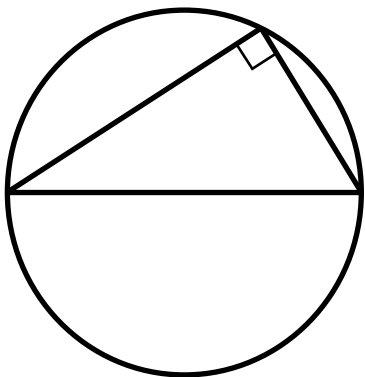
$$= 50.24 \div 2 = 25.12\text{cm}^2$$

Keyword/Skill	Definition/Tips
Area	The size of a surface. The space inside a 2D surface.
Perimeter	The distance around a two-dimensional shape.
Formula	A rule or fact written with mathematic symbols.
Semi-Circle	It is half of a circle
Accuracy	How close a measured value is to the actual (true) value.
Surface Area	The total area of the surface of a three-dimensional object.
Segment	The smallest part of a circle made when it is cut by a line.
Arc	Part of the circumference of a circle or any curve.
Sector	A "pie-slice" part of a circle.
Circumference	The distance around the edge of a circle (or any curvy shape). It is a type of perimeter.
Radius	The distance from the centre to the circumference of a circle. It is half of the circle's diameter.
Diameter	The distance from one point on a circle through the centre to another point on the circle.
Pi	The ratio of a circle's circumference to its diameter. The symbol is π $\pi = 3.14159265358979323846...$ (the digits go on forever without repeating)

Other Topics/Units this could appear in:

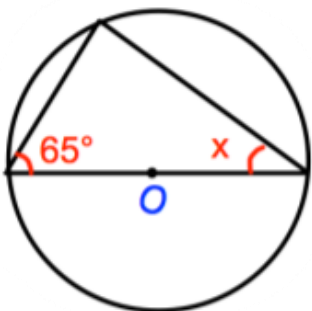
- Properties of shape and simple angle facts
- Perimeter and Area
- Mensuration
- Similarity in 2D & 3D
- Circle Geometry – Gradients & Tangents
- Circle Theorems
- Coordinate Geometry and Circles

Angles in a Semi-Circle



The angle at the circumference standing on a diameter is equal to 90°

Example:

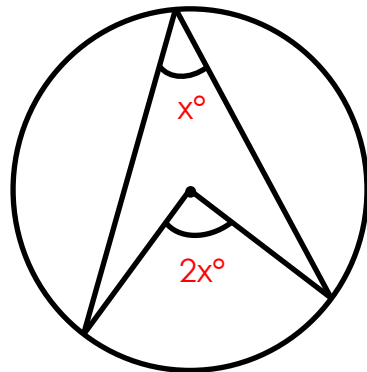


As angles in a semi-circle equal 90° , the angle at the circumference is 90° .

Angles in a triangle sum to 180° ,
So therefore: $180^\circ - (90^\circ + 65^\circ) = 25^\circ$

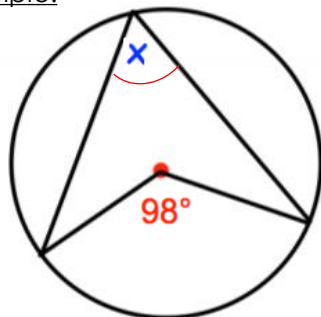
$$x = 25^\circ$$

Angles at the Centre



The angle at the centre is double the angle at the circumference

Example:

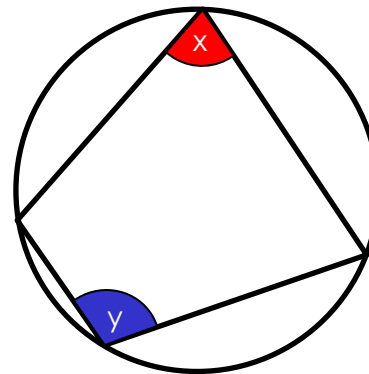


Here we have the angle at the centre. The angle at the centre is double the angle at the circumference.

$$\text{Therefore: } x = 98^\circ \div 2$$

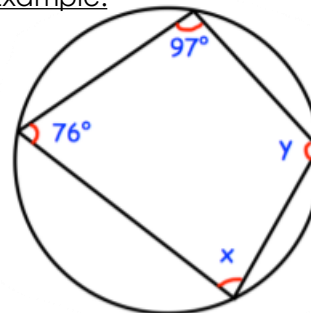
$$x = 49^\circ$$

Opposite Angles in a Cyclic Quadrilateral



Opposite angles in a cyclic quadrilateral add up to 180°

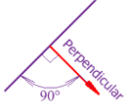
Example:



In a cyclic quadrilateral, opposite angles sum to 180°
So that means:

$$\begin{aligned} 97^\circ + x &= 180^\circ \\ -97^\circ & \quad -97^\circ \\ x &= 83^\circ \end{aligned}$$

$$\begin{aligned} 76^\circ + y &= 180^\circ \\ -76^\circ & \quad -76^\circ \\ y &= 104^\circ \end{aligned}$$

Keyword/Skill	Definition/Tips
Radius	A straight line from the centre of the circle to the circumference of a circle
Diameter	A straight-line passing side to side through the centre of a circle
Circumference	The perimeter of a circle
Tangent	A line that hits the circle at only one point
Perpendicular	At right angles (90°) to 
Chord	A straight line joining two points on a circle
Segment	The section of a circle made from a chord
Cyclic Quadrilateral	A quadrilateral with every vertex on a circle's circumference
Arc	A part of a curve, or a part of the circumference of a circle

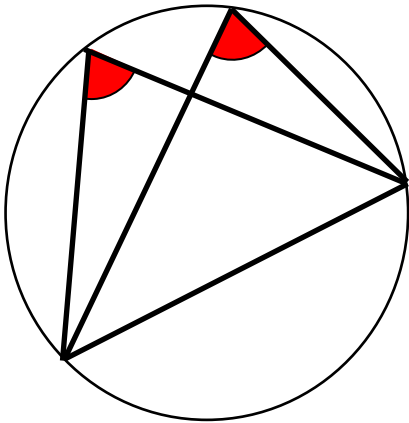
Exams!

You must write a reason for each stage of your working out when it comes to circle theorems, even basic facts (such as angles in a triangle sum to 180°).
You will miss out on marks if you do not put a reason.

Other Topics/Units this could appear in:

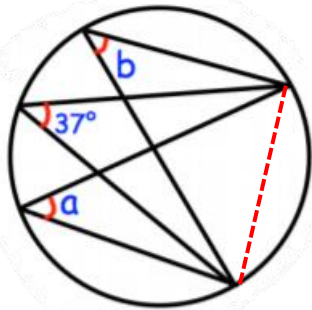
- Core – Trigonometry
- Core – Coordinate Geometry

Angles in the Same Segment



Angles created by triangles are equal if they are in the same segment

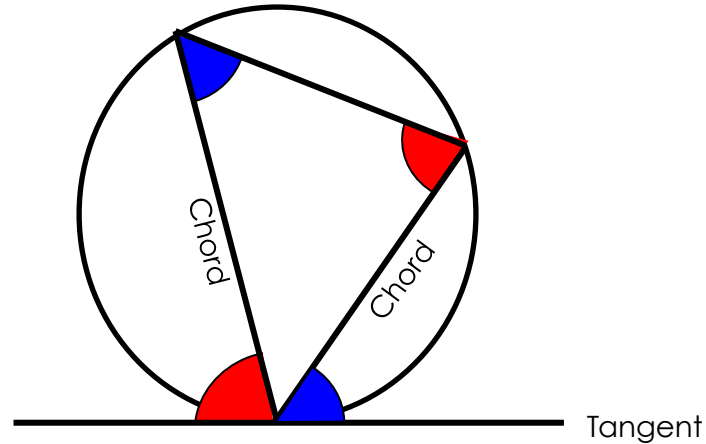
Example:



Here, these angles are all in the same segment (you can add in the line to make the segment to show it).

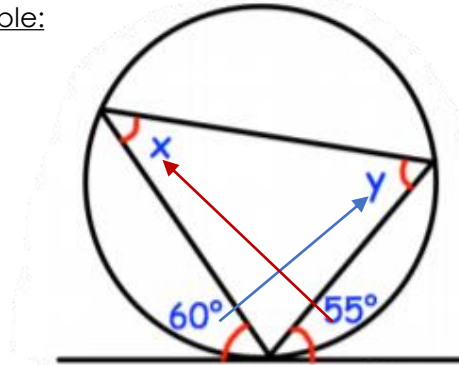
This means $a = b = 37^\circ$
 So: $a = 37^\circ$ $b = 37^\circ$
 Because angles in the same segment are equal

Alternate Segment Theorem

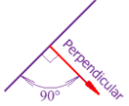


Angle between a tangent and a chord is equal to the angle at the circumference in the alternate segment

Example:

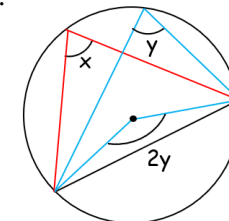


You need to recognise when to use this theorem. Here you can apply the alternate segment theorem (remember the equal angles are in **alternate** segments, follow the arrows for the equal angles).
 $y = 60^\circ$ as angles in the alternate segment are equal
 $x = 55^\circ$ as angles in the alternate segment are equal

Keyword/Skill	Definition/Tips
Radius	A straight line from the centre of the circle to the circumference of a circle
Diameter	A straight-line passing side to side through the centre of a circle
Circumference	The perimeter of a circle
Tangent	A line that hits the circle at only one point
Perpendicular	At right angles (90°) to 
Chord	A straight line joining two points on a circle
Segment	The section of a circle made from a chord
Cyclic Quadrilateral	A quadrilateral with every vertex on a circle's circumference
Arc	A part of a curve, or a part of the circumference of a circle

Exams!

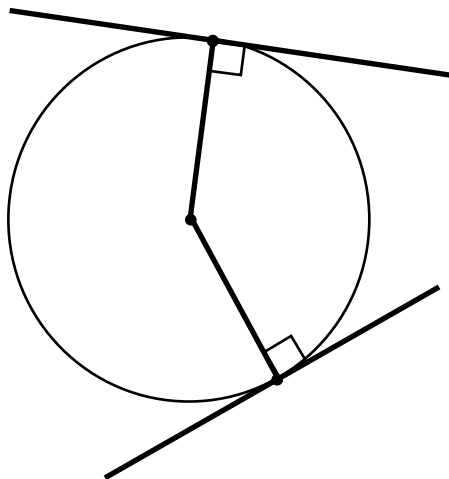
They may ask you to prove a theorem. Sometimes you can prove a theorem by using another theorem. For example to prove the angles in same segment:



- First, draw in radii
 apply 'angle at centre'
 $\Rightarrow 2x = 2y$
 $x = y$

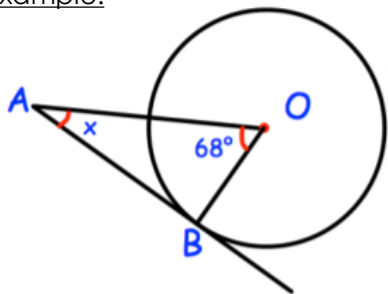
\Rightarrow Angles in same segment are equal

Tangents & Radii



The angle between the tangent and a radius is equal to 90° as they form a set of perpendicular lines

Example:

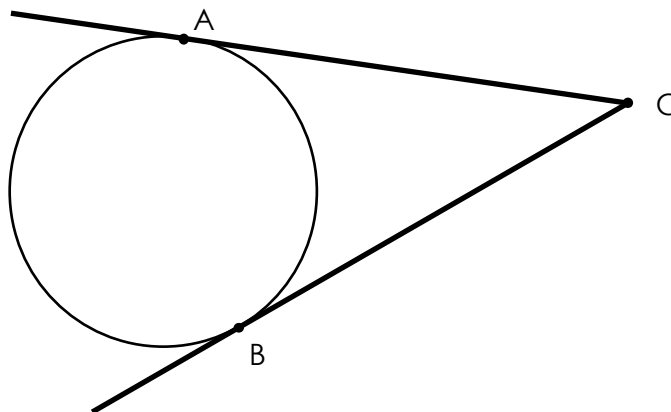


Here, the angle ABO will equal 90° as the tangent and the radius form perpendicular lines.

As angles in a triangle sum to 180° , $x = 180^\circ - 90^\circ - 68^\circ$

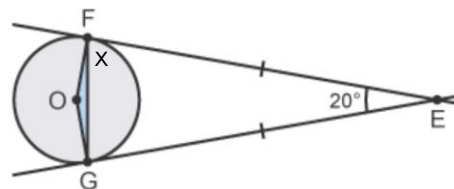
$$x = 22^\circ$$

Lengths of Tangents



Tangents to a circle which meet at a point are equal in length ($AC = AB$)

Example:

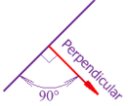


You need to calculate x , which is angle EFG .

Triangle EFG is an isosceles triangle as the lines FE and GE are equal because when two tangents to a circle meet at a point, they are equal.

Angle $EFG = FGE$ as base angles are equal in isosceles triangles.

$$\text{Angle } EFG = FGE = \frac{180^\circ - 20^\circ}{2} = 80^\circ \quad x = 80^\circ$$

Keyword/Skill	Definition/Tips
Radius	A straight line from the centre of the circle to the circumference of a circle
Diameter	A straight-line passing side to side through the centre of a circle
Circumference	The perimeter of a circle
Tangent	A line that hits the circle at only one point
Perpendicular	At right angles (90°) to 
Chord	A straight line joining two points on a circle
Segment	The section of a circle made from a chord
Cyclic Quadrilateral	A quadrilateral with every vertex on a circle's circumference
Arc	A part of a curve, or a part of the circumference of a circle

Exams!

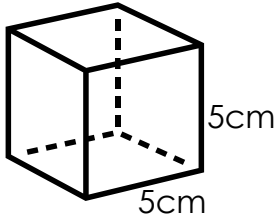
For some circle theorem questions they will combine different theorems. You will need to identify each theorem and state it in your working out.

You do not get these theorems in the exam so you need to learn them!

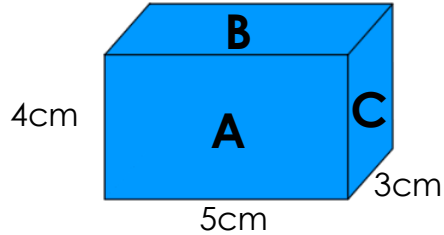
Other Topics/Units this could appear in:

- Core – Trigonometry
- Core – Coordinate Geometry

Cubes and cuboids



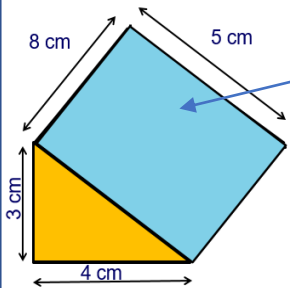
Each face has the same area.
 Area of one face:
 $5 \times 5 = 25\text{cm}^2$
 Total surface area:
 $25 \times 6 = 150\text{cm}^2$



A cuboid will have 3 pairs of equal faces:
 $2 \times A = 2 \times (5 \times 4) = 40\text{cm}^2$
 $2 \times B = 2 \times (5 \times 3) = 30\text{cm}^2$
 $2 \times C = 2 \times (3 \times 4) = 24\text{cm}^2$
 Surface Area = $40 + 30 + 24 = 94\text{cm}^2$

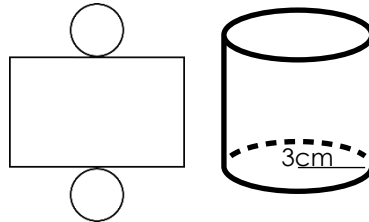
Triangular Prisms & Cylinders

Make sure you find the area of each face on a prism. They may not be all the same shape!



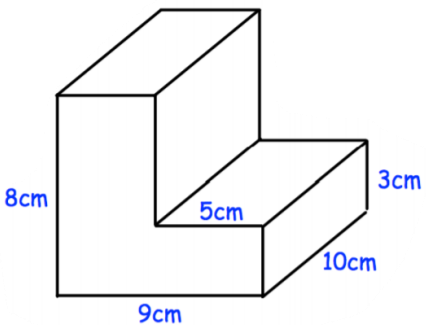
$5 \times 8 = 40\text{cm}^2$
 $3 \times 8 = 24\text{cm}^2$
 $4 \times 8 = 32\text{cm}^2$
 $(3 \times 4) \div 2 = 6\text{cm}^2$
 $(3 \times 4) \div 2 = 6\text{cm}^2$
 $40 + 24 + 32 + 6 + 6 = 108\text{cm}^2$

A cylinder's surface is made from two circles and a rectangle, you can see this from the net of a cylinder. The dimensions of the rectangle are the height of the cylinder and the circumference of one of the circles.



Area of the two circles:
 $2 \times (\pi \times 3^2) = 56.6\text{cm}^2$ (1d.p.)
 Area of the curved surface:
 Circumference \times Height
 $(2 \times \pi \times 3) \times 10 = 188.5\text{cm}$ (1d.p.)
 Total: $56.6 + 188.5 = 245.1\text{cm}^2$

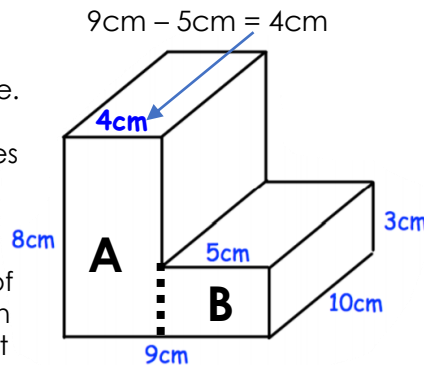
Compound Shape Prisms



The area of the bottom and the top of the shape will be the same.

The area of the left and right sides of the shape will also be the same.

You then need to split the face of the shape up into shape you can find the area of, in this example it will be two rectangles.



Area of the top and bottom:
 $2 \times (9 \times 10) = 180\text{cm}^2$
 Area of the left and right:
 $2 \times (8 \times 10) = 160\text{cm}^2$
 Area of rectangle A (front & back):
 $2 \times (8 \times 4) = 64\text{cm}^2$
 Area of rectangle B (front & back):
 $2 \times (5 \times 3) = 30\text{cm}^2$
 Total Surface Area:
 $180\text{cm}^2 + 160\text{cm}^2 + 64\text{cm}^2 + 30\text{cm}^2 = 434\text{cm}^2$

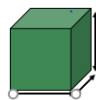
Keyword /Skill	Definition/Tips
Prism	A 3D shape that has two identical ends and flat sides.
Cross Section	A view into the inside of something by cutting through it.
Diameter	The distance from one point of a circle to another passing through the centre. It is twice the radius.
Radius	The distance from the centre of the circle to the circumference. It is half the diameter.
Formula/Formulae	A rule or fact written with mathematical symbols. ($V = l \times w \times h$).
Compound Shape	A compound shape is made up of two or more basic shapes.
Face	A flat surface of any object.
Perimeter	The distance around the outside of a shape.
Area	The space inside a 2D shape.
Surface Area	The total area of the outside of a 3D shape.
Volume	The amount of 3-dimensional space something takes up.

Other topics/units this may appear in:

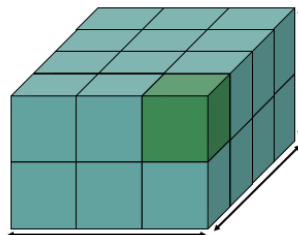
- Perimeter and Area
- 3D forms
- Mensuration

Volume Using Unit Cubes

This is a unit cube. It has a volume of 1cm^3 . You may get shapes made from unit cubes and you will need to find the volume of that shape by counting how many cubes there are.

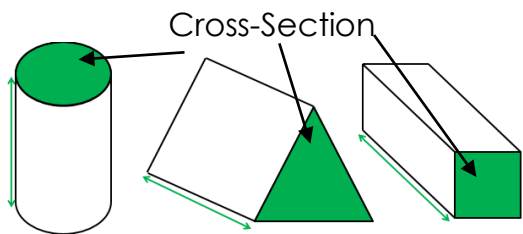


Example:



The volume of this cuboid would be 24cm^3 as there are 24 unit cubes altogether.

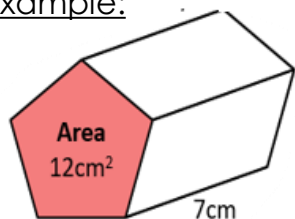
Volume of Prisms



A prism has a constant cross-section. To find the volume of it you first need to find the area of the cross section and multiply it by the height/depth of the shape.

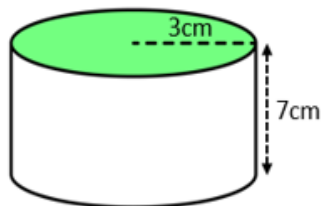
Formula for Volume of Prisms: **Area of Cross-Section x Height**

Example:



You are given the area of the cross-section so you need to multiply the area by the depth:

$$12\text{cm}^2 \times 7 = 84\text{cm}^3$$



$$\begin{aligned} \text{Area of cross-section} &= \pi \times r^2 \\ &= \pi \times 3^2 = 28.27\text{cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= \text{Area of Cross-Section} \times \text{Height} \\ &= 28.27 \times 7 = 197.89\text{cm}^3 \end{aligned}$$

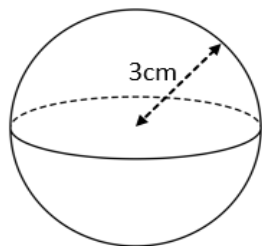
Volume of Spheres

Formula for volume of a Sphere: $\frac{4}{3} \times \pi \times r^3$

You are given this formula in the exam, you just need to be able to use it!

Example:

$$\text{Volume} = \frac{4}{3} \times \pi \times 3^3 = 113.1\text{cm}^3 \text{ (1d.p.)}$$



Exam!

Make sure you use the correct units with your answer.

Area uses square units and volume uses cubic units.

Examples:

Area units: cm^2 , m^2 , mm^2 , km^2 , etc.

Volume: cm^3 , m^3 , mm^3 , km^3 , etc.

Keyword /Skill	Definition/Tips
Prism	A 3D shape that has two identical ends and flat sides.
Cross Section	A view into the inside of something by cutting through it.
Diameter	The distance from one point of a circle to another passing through the centre. It is twice the radius.
Radius	The distance from the centre of the circle to the circumference. It is half the diameter.
Formula/ Formulae	A rule or fact written with mathematical symbols. ($V = l \times w \times h$).
Compound Shape	A compound shape is made up of two or more basic shapes.
Face	A flat surface of any object.
Perimeter	The distance around the outside of a shape.
Area	The space inside a 2D shape.
Surface Area	The total area of the outside of a 3D shape.
Volume	The amount of 3-dimensional space something takes up.

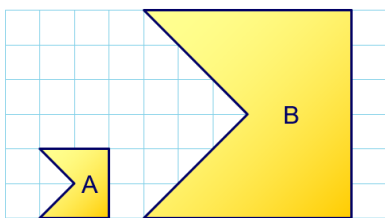
Other topics/units this may appear in:

- Perimeter and Area
- 3D forms
- Mensuration

DON'T FORGET

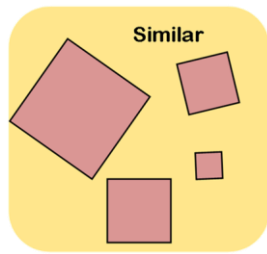
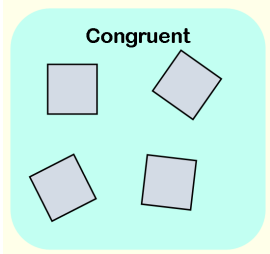
Enlargements make the object bigger or smaller.
Scale factors tell us how much bigger or smaller.

An enlarged shape will ALWAYS produce a **similar** pair of shapes.

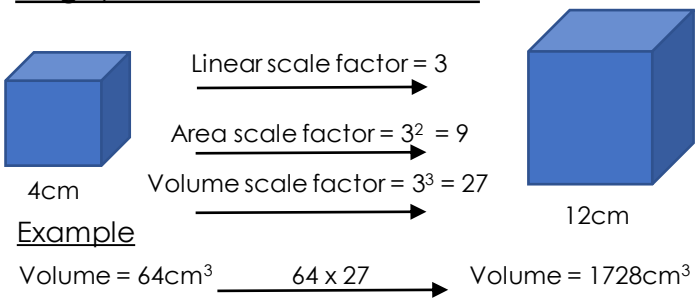


Shape A has been enlarged by a scale factor of 3 (all sides multiplied by 3) but all the angles will remain the same.

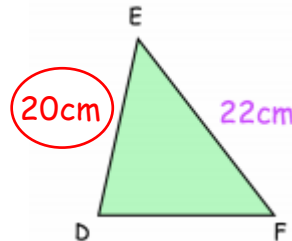
Similarity Vs. Congruence



Length, Area & Volume Scale Factor



Finding and Using a Scale Factor



In order to find length DF

Write two of the corresponding sides as a ratio = $AB : DE$
 $5 : 20$

With a scale factor of 4

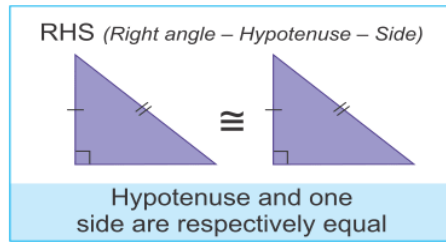
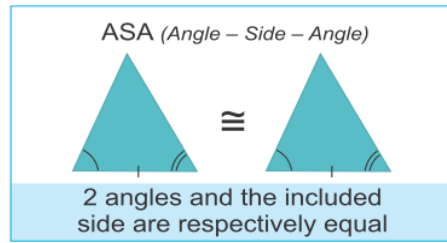
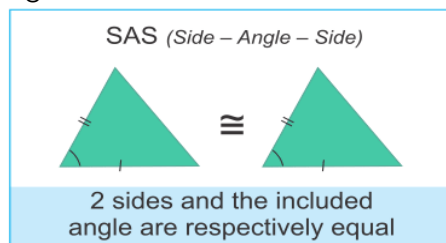
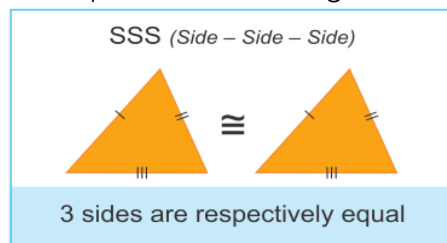
Simplify $\rightarrow 1 : 4$

To find DF- look at the corresponding length $AC = 6\text{cm}$
 $6 \times 4 = 24\text{cm}$

This is the scale factor

Rules for Congruent Triangles

If each of the three identified measurements (in the diagrams below) are equal, then the triangles are congruent.



Keyword/Skill	Definition/tip
Similar	Two shapes are similar when one can become the other after a resize , flip, slide or turn.
Congruence	Two shapes are congruent if they are exactly equal in size and shape.
Scale factor	The ratio by which a length or other measurement is increased or decreased.
Ratio	A ratio shows the relative sizes of 2 or more values.
Enlargement	When a shape/length changes size (bigger or smaller) using a scale factor.
Compass	Piece of mathematical equipment
Construction	Use ruler, pencil, protractor and/or compasses to accurately draw a given shape.

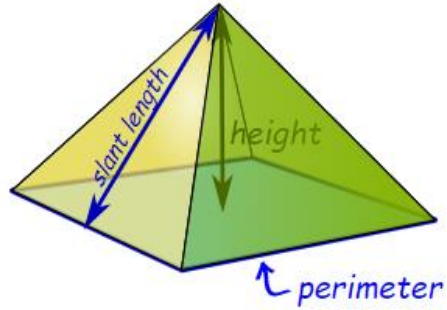
Other topics/Units this could appear in:

- Transformation
- Construction

Exam Tips

- To help you start similarity questions you will need to find the scale factor.
- You will gain a mark for recognising and using area and volume scale factor.

Pyramid

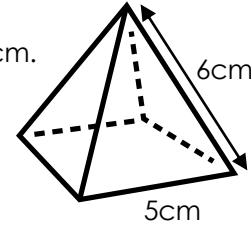


$$\text{Surface Area} = [\text{Base Area}] + \frac{1}{2} \times \text{Perimeter} \times [\text{Slant Length}]$$

When side faces are the same:

Example: Slant length = 6cm. The base is a square with side lengths of 5cm.

$$\begin{aligned} \text{Surface Area} &= \text{Base Area} + \frac{1}{2} \times \text{Perimeter of Base} \times \text{Slant Length} \\ &= (5 \times 5) + \frac{1}{2} \times (5 + 5 + 5 + 5) \times 6 \\ &= 25 + \frac{1}{2} \times 20 \times 6 \\ &= 25 + 60 \\ &= 85\text{cm}^2 \end{aligned}$$

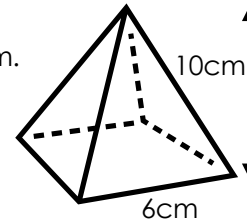


Note: When the side faces are different, calculate the area of the base AND the area of each triangular face separately and then add them up.

$$\text{Volume} = \frac{1}{3} \times [\text{Base Area}] \times \text{Height}$$

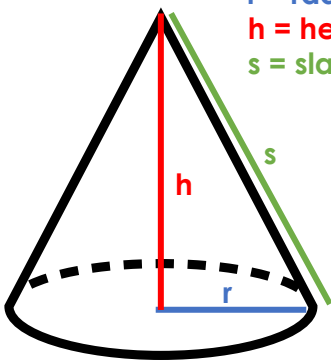
Example: Height = 10cm, The base is a square with side lengths of 6cm.

$$\begin{aligned} \text{Volume} &= \frac{1}{3} \times \text{Base Area} \times \text{Height} \\ &= \frac{1}{3} \times (6 \times 6) \times 10 \\ &= 12 \times 10 \\ &= 120\text{cm}^3 \end{aligned}$$



Cone

r = radius
h = height
s = slanted height



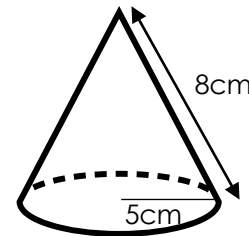
Surface Area = Area of the Base + the Curved Area

Example: Radius = 5cm, Slant Height = 8cm

$$\begin{aligned} \text{Surface Area} &= \text{Area of the Base} + \text{the Curved Area} \\ &= \pi r^2 + \pi r s \\ &= \pi \times 5^2 + \pi \times 5 \times 8 \\ &= 65\pi \text{ cm}^2 \quad \text{or} \quad 204 \text{ cm}^2 \quad (3 \text{ sig figs}) \end{aligned}$$

$$\text{Volume} = \frac{1}{3} \times [\text{Base Area}] \times \text{Height}$$

$$\begin{aligned} &= \frac{1}{3} \times \pi r^2 \times h \\ &= \frac{1}{3} \times \pi \times 5^2 \times \sqrt{8^2 - 5^2} \\ &= \frac{1}{3} \times \pi \times 25 \times \sqrt{39} \\ &= 163.5\text{cm}^3 \quad (1\text{dp}) \end{aligned}$$



Keyword/Skill	Definition/tip
Pyramid	A solid object (3D) where the sides are triangles that meet at the top. (Apex)
Cone	A solid object (3D) that has a circular base joined to a point by a curved side. The point is called a vertex.
Sphere	A solid (3D object) shaped like a ball. Every point on the surface is the same distance from the centre
Frustum	A pyramid or a cone with the top cut off parallel to its base.
Surface Area	Total area of the surface of a 3D shape
Volume	The amount of 3D space that something takes up

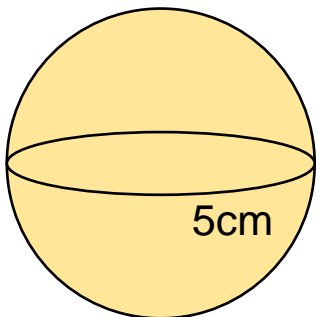
Other topics/Units this could appear in:

A-Level – Pure 1 – Forming and Solving Differential Equations

Exam Tip:

You will sometimes need to use Pythagoras Theorem to find h, r or s

Sphere



The radius of this Sphere is 5cm.

$$\begin{aligned} \text{Surface Area} &= 4 \times \pi \times r^2 \\ &= 4 \times \pi \times 5^2 \\ &= 100\pi \text{ cm}^2 \text{ or } 314 \text{ cm}^2 \text{ (3 sig figs)} \end{aligned}$$

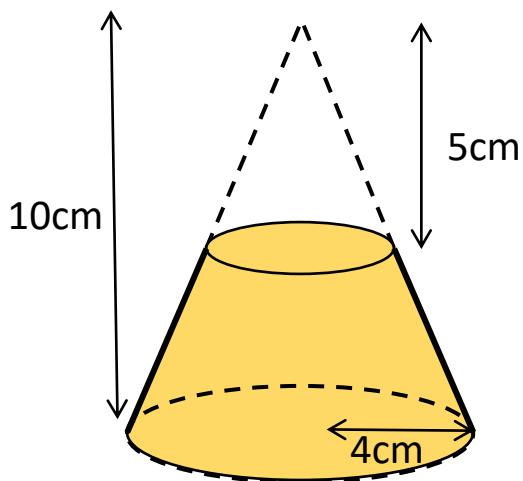
$$\begin{aligned} \text{Volume} &= \frac{4}{3} \times \pi \times r^3 \\ &= \frac{4}{3} \times \pi \times 5^3 \\ &= 524\text{cm}^3 \text{ (3 sig figs)} \end{aligned}$$

Formula you need to remember for the exam:

$$\text{Volume of a Pyramid: } \frac{1}{3} \times \text{area of base} \times \text{height}$$

The formulas you need for the surface area & volume of a cone and a sphere are given to you in the exam so you do not need to memorise them, just make sure you can use them!

Frustum (Shaded bit)



Remember: The formulae for cones are on the previous page

Scale Factor	$10 \div 5 = 2$
Radius of top circle	$4 \div 2 = 2\text{cm}$
Volume of big cone	$\frac{1}{3} \times \pi \times 4^2 \times 10 = 167.6\text{cm}^3$
Volume of small cone	$\frac{1}{3} \times \pi \times 2^2 \times 5 = 20.9\text{cm}^3$
Volume of Frustum	$167.6 - 20.9 = 147\text{cm}^3$ 3 sig figs
Length of big cone	$\sqrt{4^2 + 10^2} = 10.77\text{cm}$
Length of small cone	$\sqrt{2^2 + 5^2} = 5.39\text{cm}$
Area of curved surface	$(\pi \times 4 \times 10.77) - (\pi \times 2 \times 5.39) = 101.5\text{cm}^2$
Surface Area of Frustum	$101.5 + \pi \times 4^2 + \pi \times 2^2 = 164\text{cm}^2$

Keyword/Skill	Definition/tip
Pyramid	A solid object (3D) where the sides are triangles that meet at the top. (Apex)
Cone	A solid object (3D) that has a circular base joined to a point by a curved side. The point is called a vertex.
Sphere	A solid (3D object) shaped like a ball. Every point on the surface is the same distance from the centre
Frustum	Usually a pyramid or cone with the top cut off flat.
Surface Area	Total area of the surface of a 3d shape
Volume	The amount of 3D space that something takes up

Other topics/Units this could appear in:

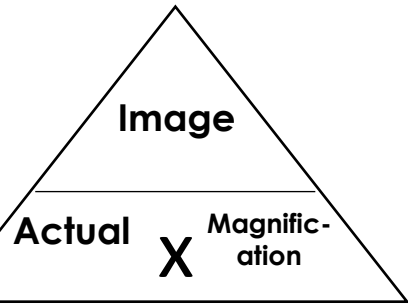
A-Level – Pure 1 – Forming and Solving Differential Equations

Exam Tip:

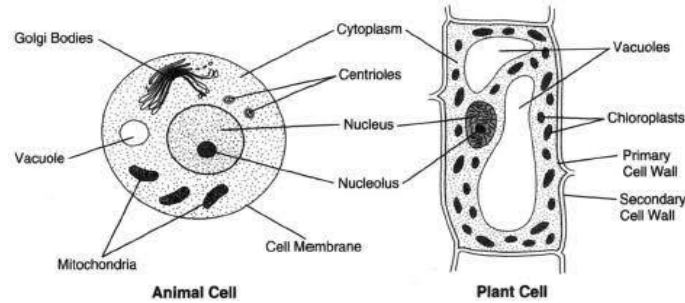
You will sometimes need to use the properties of 'Similar Shapes' and/or Pythagoras to calculate some lengths that are required

Biology Knowledge Organisers

1. Magnification



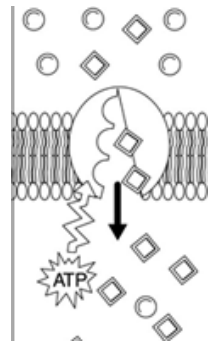
2. Plant and animal cells : compare and contrast



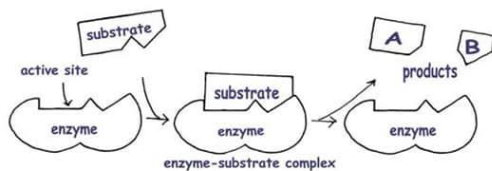
3. Enzymes and food tests

Name of large biological molecule	Name of enzyme that digests it	Digested molecule	Food test	Positive result
Carbohydrates – Starch 	Carbohydrase	Glucose 	Starch – Iodine solution Glucose – Benedict's solution	Blue/black colour Green, yellow, orange, brick red colour
Proteins 	Protease	Amino acids 	Biuret reagent	Violet colour
Lipids 	Lipase	Glycerol and three fatty acids 	N/A	N/A

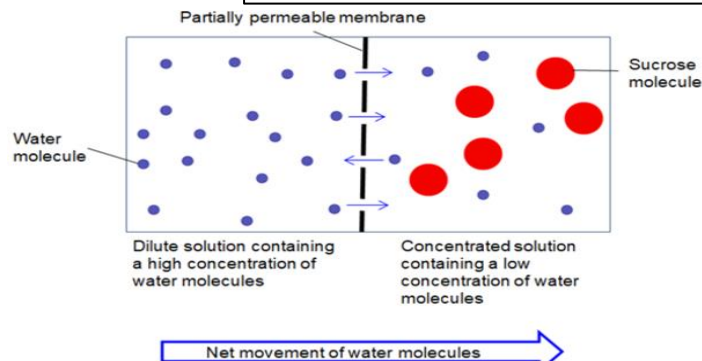
6. Active transport



4. Enzyme substrate complex

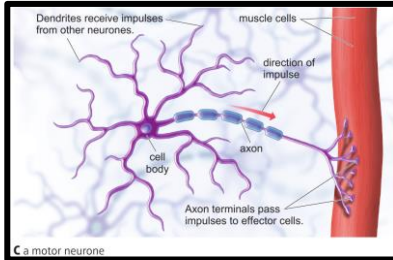
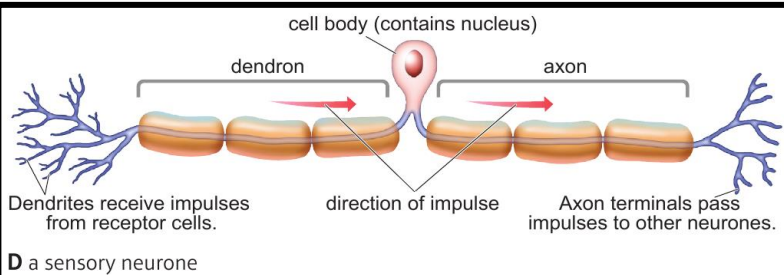
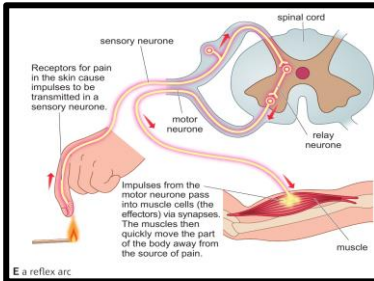
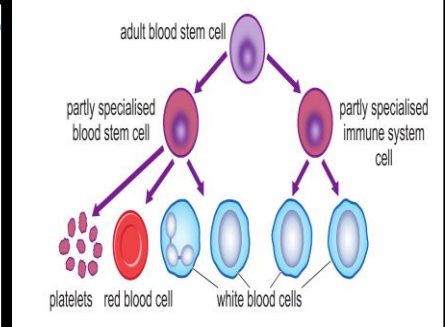
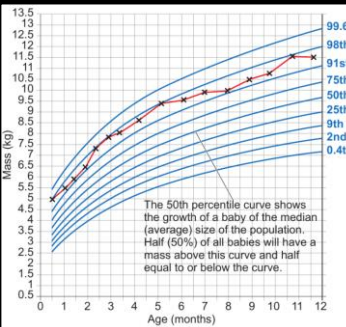
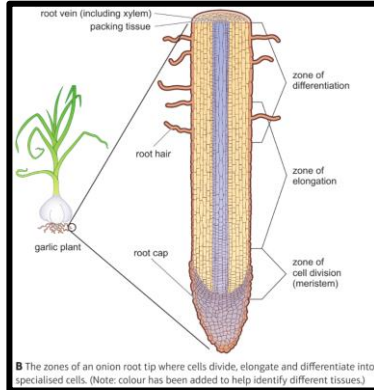
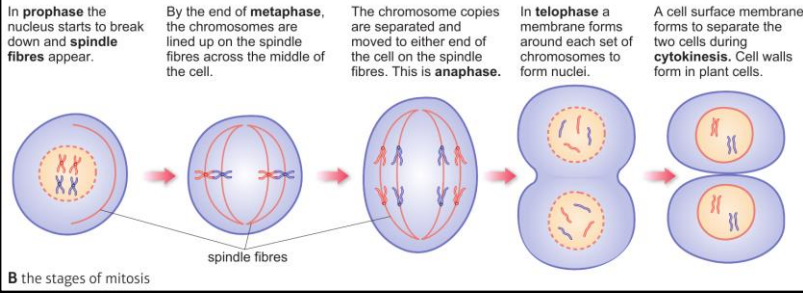


5. Osmosis



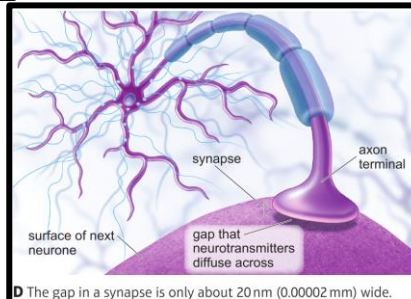
Keyword	Definition
Magnification	The number of times larger an image is than the initial object that produced it
Objective lens	The part of the microscope that is closest to the specimen
Resolution	The smallest change that can be measured by an instrument
Nucleus	The control centre of the "eukaryotic cell"
Eukaryotic	A cell with a nucleus
Microvilli (us)	A tiny fold in the cell surface membrane of a cell, increase the surface area of the cell
Adaptations	The features of something that enable it to do a certain function
Gametes	A haploid cell produced by meiosis used for sexual reproduction
Haploid	A cell or nucleus that has one set of chromosomes. Gametes are haploid
Epithelial cells	A cell found on the surface of internal organs
Chromosomal DNA	The main bulk of DNA found in a cell. In humans, this DNA is found in chromosomes
Prokaryotic	A cell with no nucleus is prokaryotic
Monomers	A small molecule that can join with other molecules like itself to form a polymer
Polymers	A long-chain molecule made by joining many smaller molecules (monomers)
Biuret test	A test that uses copper sulfate solution and potassium hydroxide solution to test for proteins. It turns from blue to purple in the presence of proteins
Benedicts solution	A solution used to detect the presence of reducing sugars (eg. Glucose) in foods
Calorimeter	Apparatus used to measure the energy content of substances by burning them and measuring the temperature increase
Ethanol emulsion test	A test using ethanol to detect lipids (fats) in food
Active site	The space in an enzyme where the substrate fits during an enzyme-catalysed reaction
Denatured	A denatured enzyme is one where the shape of the active site has changed so much that the substrate no longer fits and the reaction can no longer happen
Optimum temperature	The temperature at which an enzymes rate of reaction is greatest, or at which a population of microorganisms grow most rapidly
Osmosis	The movement of water from a high concentration to a low concentration through a partially permeable membrane
Active Transport	The pumping of particles across a cell membrane from a low concentration to high concentration (requires energy)

KS4 Biology – Cells and Control



Cell differentiation

Although all animals develop from a single cell, not all the cells in their bodies are the same. Cells produced by mitosis are the same as the cell from which they were formed. However, the new cells may then change in different ways, so they become specialised for different functions. The process that changes less specialised cells into more specialised ones is called **differentiation**.



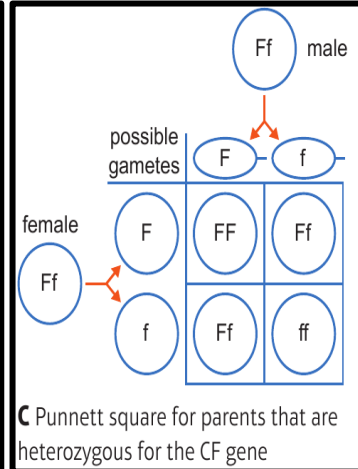
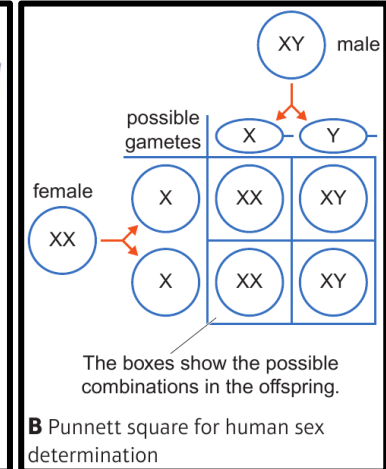
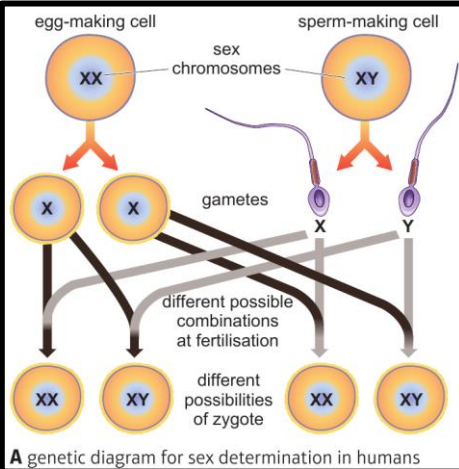
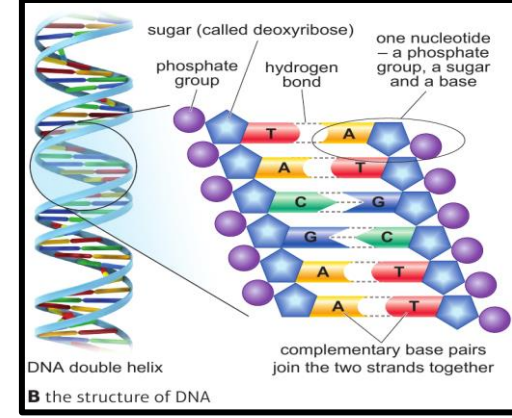
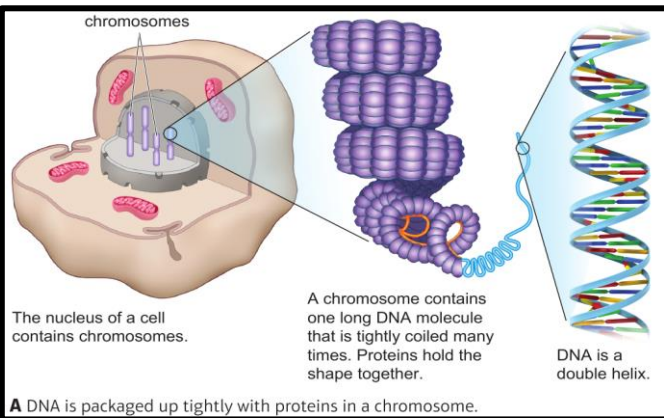
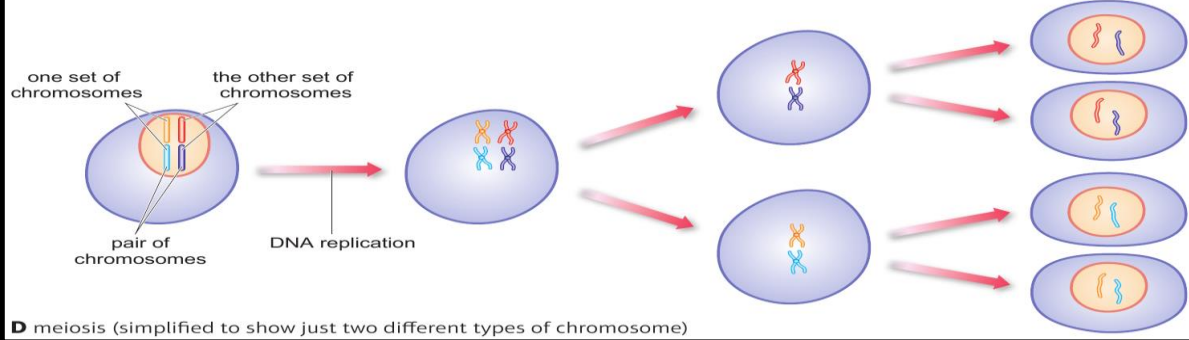
Keyword	Definition
anaphase	The stage of mitosis in which the separated chromosomes move away from each other.
cancer cell	Cell that divides uncontrollably.
cell cycle	A sequence of growth and division that happens in cells. It includes interphase and mitosis, and leads to the production of two daughter cells that are identical to the parent cell.
clone	Offspring from asexual reproduction. All the cells in a clone are genetically identical to each other and to the parent's cells.
cytokinesis	When the cytoplasm of the cell is separated as the cell membrane is pinched to divide the cell into two daughter cells.
daughter cell	New cell produced by cell division.
diploid	A cell with two sets of chromosomes.
DNA replication	The copying of the DNA within a cell.
haploid	A cell with one set of chromosomes.
interphase	The stage when the cell prepares itself for the process of cell division, and DNA replication takes place. The cell also makes more of its sub-cellular structures.
metaphase	The stage of mitosis when the chromosomes line up across the middle of the cell.
mitosis	The process of cells dividing to produce two daughter cells that are genetically identical to the parent.
prophase	The stage of mitosis in which the nucleus starts to break down and spindle fibres appear.
telophase	The stage of mitosis in which the chromosomes arrive at opposite ends of the cell and the nucleus membrane reforms.
differentiation	When a group of similar things, such as cells, become different in form from each other.
percentile	A $\frac{1}{100}$ th division of a group. For example, 10 per cent of the data items are below the 10th percentile and 50 per cent are below the 50th percentile.
elongation	When something gets longer (such as a cell in a plant root or shoot before it differentiates into a specialised cell).
adult stem cell	Stem cell found in specialised tissue that can produce more of the specialised cells in that tissue for growth and repair.
cancer	Disease caused by the uncontrolled division of stem cells in a part of the body.
embryonic stem cell	Stem cell from an early embryo that can produce specialised cells of many different types.
rejection	When the immune system attacks and kills cells and tissue that come from another person, such as blood (after transfusion) or stem cells.
axon	The long extension of a neurone that carries an impulse away from the dendron or dendrites towards other neurones.

KS4 Biology – Genetics

The gamete-making cell has two sets of chromosomes. It is diploid (2n).

The chromosomes replicate (and the copies stay stuck to one another).

The cell divides into two and then into two again. Each of the final four daughter cells has a copy of one chromosome from each pair. They are haploid (1n).



Keyword	Definition
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
daughter cell	A cell produced by another cell that has divided.
diploid	A cell or nucleus that has two sets of chromosomes. In humans, almost all cells except the sperm and egg cells are diploid.
DNA	Deoxyribonucleic acid. A polymer made of sugar and phosphate groups joined to bases. One molecule of DNA is found in each chromosome.
fertilisation	Fusing of a male gamete with a female gamete.
gamete	A haploid cell used for sexual reproduction.
gene	Section of the long strand of DNA found in a chromosome, which often contains instructions for a protein.
genome	All the DNA in an organism. Each body cell contains a copy of the genome.
haploid	A cell or nucleus that has one set of chromosomes. Gametes are haploid.
meiosis	A form of cell division in which one parent cell produces four haploid daughter cells.
replicate	When DNA replicates it makes a copy of itself.
zygote	Another term for 'fertilised egg cell'.
base (in DNA)	Four substances that help make up DNA, often shown by the letters A, C, G and T. Pairs of bases form 'links' between two 'spines' formed of phosphate groups and a type of sugar.
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
complementary base pair	Two DNA bases that fit into each other and link by hydrogen bonds. There are two types of complementary base pair: A linking with T, and C linking with G.
double helix	Two helices joined together.
allele	Most genes come in different versions called alleles. So a gene for eye colour may have one version (allele) that can cause dark eyes, and another allele that can cause pale eyes.
phenotype	The characteristics that a certain set of alleles display.
genotype	The alleles for a certain characteristic that are found in an organism. Written in a shorthand using letters to represent the alleles (with the dominant allele having a capital and being written first).
dominant	Allele that will always affect the phenotype (as opposed to a recessive allele, whose effect will not be seen if a dominant allele is present).
recessive	Allele that will only affect the phenotype if the other allele is also recessive. It has no effect if the other allele is dominant.
heterozygous	When both the alleles for a gene are different in an organism.
homozygous	When both the alleles for a gene are the same in an organism.

1. Evidence for human evolution

Ardi (Ardipithecus ramids)	<ul style="list-style-type: none"> Human like female fossil Walked upright Long arms and short legs Small skull and brain
Lucy (Australopithecus afarensis)	<ul style="list-style-type: none"> More human like female fossil than Ardi Walked upright better than Ardi Arm and legs were the length between ape and human Skull and brain slightly larger than Ardi
Turkana Boy (Homo erectus) discovered by Richard Leakey	<ul style="list-style-type: none"> More human like female fossil than Lucy Walked upright better than Lucy Arm and legs were human length Skull and brain larger than Lucy

Evidence for human evolution can also be gained from looking at stone tools, which become more sophisticated overtime



2. Darwin's Theory of Evolution

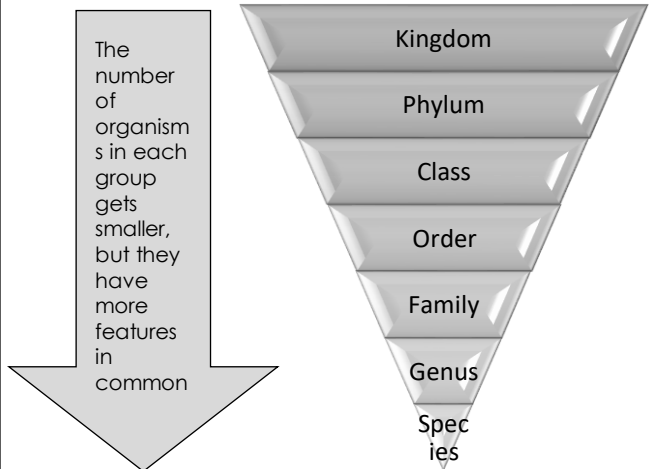
Evolution is a change in the inherited characteristics of a population over time. This occurs through a process called natural selection.

- The differences in a population gives some individuals an advantage.
- This individual is more likely to survive for longer and be able to breed to pass on desirable genes.
- Nature is selecting the individual with the phenotypes most suited to survival ('survival of the fittest'). This is called natural selection.

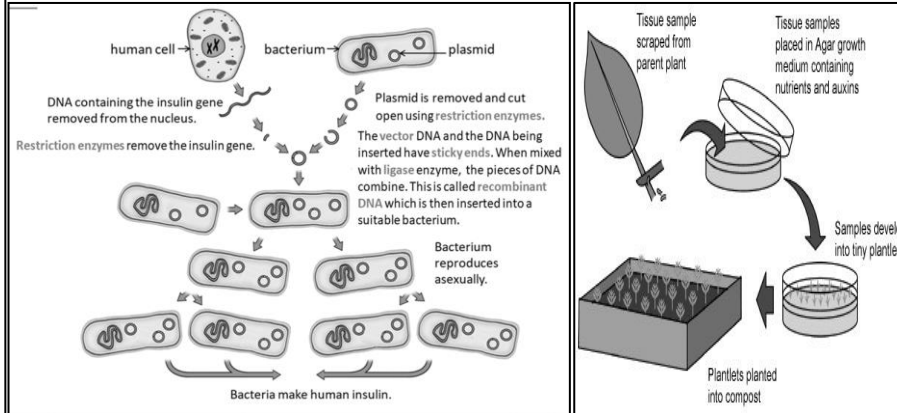
Our understanding of evolution has also been helped by the study of antibiotic resistance in bacteria.



3. Classification



4. Genetic Engineering and Tissue Culture



Keyword	Definition
Binomial system	The system of naming organisms using two Latin words
Evolution	A change in one or more characteristic of a population over a long period of time
Genetic variation	Differences between organisms caused by differences in the alleles they inherit from their parents, or differences in genes caused by mutation. Also called inherited variation
Natural selection	A process in which certain organisms are more likely to survive and reproduce than other members of the same species because they possess certain genetic variations
Resistance	When an organism has resistance to something, it is unaffected by it, or not affected very much
Pentadactyl limb	A limb that has five digits (fingers and thumbs). Amphibians, reptiles, birds and mammals share this characteristics
Classification	The process of sorting organisms into groups based on their characteristics
Kingdoms	There are five kingdoms into which organisms are usually divided: plants, animals, fungi, protists and prokaryotes
Selective breeding	When humans choose an organism that has a certain characteristic and breed more of these organisms, making that chosen characteristic more and more obvious
Varieties	Groups of plants of the same species that have characteristics that make them different to other members of the species
Genetic engineering	Altering the genome of an organism, usually by adding genes from another species.
GMOs	An organism that has had its genome genetically altered (genetic modification)
Yield	The amount of useful product that you can get from something
Disease resistance	Unaffected or less affected by a certain disease
Stem cells	An unspecialised cell that continues to divide by mitosis to produce more stem cells and other cells that differentiate into specialised cells
Tissue culture	Growing tiny pieces of tissue, or cells, in the lab
Pests	Animals that cause problems, such as damaging crops
Biological control	Using organisms to kill problem organisms, such as pests or weeds
Insecticides	A substance used to kill insect pests

In **genetic engineering**, genes from the chromosomes of **humans** and other organisms are **cut out** of the **DNA** using **enzymes**. The **genes** are then **transferred** to the **cells of the organism** to be genetically modified.

KS4 Biology - Health, Disease and the Development of Medicine

Transmission of Disease

Disease	Symptom	Method of transmission	Control spread of disease by:	Caused by:
Malaria	Recurrent fever	Animal vector	Preventing breeding of mosquitoes or use of a net to prevent being bitten.	Protist
Chalara ash dieback	Leaf loss and bark lesions	Airborne	Remove infected leaf litter. Clean all tools, vehicles and footwear.	Fungus
Cholera	Diarrhoea	Waterborne	Clean drinking water and good hygiene and sanitation.	Bacteria
Tuberculosis	Lung damage	Airborne	Vaccination programme. Treat infection with antibiotics.	Bacteria
HIV	Flu like illness	Sexual contact or bodily fluids. Direct contact.	Use of condoms / clean needles. Treat infection with antiretroviral drugs.	Virus
Ebola	Haemorrhagic fever	Bodily fluid - direct contact	Avoid contact with people infected with Ebola.	Virus

Communicable diseases:

Common cold

Influenza

STDs

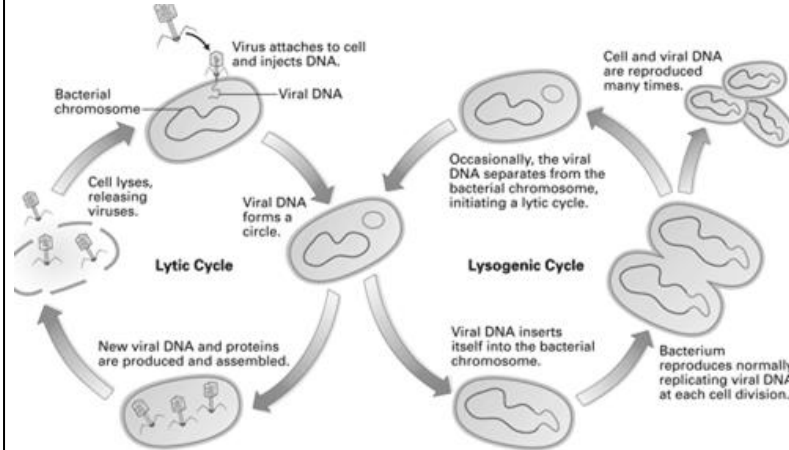
Non-communicable diseases:

Diabetes

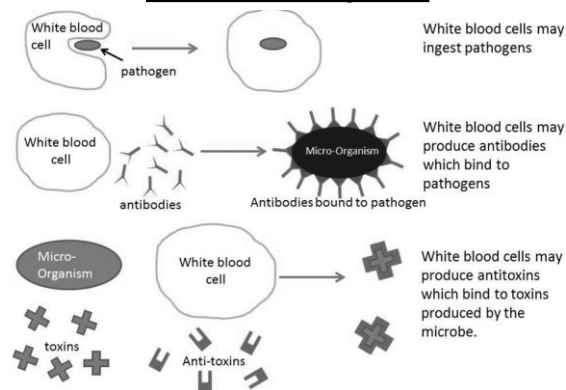
Cancer

Cardiovascular disease

Lysogenic Vs Lytic Virus Lifecycle



The Immune System



Defence Against Disease

Physical barriers nose

Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.

Physical barriers respiratory system

Respiratory system is lined with **mucus** to trap dust and pathogens. **Cilia** move the mucus upwards to be **swallowed**.

Chemical defence stomach

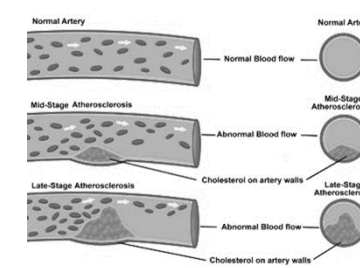
Tears, saliva and mucus contain an enzyme called **lysozyme** which destroys microorganisms.

Chemical defence skin

Hard to penetrate waterproof barrier. **Glands** secrete **oil** which kill microbes.

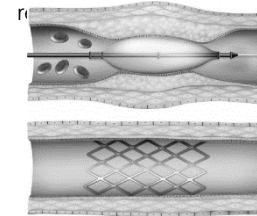
The human body has several **non specific** ways of defending itself from pathogens getting in.

Cardiovascular Disease



Cardiovascular disease (CVD) is a general term for disease which involve the **heart** or **blood vessels**. **Atherosclerosis** is a cause of **coronary heart disease** where **layers of fatty material** build up inside the coronary arteries, **narrowing** them. This **reduces** the flow of blood through the coronary arteries, resulting in a **lack of oxygen** for the **heart muscle**.

Atherosclerosis can be **treated** in two main ways by placing a **stent** in the coronary artery and/or using **lifelong medication** called **statins**. Lifestyle changes such as a healthy diet, exercise and no smoking are also vital in



Stents are metal cylinder grids which can be **inserted** into an artery to maintain blood flow by **keeping the artery open** so that the heart continues to receive **enough oxygen** to function effectively.

Statins are drugs that lower harmful **cholesterol** in the blood and stop the **liver** producing too much cholesterol and reduce the rate at which it is deposited. Patients should change their **lifestyle** and have a healthy **diet**. This **reduces** the risk of heart disease.

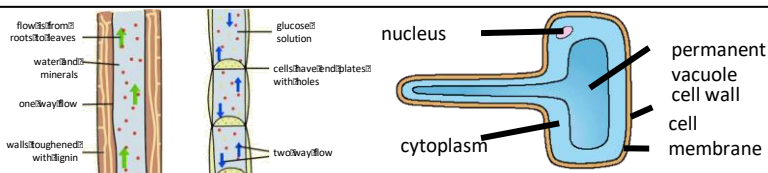
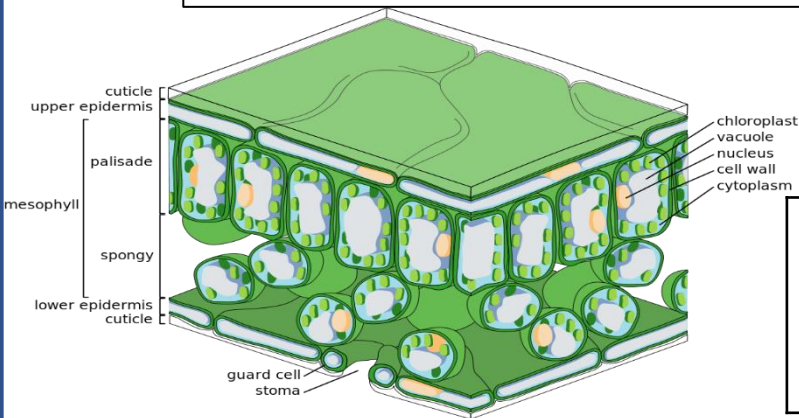
Obesity

Excess weight (obesity) can make a person at **risk of cardiovascular disease**, a stroke and Type 2 diabetes. A tool called the **Body Mass Indicator (BMI)** can be used to calculate whether a persons weight lies within a healthy range.

$$BMI = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$

The use of **BMI** has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone. The **waist to hip ratio** should be considered alongside the BMI figure.

KS4 Biology – Plant Structures and their Functions



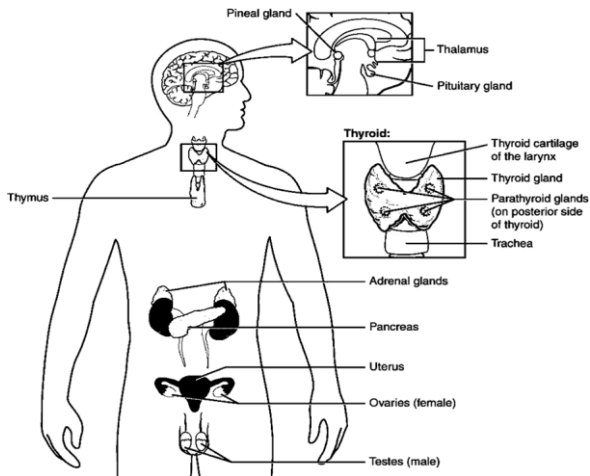
Photosynthesis	Plants make use of light energy from the environment (ENDOTHERMIC) to make food (glucose)	Carbon dioxide + Water → Oxygen + Glucose
		$CO_2 + H_2O \rightarrow O_2 + C_6H_{12}O_6$

Epidermal tissues	Waxy cuticle (top layer of the leaf)	Reduces water loss from the leaf
	Guard cells and stomata	Guard cells open and close the stomata to control water loss and allow for gas exchange (oxygen and carbon dioxide).
Palisade mesophyll	Palisade cells	Cells near the top surface of the leaf that are packed with chloroplasts that contain chlorophyll. Both adaptations maximize photosynthesis.
Spongy mesophyll	Air spaces in the leaf between cells	Increased surface area for gas exchange so that carbon dioxide can diffuse into photosynthesising cells.
xylem	Hollow tubes strengthened by lignified dead cells adapted for the transportation of water and mineral ions through the plant in the transpiration stream	Allows transport of water and mineral ions from the roots to the stem and the leaves.
phloem	Cell sap moves from one phloem cell to the next through pores in the end walls	Transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage (translocation).
Meristem tissue	New cells (roots and shoot tips) are made here including root hair cells	Root hair cells have an increased surface area for the uptake of water by osmosis, and mineral ions by active transport.

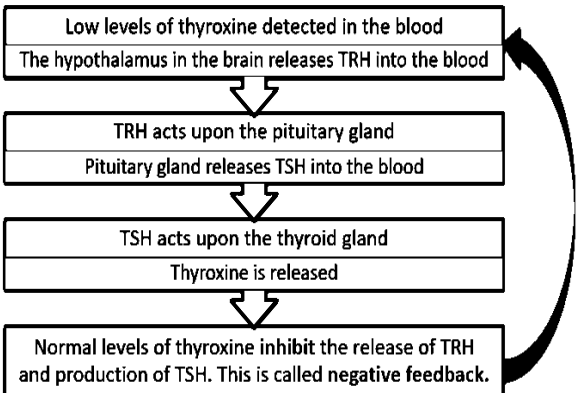
Factors affecting the rate of photosynthesis	Factor	How the rate is affected	Limiting factors (why the rate stops going up)
	Temperature	As the temperature of the environment the plant is in increases rate of photosynthesis increases (up to a point) as there is more energy for the chemical reaction.	Photosynthesis is an enzyme controlled reaction. If the temperature increases too much, then the enzymes become denatured and the rate of reaction will decrease and stop
	Light intensity	Light intensity increases as the distance between the plant and the light sources increases. As light intensity increases so does the rate of photosynthesis (up to a point) as more energy is available for the chemical reaction.	At point X another factor is limiting the rate of photosynthesis. This could be carbon dioxide concentration, temperature or the amount of chlorophyll
	Carbon dioxide concentration	Carbon dioxide is needed for plants to make glucose. The rate of photosynthesis will increase when a plant is given higher concentrations of carbon dioxide (up to a point).	At point X another factor is limiting the rate of photosynthesis. This could be light intensity, temperature or the amount of chlorophyll

Keyword	Definition
Active Transport	Active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). The energy is provided by respiration
Xylem	Form hollow tubes made of dead tissue. Long cells with walls toughened by waterproof lignin. Water and minerals flow from the roots towards the leaves in one direction in a process called TRANSPIRATION. Xylem vessels also provide support to the stem of the plant.
Phloem	Form tubes made of living tissue. Cells have end plates with holes in them. Sucrose in solution move from the leaves to growing tips and storage tissues in both directions. This process is called TRANSLOCATION. There are no forces causing translocation to occur and so the sucrose is moved along using active uptake which requires energy.
Stoma	
Guard Cell	Cells either side of the stoma that
Gibberellins	End seed dormancy, promote flowering, increase fruit size.
Ethene	Control ripening of fruit during storage and transport.
Auxins	Weed killers, rooting powders, promoting growth in tissue culture.

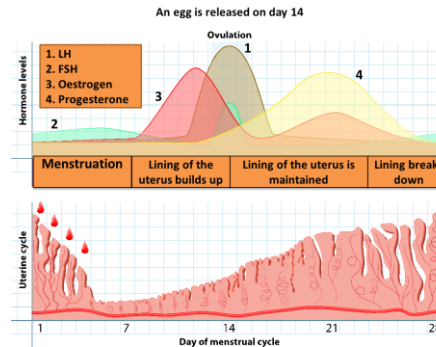
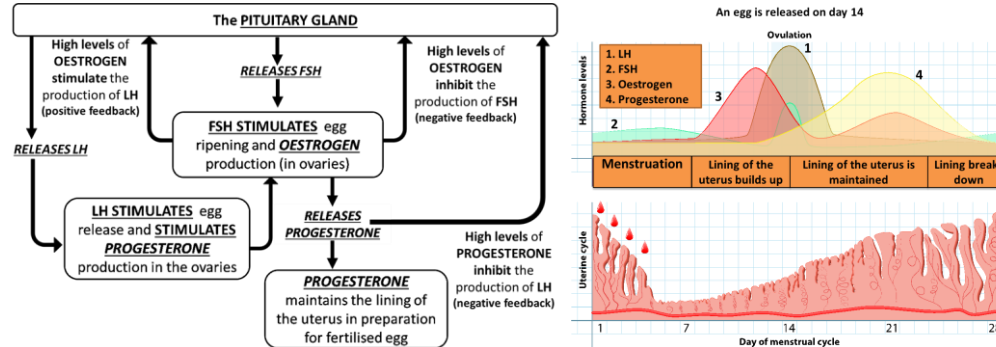
The Human Endocrine System



Anti-diuretic hormone (ADH)	Kidney	Controls water levels in the blood
Thyroid-stimulating hormone (TSH)	Thyroid	Stimulates the thyroid gland to secrete thyroxine
Luteinising hormone (LH)	Ovaries	Stimulates egg release and progesterone production in the ovaries
Follicle-stimulating hormone (FSH)	Ovaries	Stimulates egg ripening and oestrogen production (in ovaries)
Prolactin (PRL)	Breasts	Stimulates the breasts to produce milk
Growth hormone (GH)	All cells in the body	Stimulates growth and repair



The Menstrual Cycle



Hormone	Produced in...	Causes...
FSH Follicle stimulating hormone	Pituitary Gland	Stimulates egg ripening and oestrogen production (in ovaries)
Oestrogen	Ovaries	Lining of the womb to develop. Stimulates pituitary gland to make LH
LH Luteinising hormone	Pituitary Gland	Stimulates egg release and progesterone production in the ovaries
Progesterone	Ovaries	Maintains the lining of the womb

Contraception

The pill - oral contraceptives that contain oestrogen to inhibit FSH production so that no eggs develop and mature. After taking for a while egg development and release will stop completely.

The **mini pill** and **injections** contain progesterone. High levels stimulate the cervix to produce a thick mucus which stops sperm entering the uterus.

Implant or **skin patches** of slow release progesterone inhibit the maturation and release of eggs for a number of months or years.

Spermicidal agents which kill or disable sperm.

Barrier methods such as **condoms and diaphragms** prevent the sperm reaching an egg

The '**coil**' or other **intrauterine devices** which prevent the implantation of an embryo

Sterilisation or vasectomy - surgical methods of male and female sterilisation.

Keyword	Definition
Endocrine system	Collection of organs/glands in the human body that release hormones
Hormones	Chemical messengers released from endocrine glands that cause a change in bodily responses
Target organ	The organ where a particular hormone is released and effects
Metabolic rate	The rate at which the energy stored is transferred by all the reactions that take place in your body
Glycogen	How glucose is stored as a polymer
Fight or flight response	When the body prepares to fight or run away from a perceived danger. This response is caused by the hormone adrenaline
Menstrual cycle	A roughly 28 day cycle of changes that occurs in the female reproductive system
Menstruation	When the lining of the uterus breaks down and passes out through the vagina, Also known as a period
Ovulation	When an egg is releases from its follicle in the ovary, happens roughly on day 14 of the menstrual cycle
Contraception	A method that prevents fertilisation and therefore pregnancy. Contraception can be hormonal or physical/barrier methods
ART	Assisted reproductive technology that uses hormones and other techniques to increase the chance of pregnancy in infertile women. Clomifene therapy is an example of ART

Control of Blood Glucose

Blood glucose concentration **TOO HIGH**



The **PANCREAS** releases the hormone **insulin**

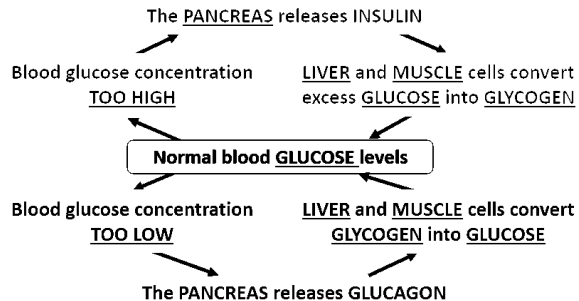


Insulin stimulates the movement of **GLUCOSE** from the blood into cells



Liver and **muscle** cells convert excess **glucose** into **glycogen**

The control of blood glucose concentration is an example of **NEGATIVE FEEDBACK**. This ensures that, in any control system, changes are reversed and returned back to the set level.



Diabetes- a condition that causes a person's blood sugar level to become too high.

Type 1 diabetes

A disorder in which the pancreas fails to produce enough insulin.

The lack of insulin causes uncontrolled high blood glucose levels.

Type 1 is normally treated with insulin injections.

Type 2 diabetes

A disorder where the body cells no longer respond to insulin produced by the pancreas.

Obesity is a risk factor for Type 2 diabetes.

Type 2 is normally treated by controlling the carbohydrate in the diet and by exercise.

Excess weight (obesity) can make a person have a greater risk of developing type 2 diabetes.

A tool called the **Body Mass Indicator (BMI)** can be used to calculate whether a person's weight lies within a healthy range.

$$\text{BMI} = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$



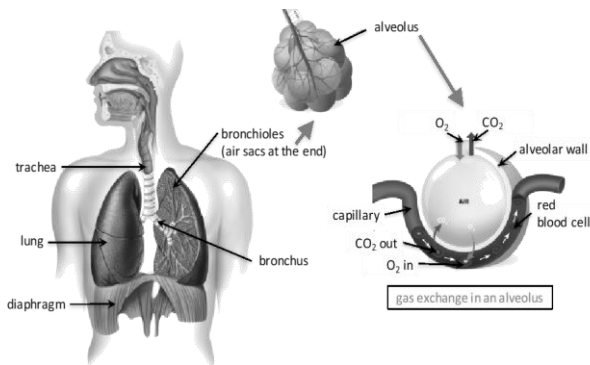
The use of BMI has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone.

Very muscular adults and athletes may be classed as overweight or obese even though their body fat is low.

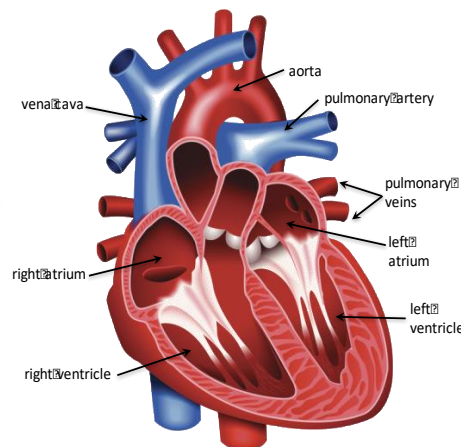
The **waist to hip ratio** should be considered alongside the BMI figure.

Male (waist : hip ratio)	Female (waist : hip ratio)	Health risk based on Waist : hip ratio
0.95 or below	0.80 or below	Low risk
0.96 to 1.0	0.81 to 0.85	Moderate risk
1.1 or more	0.86 or more	High risk

KS4 – Biology Exchange and Transport



Trachea	Carries air to/from the lungs	Rings of cartilage protect the airway.
Bronchioles	Carries air to/from the air sacs (alveoli)	Splits into multiple pathways to reach all the air sacs.
Alveoli	Site of gas exchange in the lungs	Maximises surface area for efficient gas exchange.
Capillaries	Allows gas exchange between into/out of blood	Oxygen diffuses into the blood and carbon dioxide diffuses out.

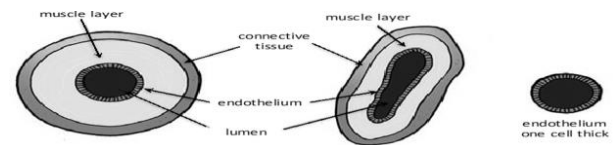


Different structure in the heart have different functions

Right ventricle	Pumps blood to the lungs where gas exchange takes place.
Left ventricle	Pumps blood around the rest of the body. Thicker cardiac muscle in the wall.
Pacemaker (in the right atrium)	Controls the natural resting heart rate. Artificial electrical pacemakers can be fitted to correct irregularities.
Coronary arteries	Carry oxygenated blood to the cardiac muscle.
Heart valves	Prevent blood in the heart from flowing in the wrong direction.

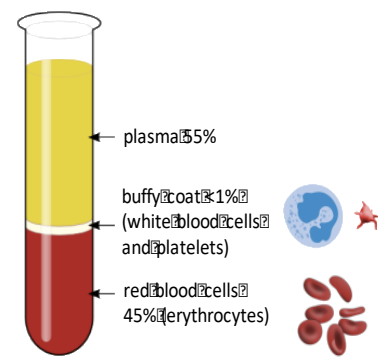
Aerobic respiration
Respiration with oxygen. Occurs inside the mitochondria continuously
Glucose is oxidised by oxygen to transfer the energy the organism needs to perform it's functions.
$\text{Glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$

Anaerobic respiration
Respiration when oxygen is in short supply. Occurs during intensive exercise
During hard exercise, muscle cells are respiring so fast that blood cannot transport enough oxygen to meet their needs. Glucose is partially oxidised to produce lactic acid which builds up in muscle tissue causing them to become painful and fatigued.
$\text{Glucose} \rightarrow \text{lactic acid}$



Artery	Vein	Capillary
Carry blood away from the heart	Carry blood to the heart	Connects arteries and veins
Thick muscular walls, small lumen, carry blood under high pressure, carry oxygenated blood (except for the pulmonary artery).	Thin walls, large lumen, carry blood under low pressure, have valves to stop flow in the wrong direction, carry deoxygenated blood (except for the pulmonary vein).	One cell thick to allow diffusion, Carry blood under very low pressure.

Factors affecting rate of diffusion (Biology only)		
Surface area	Concentration gradient	Diffusion distance
Increased surface area on exchange surface increases diffusion.	Diffusion is from area of high concentration to low concentration. A large difference in concentration will increase rate of diffusion.	The smaller the diffusion distance to faster the rate of diffusion,

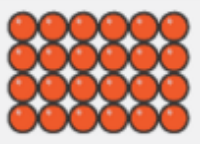

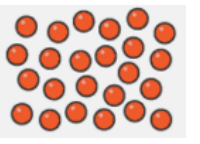


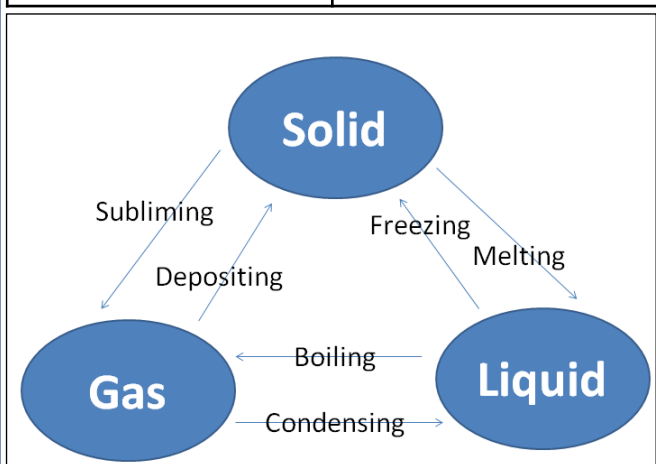
Keyword	Definition
Diffusion	The spreading of the particles of a gas or substances in solution, resulting in a net movement of particles from a region where they are of a higher concentration to an area of lower concentration
Surface areas to volume ratio	The surface area to volume ratio can be calculated by dividing an object's surface area (SA) by its volume
Cardiac Output	Cardiac output = stroke volume x heart rate
Stroke Volume	Cardiac output is the volume of blood pumped by a ventricle per minute. The units are $\text{cm}^3 \text{min}^{-1}$
Heart Rate	Heart rate is the number of beats per minute (bpm)
Stroke Volume	Stroke volume is the volume of blood pumped by one ventricle per contraction (cm^3)

Plasma (55%)	Pale yellow fluid	Transports CO_2 , hormones and waste.
Red blood cells (erythrocytes) (45%)	Carries oxygen	Large surface area, no nucleus, full of haemoglobin.
White blood cells (phagocytes and lymphocytes) (<1%)	Part of the immune system	Some produce antibodies, others surround and engulf pathogens.
Platelets (<1%)	Fragments of cells	Clump together to form blood clots.

Chemistry Knowledge Organisers

Year 9 – Science – C3a. Purifying substances

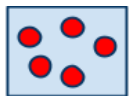
	Solids	Liquids	Gases
			
Arrangement	Particles are close together, next to each other. Particles are in rows. Regular arrangement.	Particles touch each other and are next to each other. Particles are not in a regular pattern.	Particles are not in a regular arrangement. The particles are spaced out.
Movement	Very little movement, particles vibrate in their fixed positions. They do not move from one place to another.	Particles have some movement. The particles are able to rollover each other.	Particles in gases have lots of movement and move in all directions.
Challenge – energy and attraction of particles	Particles have very little energy. The particles are attracted to each other.	Particles have some energy. The particles are attracted to each other.	Particles have lots of energy and there is no or very little attraction between the particles.



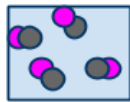
Physical change (Reversible)	Chemical change (Irreversible)
For example – melting chocolate Freezing water into ice	For example – frying an egg - rusting
No new substances or products formed. There has just been a change of state (solid, liquid, gas)	One or more new substances has been formed.

Chromatogram	The end product in chromatography (paper with separated components).
Solute	The solid that dissolves.
Solvent	The liquid that dissolves the solute.
Solution	Formed when a solvent dissolves a solute.
Dissolve	The act in which a solution is made (forming a solution).
Saturated	When no more solute can be dissolved in a solvent.
Unsaturated	When more solute can be dissolved in a solvent.
Atom	Smallest component of an element.
Molecule	A group of atoms chemically bonded together.
Compound	Two or more different atoms chemically bonded together.
Evaporation	Change of state where a liquid turns to a gas.
Condensation	Change of state where a gas turns to a liquid.
Filtration	Separation technique where insoluble particles are separated from soluble particles and liquid.
Crystallisation	Separation technique where the solvent in a solution is left to evaporate, leaving the solute behind.
Distillation	Separation technique where liquid mixtures or soluble solutions can be separated based on their boiling points.
Soluble	Can dissolve in water.
Insoluble	Cannot dissolve in water.
Baseline	The pencil line drawn at the base of the chromatography paper during chromatography.
Mixture	Two or more different atoms not chemically bonded together.
Boiling point	The temperature that a liquid turns into a gas.

A pure substance contains atoms of one single element only.

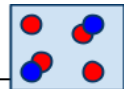


a. pure substance - 1 element

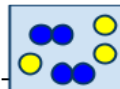


b. pure substance - 1 compound

An impure substance is 2 or more different elements and/or compounds together that are not chemically bonded. AKA, a mixture.



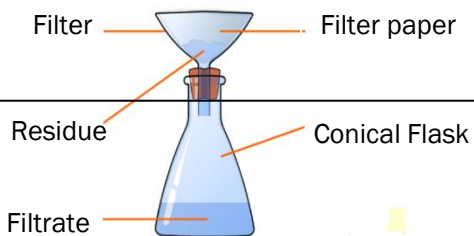
a. mixture - 1 element & 1 compound



b. mixture - 2 elements

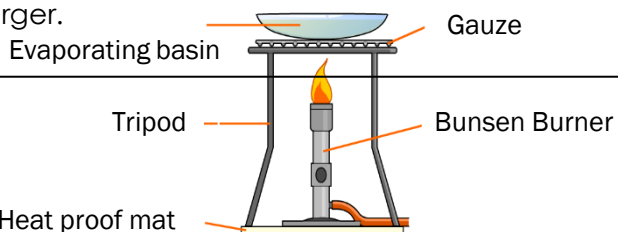
Filtration

- Filtration separates insoluble from soluble.
- Soluble substances and liquid are allowed through the small holes in the filter paper and form filtrate.
- Insoluble particles cannot fit through the small holes and are kept in the filter papers as the residue.



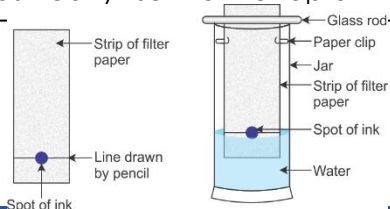
Crystallisation

- Heat the solution.
- Evaporate off the solvent, leaving the solute behind.
- Crystallisation forms crystals of different sizes.
- If the solvent takes longer to evaporate, the crystals have more time to form an order and therefore larger.



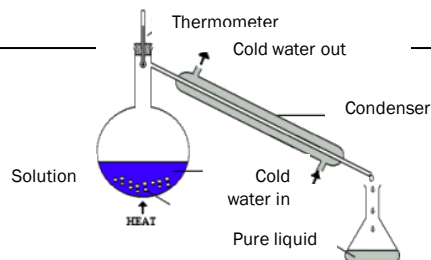
Chromatography

- Draw a horizontal line, using pencil and ruler, 2cm up from the bottom filter paper (pencil is insoluble).
- Add a dot of ink mixture to each 'x' mark evenly spaced on the baseline.
- Measure 1cm depth of water (or other solvent) in a beaker.
- Stand the filter paper up in the water, making sure the waterline is UNDER the baseline (to ensure the solvent moves up the stationary phase).
- Take out the chromatogram when the mobile phase has nearly risen to the top of the paper.



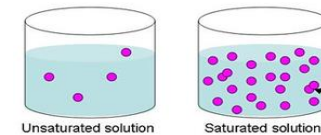
Distillation

- Heat the mixture until one solution evaporates to become a gas (one with the lowest boiling point).
- The evaporated liquid will rise up as a gas.
- The gas will enter the condenser.
- In the condenser delivery tube, energy will be taken from the solution by the circulating water outside.
- The gas will turn to a liquid- condensation.
- The pure liquid will fall into a separate beaker.
- The other liquid in the mixture will be left in the round-bottom flask.



Solutions

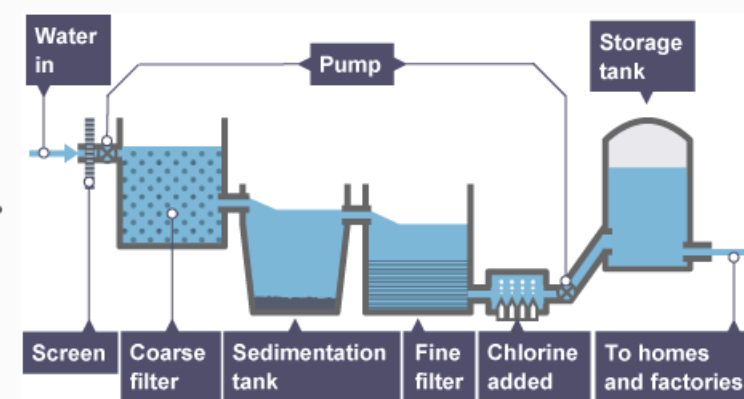
Solvent + Solute → Solution



Making a saturated solution

1. Add solute to a solvent and stir.
2. Continue to add the solute until it no longer dissolves.

Making drinking water potable



Water is essential for life. Water that is safe for humans to drink is called potable water. Potable water is not pure water because it almost always contains dissolved impurities.

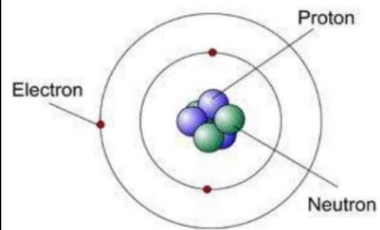
For water to be potable, it must have sufficiently low levels of dissolved salts and microbes. This is because:

dissolved salts can sometimes be harmful for humans microbes can cause illnesses

Year 9 – Science – C3b. Atomic Structure and the Periodic Table

Atomic Structure

Dalton's atomic model



Isotopes

- Versions of an element with same atomic number but different atomic mass.
- Number of protons is the same, but number of neutrons is different.
- Relative Atomic Mass is average of the masses of the isotopes, weighted by their **relative abundance**
- For example, Neon has three isotopes

Neon Isotope Mass	Relative Abundance (%)
20	90.5
21	0.3
22	9.2

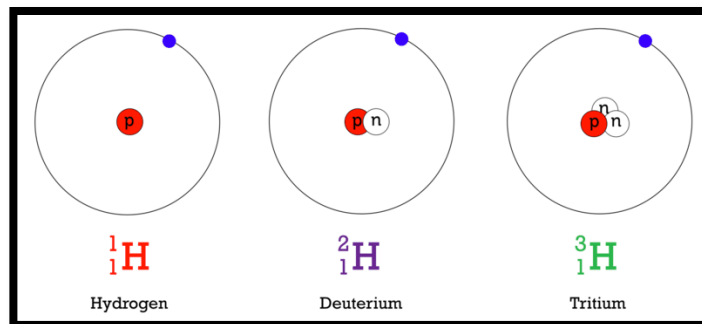
• Relative atomic mass of Neon = $\frac{20 \times 90.5 + 21 \times 0.3 + 22 \times 9.2}{90.5 + 0.3 + 9.2} = 20.2$

- This is why some atoms have a relative atomic mass with a decimal point.

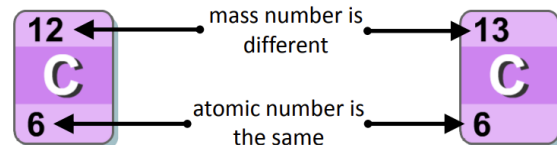
Sub-atomic particles

Atoms are made from smaller particles called subatomic particles. There are three type:

Particle	Relative mass	Relative charge	Found?
Proton	1	Positive, +1	In nucleus
Neutron	1	Neutral, 0	In nucleus
Electron	Negligible ($\frac{1}{1840}$)	Negative, -1	In shells orbiting nucleus



- For example, two isotopes of carbon:



- The existence of isotopes results in relative atomic masses not being whole numbers

Reading the Periodic Table

19
F
fluorine
9

Relative Atomic Mass (aka nucleon number):
The total number of protons and neutrons added together.

Atomic number (aka proton number):
The number of protons or electrons.

Note: on some periodic tables, they are the wrong way up, just remember that the smaller number is the proton number.

What's in my atom?

Protons = atomic number

Electrons = atomic number

Neutrons = relative atomic mass subtract atomic no.

19
F
fluorine
9

Atomic number = 9
Relative Atomic mass = 19

Protons = 9
Electrons = 9
Neutrons = 19-9 = 10

32
S
sulfur
16

Atomic number = 16
Relative Atomic mass = 32

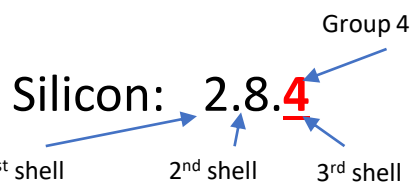
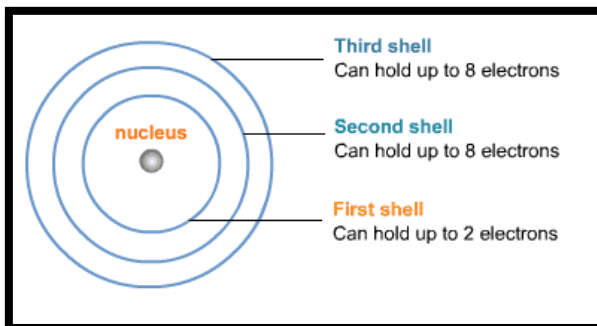
Protons = 16
Electrons = 16
Neutrons = 32-16 = 16

Mendeleev

- Arranged elements by increasing atomic mass but...
- He broke this rule and left some gaps if an element's properties weren't similar to the one above it.
- He thought the gaps were for elements that hadn't been discovered yet and predicted their properties.
- When they were discovered, the properties matched the predictions

Electron Configuration

- Electrons orbit the nucleus in **shells**.
- **First** shell holds up to two electrons
- **Second** shell can hold up to 8 electrons
- **Third** shell can also hold up to 8 electrons



3 shells used = so the element is in the 3rd period

PERIODS....increasing atomic mass, differing properties

1		2												3	4	5	6	7	0		
				Key relative atomic mass atomic symbol name atomic (proton) number																	
				Element Type = non-metal = metal																	
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	Elements with atomic numbers 112-116 have been reported but not fully authenticated										

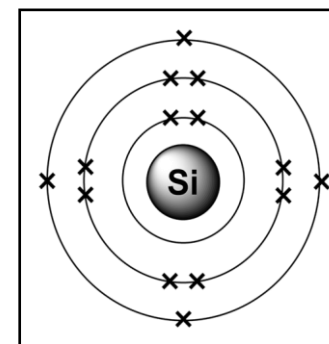
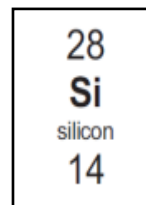
* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.
The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Example: Silicon

Atomic number is 14, so it has 14 electrons.

You build up electrons from the first shell outwards, so in this case:

- First shell has 2
- Second shell has 8
- Third shell has 4



This can be written as: **2.8.4**; or drawn as:

Electron configuration and how it links to the Periodic Table:

Group number: shows the number of electrons in the outer electron shell
 Period number: shows the number of electron shells
 In the above example, we can see Silicon belongs to group 4, and is in period 3.

KS4 Chemistry - Chemical Bonding and Types of Substances (part 1)

Ionic	Particles are oppositely charged ions	Occurs in compounds formed from metals combined with non metals.
Covalent	Particles are atoms that share pairs of electrons	Occurs in most non metallic elements and in compounds of non metals.
Metallic	Particles are atoms which share delocalised electrons	Occurs in metallic elements and alloys.

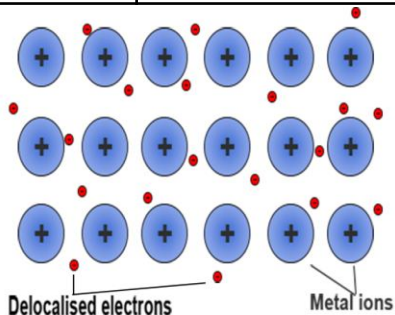
Keyword	Definition
Ion	<i>An atom with an electric charge, caused by the loss or gain of electrons.</i>
Cation	<i>A positively charged ion.</i>
Anion	<i>A negatively charged ion.</i>
Electrostatic force	<i>The attractive or repulsive force between two electrically charged objects.</i>
Attraction	<i>The electric force that acts between oppositely charged bodies, tending to draw them together.</i>
Intermolecular force	<i>Forces of attraction which act between molecules.</i>
Atom	<i>The smallest unit into which matter can be divided without the release of electrically charged particles.</i>
Element	<i>An element is a substance whose atoms all have the same number of protons.</i>
Compound	<i>A substance formed when two or more chemical elements are chemically bonded together.</i>
Transfer	<i>Movement of a particle from one place to another.</i>
Share	<i>Two bodies having equal portions distributed between the two.</i>
Delocalised electron	<i>An electron that is not associated with a particular atom within a shell, or held in a covalent bond.</i>
Proton	<i>A particle found in the nucleus of an atom, having a positive charge and the same mass as a neutron.</i>
Neutron	<i>A particle found in the nucleus of an atom having zero charge and a mass of 1.</i>
Electron	<i>A tiny particle with a negative charge and very little mass.</i>
Shell	<i>Area around a nucleus that can be occupied by electrons and usually drawn as circles.</i>
Nucleus	<i>The central part of an atom or ion.</i>

Keyword	Definition
Ionic bond	<i>A strong electrostatic force of attraction between oppositely charged ions.</i>
Covalent bond	<i>The bond formed when a pair of electrons is shared between two atoms.</i>
Metallic bond	<i>The type of bonding found in metals. Positively charged ions in a 'sea' of negatively charged electrons.</i>
Lattice Structure	<i>An arrangement of many particles that are bonded together in a fixed, regular, grid-like pattern</i>
Melting point	<i>The temperature at which a substance changed fro the solid state to the liquid state when heated, or from the liquid state to solid state when cooled.</i>
Boiling point	<i>The temperature at which a substance changed from a liquid to a gas.</i>
Charge	<i>Also known as electric charge, is a characteristic of a unit of matter that expresses the extent to which it has more or fewer electrons than protons.</i>
Electrical conductivity	<i>Allowing electricity to pass through.</i>
Aqueous solution	<i>A mixture that is formed when a substance is dissolved in water.</i>
Molten	<i>A substance that has been liquefied by heat.</i>
Electron pair	<i>Two electrons occupying the same orbital in an atom or molecule, especially forming a nonpolar covalent bond between atoms.</i>

Metallic bonding

Giant structure of atoms arranged in a regular pattern

Electrons in the outer shell of metal atoms are delocalised and free to move through the whole structure. This sharing of electrons leads to strong metallic bonds.



High melting and boiling points

This is due to the strong metallic bonds.

Pure metals can be bent and shaped

Atoms are arranged in layers that can slide over each other.

Good conductors of electricity and heat

Delocalised electrons transfer energy.

Ionic bonding

High melting and boiling points

Large amounts of energy needed to break the bonds.

Do not conduct electricity when solid

Ions are held in a fixed position in the lattice and cannot move.

Do conduct electricity when molten or dissolved

Lattice breaks apart and the ions are free to move.

Electrons are transferred so that all atoms have a noble gas configuration (full outer shells).

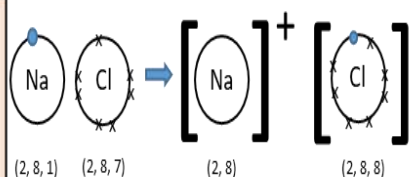
Metal atoms lose electrons and become positively charged ions

Group 1 metals form +1 ions
Group 2 metals form +2 ions

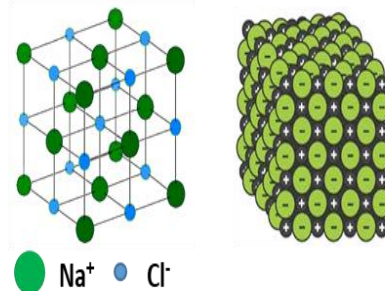
Non metals atoms gain electrons to become negatively charged ions

Group 6 non metals form -2 ions
Group 7 non metals form -1 ions

Dot and cross diagram



Giant structure



Structure

- Lattices consist of a regular arrangement of atoms
- Held together by strong electrostatic forces of attraction between oppositely charged ions
 - Forces act in all directions in the lattice

-ide

If a compound name ends in -ide, it usually contains only two elements.

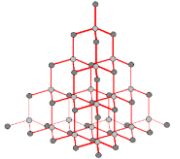
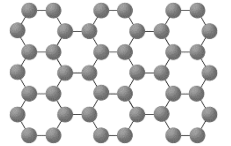
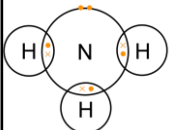
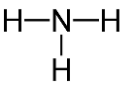

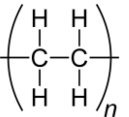
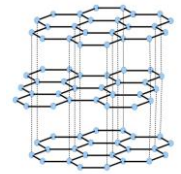
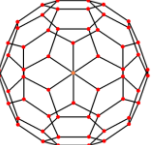
For example:
calcium + oxygen → calcium oxide

-ate

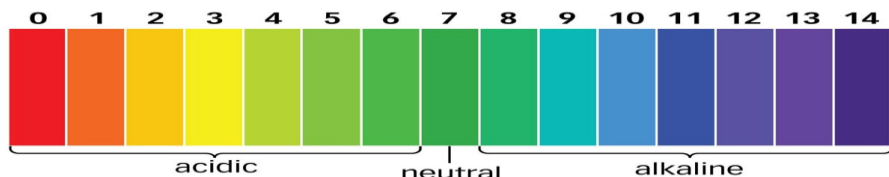
If a compound name ends in -ate, it usually contains three or more elements one of which is always oxygen.

For example:
Calcium + carbon + oxygen → calcium carbonate

Covalent bonding

Simple molecular compounds		Giant covalent structures									
Low melting and boiling points	Small amounts of energy needed to overcome the intermolecular forces.	Diamond		Graphene and fullerenes							
Poor conductors of electricity	No free electrons to transfer energy.	Each carbon atom is bonded to four others 	Very hard.	Rigid structure.	Graphene 	Excellent conductor.	Contains delocalised electrons.				
Size of atoms and molecules	Simple molecular structures consist of atoms joined by strong covalent bonds. This means that atoms are smaller than simple molecules.		Very high melting point.	Strong covalent bonds.		Single layer of graphite one atom thick	Very strong.	Contains strong covalent bonds.			
			Does not conduct electricity.	No delocalised electrons.							
Atoms share pairs of electrons Can be small molecules e.g. ammonia  Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical  2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°  3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5° Can be giant covalent structures e.g. polymers  Simple polymers consist of large chains of hydrocarbons.		Used for cutting tools due to being very hard.									
		Graphite		Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers 		Fullerenes 		Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.			
										Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.								
		Does conduct electricity.	Delocalised electrons between layers.	Diamond, graphite, silicon dioxide	Very high melting points						
		Used for electrodes as is inert.									

KS4 Chemistry – Acids and Alkalis (part 1)



The pH scale and indicators

Acids	Acids produce hydrogen ions (H ⁺) in aqueous solutions.
Alkalis	Aqueous solutions of alkalis contain hydroxide ions (OH ⁻).
Base	A base is any substance that reacts with an acid to form a salt and water only
Examples of soluble bases	Alkalis e.g. sodium hydroxide, potassium hydroxide

Universal indicator	Red in acid, green in neutral and blue in alkali
Litmus	Red in acid, purple in neutral and blue in alkali
Methyl orange	Red in acid, yellow in neutral and yellow in alkali
Phenolphthalein	Colourless in acid and in neutral and pink in alkali
A neutralisation reaction is between an acid and a base	In neutralisation reactions, hydrogen ions react with hydroxide ions to produce water: $H^+ + OH^- \rightarrow H_2O$

Reactions with acids

Metals	Metal + acid → metal salt + hydrogen	Magnesium + hydrochloric acid → magnesium chloride + hydrogen
Metal oxides	Metal oxide + acid → metal salt + water	Copper oxide + sulfuric acid → copper sulfate + water
Metal hydroxides	Metal hydroxide + acid → metal salt + water	Sodium hydroxide + nitric acid → sodium nitrate + water
Metal carbonates	Metal carbonates + acid → metal salt + carbon dioxide + water	Calcium carbonate + sulfuric acid → calcium sulfate + carbon dioxide + water

Gas	Test	Positive result
Hydrogen	Burning splint	'squeaky pop' sound.
Carbon dioxide	Limewater	Goes cloudy (as a solid calcium carbonate forms).

Keyword	Definition
H ⁺ ion	A positively charged hydrogen ion
OH ⁻ ion	A negatively charged, diatomic hydroxide ion.
Aqueous solution	A mixture that is formed when a substance is dissolved in water.
Acid	A solution that reacts with alkalis, turns litmus red and has a pH of less than 7.
Alkali	A solution which contains an excess of OH ⁻ ions, turns litmus blue and has a pH greater than 7.
Base	A substance that will react with an acid to form only a salt and water.
pH scale	A scale going up to 14 showing acidity or alkalinity.
Indicator	A substance which can change colour depending on the pH of a solution.
Concentration	The amount of a solute dissolved in a certain volume of solvent.
Concentrated	Containing a large amount of solute dissolved in a small volume of solvent.
Dilute	A low concentration of solute in a solution.
Strong acid	An acidic solute that dissolves completely into ions when it dissolves.
Weak acid	An acidic solute that does not dissociate completely into ions when it dissolves.
Salt	A compound formed by neutralisation of an acid by a base.
Filtration	Using a filter to separate insoluble substances from a liquid.
Crystallisation	Separating the solute from a solution by evaporating the solvent.
Soluble	A substance that can be dissolved in a certain liquid.
Insoluble	A substance that cannot be dissolved in a certain liquid.
Solute	Describes a substance that dissolves in a liquid to make a solution.
Solvent	Describes the liquid in which a substance dissolves to make a solution.
Solution	Formed when a substance has dissolved in a liquid.
Burette	A piece of apparatus used to accurately measure the volume of solution that has been added during a titration.
Pipette	A piece of apparatus used in a titration to accurately measure a set volume of a solution.
End-point	When just enough solution has been added from the burette to react with all the solution in the flask in a titration experiment.
Ionic equation	A balanced equation that only shows the ions that react together. The spectator ions are not included.
Half equation	A chemical equation written to describe an oxidation or reduction half-reaction.
Spectator ion	These are ions that do not change within a reaction.

KS4 Chemistry – Acids and Alkalis (part 2)

Making pure, dry insoluble salts

Step 1	Add insoluble reactant (e.g. metal oxide) to acid	Add until there is an excess of insoluble reactant.
Step 2	Filter the solution	Collect the filtrate in a conical flask and dispose of the residue.
Step 3	Crystallisation	Heat the filtrate using a Bunsen burner to evaporate the water from the solution.
Step 4	Evaporation	Leave the evaporating basin with the heated filtrate to evaporate any remaining water and make pure, dry insoluble salts.

Titration is used to work out the precise volumes of acid and alkali solutions that react with each other to form salt and water.

Step 1	Use the pipette to add 25 cm ³ of alkali to a conical flask and add a few drops of indicator.
Step 2	Fill the burette with acid and note the starting volume. Slowly add the acid from the burette to the alkali in the conical flask, swirling to mix.
Step 3	Stop adding the acid when the end-point is reached (the appropriate colour change in the indicator happens). Note the final volume reading. Repeat steps 1 to 3 until you get consistent readings.

State Symbol	Meaning
s	Solid
l	Liquid
g	Gas
aq	Aqueous solution

Producing salts from soluble reactants

Soluble salts	Soluble salts can be made from reacting acids with solid insoluble substances (e.g. metals, metal oxides, hydroxides and carbonates).
Production of soluble salts	Add the solid to the acid until no more dissolves. Filter off excess solid and then crystallise to produce solid salts.

Solubility

Sodium, potassium and ammonium	All common sodium, potassium and ammonium salts are soluble e.g. sodium chloride and potassium fluoride.
Nitrates	All nitrates are soluble e.g. potassium nitrate.
Sulfates	Common chlorides (e.g. sodium chloride) are soluble, except those of silver and lead.
Carbonates and hydroxides	Common carbonates and hydroxides are insoluble except those of sodium, potassium and ammonium.

Strong and weak acids (HT ONLY)

Concentrated	High mass of substance in a given volume of solution
Dilute	Low mass of substance in a given volume of solution
Strong acids	Completely ionised in aqueous solutions e.g. hydrochloric, nitric and sulfuric acids.
Weak acids	Only partially ionised in aqueous solutions e.g. ethanoic acid, citric acid.
Hydrogen ion concentration	As the pH decreases by one unit (becoming a stronger acid), the hydrogen ion concentration increases by a factor of 10. 49

KS4 Chemistry – Calculations involving masses

1. How to find an empirical formula:

Example: 10.0g of calcium reacts with 17.8g of chlorine. Find the empirical formula of the product that is formed.

1. Symbol	Ca	Cl
2. Mass (g)	10.0	17.8
3. A_r	40.0	35.5
4. Divide mass by A_r	$\frac{10.0}{40} = 0.25$	$\frac{17.8}{35.5} = 0.50$
5. Divide answers by smallest number	$\frac{0.25}{0.25} = 1$	$\frac{0.50}{0.25} = 2$
6. Empirical formula	CaCl ₂	

2. How to deduce the molecular formula from the empirical formula and relative formula mass:

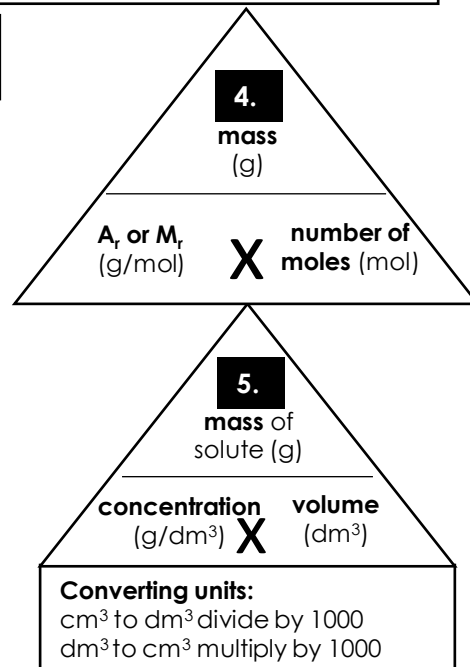
Example: The empirical formula for glucose is CH₂O and its relative formula mass is 180. Deduce the molecular formula for glucose.

1. Find the empirical formula mass by adding up the relative atomic masses of all of the atoms	C + H + H + O 12 + 1 + 1 + 16 = 30
2. Divide the relative formula mass by the empirical formula mass	$\frac{180}{30} = 6$
3. Multiply the numbers in the empirical formula to get the molecular formula	<ul style="list-style-type: none"> • CH₂O x 6 • So C₆H₁₂O₆

3. How to calculate the masses of reactants or products:

Example: Calculate the mass of chlorine needed to make 53.4g of aluminium chloride.

1. Write the balanced equation	2Al + 3Cl ₂ -> 2AlCl ₃
2. Calculate M_r of substances in the question	<ul style="list-style-type: none"> • M_r Cl₂ = 2 x 35.5 = 71 • M_r AlCl₃ = 27 + (3 x 35.5) = 133.5
3. Calculate the ratio of masses	<ul style="list-style-type: none"> • 3Cl₂ makes 2AlCl₃ • (3 x 71) Cl₂ makes (2 x 133.5)AlCl₃ • 213g Cl₂ makes 267g AlCl₃
4. Divide to work out the mass for 1g of product	<ul style="list-style-type: none"> • $\frac{213g}{267}$ Cl₂ makes $\frac{267g}{267}$ AlCl₃ • 0.798g Cl₂ makes 1g AlCl₃
5. Multiply to scale up	<ul style="list-style-type: none"> • (0.798g x 53.4) Cl₂ makes (1g x 53.4) AlCl₃ • 42.6g Cl₂ makes 53.4g AlCl₃



6. Keyword

7. Definition

atom	The smallest neutral part of an element that can take place in chemical reactions.
Avogadro constant*	The number of particles in one mole of a substance (6.02 x 10 ²³ atoms, molecules, formulae or ions).
closed system	Substances cannot enter or leave such as a precipitation reaction in a stoppered flask.
concentration	The amount of solute dissolved in a stated volume of a solution. Units include g/dm ³ .
conservation of mass	During a chemical reaction, the overall mass of substances does not change so the total mass of reactants is equal to the total mass of products.
empirical formula	The simplest whole number ratio of atoms or ions of each element in a substance.
excess reactant	There is more of this reactant present than is needed so it is not completely used up in a reaction.
limiting reactant	There is less of this reactant present than is needed so it is completely used up in a reaction. The mass of product formed is controlled by this reactant.
mole*	One mole of particles of a substance is defined as: a) the Avogadro constant number of particles (6.02 x 10 ²³ atoms, molecules, formulae or ions) of that substance b) a mass of 'relative particle mass' g. The SI unit symbol is mol.
molecular formula	This represents the actual number of atoms of each element in one molecule.
molecule	A particle consisting of two or more atoms joined together by bonds.
open system	Substances can enter or leave such as a reaction in an open flask that takes in or gives out a gas.
precipitate	An insoluble substance that is formed when two soluble substances react together in solution.
precipitation	A reaction in which a precipitate is formed.
product	A substance formed in a reaction.
reactant	A substance used up in a reaction.
reaction	A process in which reactants are converted to different substances called products.
relative atomic mass	(A_r) The mean mass of an atom relative to the mass of an atom of C-12 which is assigned a mass of 12. Unit is g/mol.
relative formula mass	(M_r) The sum of the relative atomic masses of all the atoms or ions in its formula. Unit is g/mol.
stoichiometry*	The ratio of moles of each substance in a reaction.
volume	The amount of space that a liquid takes up. Units include cm ³ and dm ³ .

KS4 Chemistry – Electrolytic Processes

Key Word	Definition
Electrolysis	Decomposition/break down of a compound using electrical energy.
Ions	Charged particle.
Cations	Positively charged ions, formed by losing electrons. Usually metal form cations.
Anions	Negatively charged ions, formed by gaining electrons. Usually non-metal form anions.
Electrodes	A rod made of metal or carbon which carries the current in the electrolyte.
Cathode	An electrode that is negatively charged.
Anode	An electrode that is positively charged.
Electrolyte	Ionic liquid where moving ions carry the current during electrolysis
Reduction	When a positive ion gains electrons.
Oxidation	When a negative ion loses electrons.
Discharged	When ions convert to elements due to transfer of electrons during electrolysis.
(H) Half equations	Ionic equation showing transfer of electrons in oxidation and reduction.

Process of electrolysis	Splitting up using electricity	When an ionic compound is melted or dissolved in water, the ions are free to move. These are then able to conduct electricity and are called electrolytes. Passing an electric current through electrolytes causes the ions to move to the electrodes.
Electrode	Anode Cathode	The positive electrode is called the anode. The negative electrode is called the cathode.
Where do the ions go?	Cations Anions	Cations are positive ions and they move to the negative cathode. Anions are negative ions and they move to the positive anode.

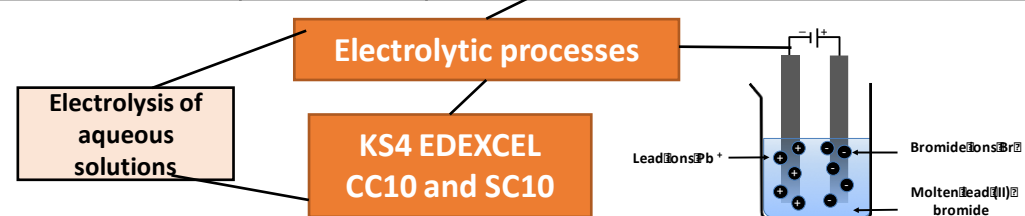
Oxidation Is Loss, Reduction Is Gain

Extracting metals using electrolysis

Metals can be extracted from molten compounds using electrolysis.

This process is used when the metal is too reactive to be extracted by reduction with carbon.

The process is expensive due to large amounts of energy needed to produce the electrical current.
Example: aluminium is extracted in this way.

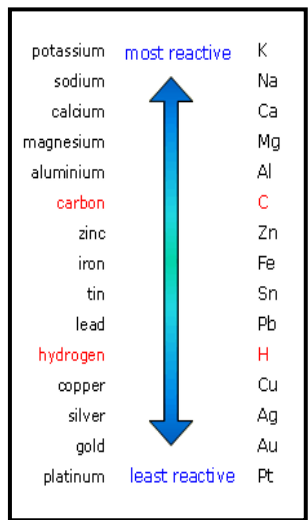


Higher tier: You can display what is happening at each electrode using half-equations:
 At the cathode: $Pb^{2+} + 2e^{-} \rightarrow Pb$
 At the anode: $2Br^{-} \rightarrow Br_2 + 2e^{-}$

At the negative electrode	Metal will be produced on the electrode if it is less reactive than hydrogen. Hydrogen will be produced if the metal is more reactive than hydrogen.
At the positive electrode	Oxygen is formed at positive electrode. If you have a halide ion (Cl ⁻ , I ⁻ , Br ⁻) then you will get chlorine, bromine or iodine formed at that electrode.

The ions discharged when an aqueous solution is electrolysed using inert electrodes depend on the relative reactivity of the elements involved.

Using copper	Copper is a very good electrical conductor	Much of the copper available isn't pure enough for this use so it is purified using electrolysis.
Copper sulfate solution	The anode is made of impure copper and the cathode is made of pure copper	Both electrodes are placed in copper sulfate solution. Copper ions (Cu ²⁺) leave the anode and are attracted to the cathode.
Electrodes	The cathode of pure copper builds up	The anode decreases in size. The impurities left behind form a sludge.

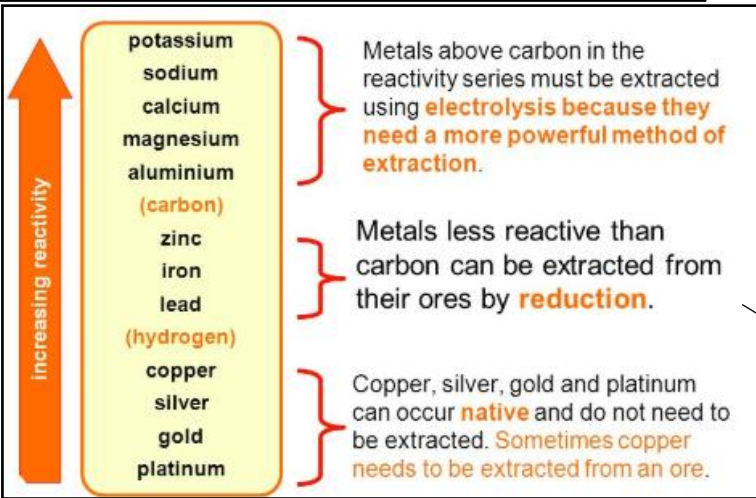


negative ion in solution	element given off at positive electrode
chloride, Cl ⁻	chlorine, Cl ₂
bromide, Br ⁻	bromine, Br ₂
iodide, I ⁻	iodine, I ₂
sulfate, SO ₄ ²⁻	oxygen, O ₂

KS4 Chemistry – Obtaining and Using Metals (part 1)

Oxidation is **Loss** (of electrons)
Reduction is **Gain** (of electrons)

HT ONLY: Reactions between metals and acids are redox reactions as the metal donates electrons to the hydrogen ions. This displaces hydrogen as a gas while the metal ions are left in the solution.



Extraction using carbon

Metals less reactive than carbon can be extracted from their oxides by reduction.

For example:
 $\text{zinc oxide} + \text{carbon} \rightarrow \text{zinc} + \text{carbon dioxide}$

Unreactive metals, such as gold, are found in the Earth as the metal itself. They can be mined from the ground. More reactive metals are obtained by displacement or electrolysis.

Extraction of metals and reduction

Reactions with acids

$\text{metal} + \text{acid} \rightarrow \text{metal salt} + \text{hydrogen}$

magnesium + hydrochloric acid \rightarrow magnesium chloride + hydrogen

zinc + sulfuric acid \rightarrow zinc sulfate + hydrogen

Reactions of acids and metals

Acids react with some metals to produce salts and hydrogen.

Obtaining and Using Metals CC11 and SC11

The reactivity series

	Reactions with water	Reactions with acid
Group 1 metals	Reactions get more vigorous as you go down the group	Reactions get more vigorous as you go down the group
Group 2 metals	Do not react with water	Observable reactions include fizzing and temperature increases
Zinc, iron and copper	Do not react with water	Zinc and iron react slowly with acid. Copper does not react with acid.



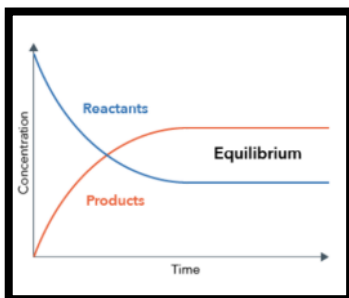
Metal	Reaction with water	Reaction with dilute acids	Reactivity
Potassium	Violent with cold water	Violent	Most reactive Least reactive
Sodium			
Calcium	Slow with cold water Rapid with steam	Rapid	
Magnesium			
Aluminium			
Zinc	Usually no reaction	Slow	
Iron	Rusts slowly		
(Hydrogen)			
Copper			
Silver	No reaction	No reaction	
Gold			

Metals form positive ions when they react	The reactivity of a metal is related to its tendency to form positive ions	The reactivity series arranges metals in order of their reactivity (their tendency to form positive ions).
Carbon and hydrogen	Carbon and hydrogen are non-metals but are included in the reactivity series	These two non-metals are included in the reactivity series as they can be used to extract some metals from their ores, depending on their reactivity.
Displacement	A more reactive metal can displace a less reactive metal from a compound.	Silver nitrate + Sodium chloride \rightarrow Sodium nitrate + Silver chloride

KS4 Chemistry Dynamic Equilibrium and Fertilisers

Reversible Reactions and Equilibria

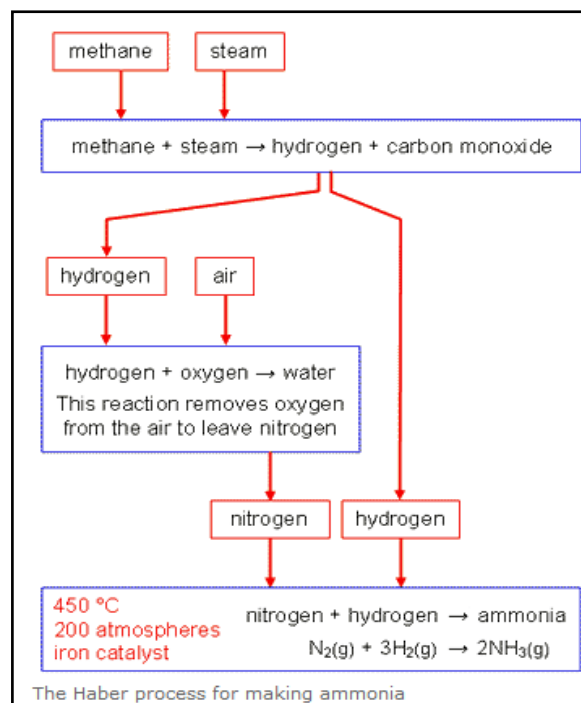
Reversible reactions	In some chemical reactions, the products can react again to re-form the reactants.
Representing reversible reactions	$A + B \rightleftharpoons C + D$
The direction	The direction of reversible reactions can be changed by changing conditions: $A + B \xrightleftharpoons[\text{cool}]{\text{heat}} C + D$



Graph sketch shows in a reversible reaction, the backward reaction gets faster with time, and the forward reaction gets lower with time. When they are occurring at the same rate, dynamic equilibrium has been reached.

Changing concentration	If the concentration of a reactant is increased, more products will be formed. If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.

The Haber process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
Optimum temperature	The optimum temperature for the Haber process is 450°C.
Optimum pressure	The optimum pressure for the Haber process is 200 atmospheres.
Optimum conditions	The optimum temperature for the Haber process is 450°C and optimum pressure is 200 atmospheres. These are economically viable conditions as they produce the best yield to cost ratio.
The use of a catalyst	The Haber process uses an iron catalyst. This does not alter the position of the equilibrium but it does increase the rate of the reaction.



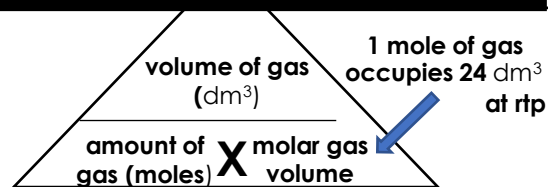
Keyword	Definition
Le Chatelier's Principles	States that when a system experiences a disturbance (change in condition), it will respond to restore a new equilibrium state.
Changing concentration	If the concentration of a reactant is increased, more products will be formed. If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
The Haber Process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
NPK fertilisers	Formulations of various salts containing appropriate percentages of the elements.

KS4 Chemistry Quantitative Analysis

1. Percentage yield

- percentage yield = $\frac{\text{actual yield}}{\text{theoretical yield}} \times 100$
- Less than 100% due to:
 - an incomplete reaction
 - side reactions
 - loss of product

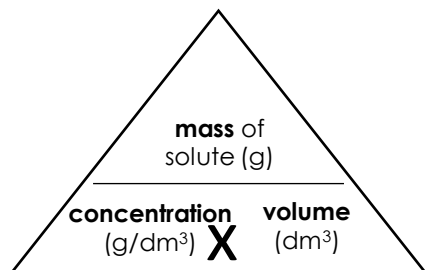
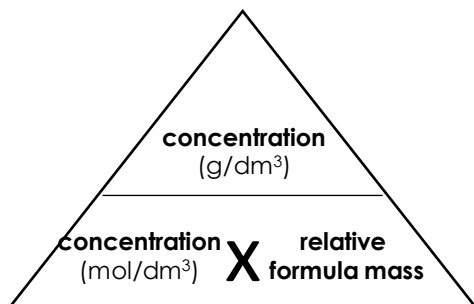
5. Molar volume of gases



2. Atom economy

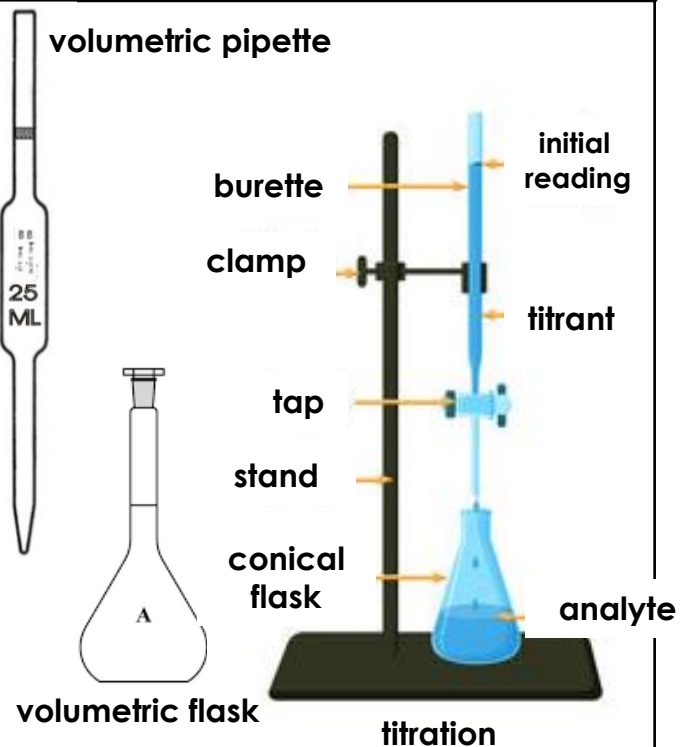
- atom economy = $\frac{\text{relative formula masses of the useful product}}{\text{sum of relative formula masses of all reactants}} \times 100$
- We want it to be as high as possible
- It can be increased by finding a different way to make the product

3. Concentration



Converting units:
 cm³ to dm³ divide by 1000
 dm³ to cm³ multiply by 1000

4. Titrations

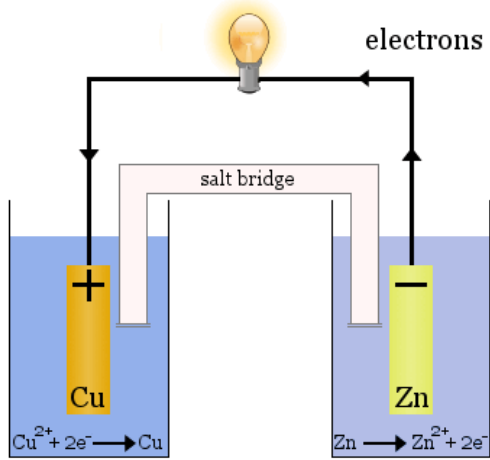


6. Keyword

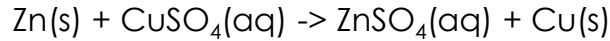
7. Definition

actual yield	The actual amount of product obtained from a chemical reaction.
atom economy	The percentage, by mass, of reactants that are converted into useful products.
Avogadro's law	If the temperature and pressure are the same, equal volumes of different gases contain an equal number of molecules.
burette	A piece of apparatus used to accurately measure the volume of solution that has been added during a titration.
by-product	Substance produced in a chemical reaction in addition to the desired product.
calibrated	Marked with a scale for accurate readings.
concentration	The amount of solute dissolved in a certain volume of solvent.
concordant	Readings that have been taken several times and are identical, or close to each other.
end-point	When just enough solution has been added from the burette to react with all the solution in the flask.
indicator	A substance which changes colour depending on the pH.
molar gas volume	The volume occupied by one mole of any gas. It is 24dm ³ at rtp.
side reactions	A reaction which takes place at the same time as another main reaction.
theoretical yield	The maximum calculated amount of a product that could be formed from a given amount of reactants.
titration	A technique in volumetric analysis that is used to find the exact volumes of solutions which react with each other.
volumetric flask	A flask which is accurately calibrated to hold a given volume of solution.
volumetric pipette	This piece of equipment is calibrated to allow extremely accurate measurement of the volume of a solution.

Chemical cells



- 2 different metals.
- Each metal is in a **solution of its salt**.
- A **salt bridge** to allow ions to move between solutions.
- The further apart the metals are in the **reactivity series**, the bigger the voltage made.
- An **exothermic reaction** which mainly transfers energy as **electricity**.

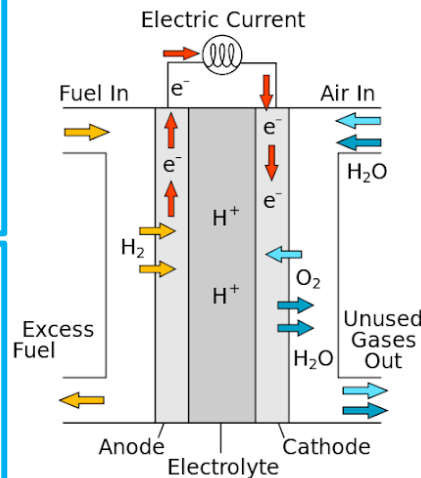


Keyword	Definition
by-product	A substance that is made in addition to the desired product.
chemical cell	A device that produces a voltage due to reactions between the reactants stored inside it, until one of the reactants gets used up (cell goes 'flat').
electrode	A rod made of metal or graphite that carries the current into or out of the electrolyte.
fuel	A substance that releases thermal energy when burned.
fuel cell	A device that produces a voltage due to reactions involving a fuel and oxygen.
greenhouse gas	A gas that helps to trap 'heat' in the atmosphere (eg carbon dioxide, methane, water vapour).
oxidation	A reaction in which oxygen reacts with a chemically joins to a substance. Involves the loss of electrons
reduction	A reaction in which oxygen is removed from a substance. Involves the gain of electrons

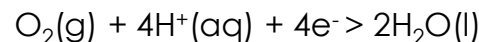
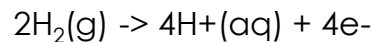
Fuel Cells – example hydrogen-oxygen cell

- Produces a voltage (electrical energy) by reacting hydrogen with oxygen
- hydrogen + oxygen → water
- $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$
- Hydrogen is oxidised
- Oxygen is reduced

- Need non renewable natural gas to make hydrogen
- Making hydrogen produces carbon dioxide as a by-product
- Hydrogen has to be stored safely (explosive, takes up space)



- More efficient than power stations or cells as:
 1. less stages so less heat loss.
 2. no moving parts so no energy lost as friction.
- No need for turbines, generators etc as electricity is generated directly from the reaction.
- Quieter than a petrol or diesel engine.
- Don't produce CO₂, NO, SO₂, CO.
- Only by-products are water and heat.



KS4 Chemistry Groups in the Periodic Table

1 2 3 4 5 6 7 0

H	Transition metals																He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	?	?	?						

Elements arranged in order of atomic number

Elements with similar properties are in columns called groups

Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Group 0	
Noble gases	Unreactive, do not form molecules This is due to having full outer shells of electrons.
	Boiling points increase down the group Increasing atomic number.
Helium	Used in balloons Due to being less dense than air, which means balloons will float.
Neon	Used in signs Glow when electricity flows through it.
Argon	Used in filament light bulbs Stops the heated filament reacting with oxygen. Bulbs filled with unreactive argon instead.

Keyword	Definition
Reactivity of group 1	The atoms get larger as you go down, so the single electron in the outermost shell (highest energy level) is attracted less strongly to the positive nucleus. The electrostatic attraction with the nucleus gets weaker because the distance between the outer electron and the nucleus increases. Also the outer electron experiences a shielding effect from the inner electrons, reducing the attraction between the oppositely charged outer electron and the nucleus.
Reactivity of group 7	When Group 7 elements react, the atoms gain an electron in their outermost shell. Going down the group, the outermost shell's electrons get further away from the attractive force of the nucleus, so it is harder to attract and gain an extra electron. The outer shell will also be shielded by more inner shells of electrons, again reducing the electrostatic attraction of the nucleus for an incoming electron.
Reactivity of group 0	Elements in Group 0 of the periodic table are called the noble gases. They are unreactive because their atoms have stable arrangements of electrons. The atoms have eight electrons in their outermost shell, apart from helium which has just two but still has a complete outer shell. The stable electronic structure explains why they exist as single atoms; they have no tendency to react to form molecules. The boiling points of the noble gases get higher going down the group. For example, helium boils at -269°C and radon boils at -62°C .

Group 1

Metal	Reaction with water	Word equation
Lithium	Fizzing	Lithium + water \rightarrow lithium hydroxide + hydrogen
Sodium	Fizzing more vigorously than lithium	Sodium + water \rightarrow sodium hydroxide + hydrogen
Potassium	Fizzes and burns with a lilac flame	Potassium + water \rightarrow potassium hydroxide + hydrogen

Alkali metals	Soft and easily cut	Low melting and boiling points.
	Very reactive with oxygen, water and chlorine	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

Group 7

Halogens	Consist of molecules made of a pair of atoms	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas \rightarrow liquid \rightarrow solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is less easily gained as outer shell is further away from nucleus, therefore the attraction force is weaker.

With metals	Forms a metal halide e.g. Sodium + chlorine \rightarrow sodium chloride	Metal + halogen \rightarrow metal halide e.g. Sodium + chlorine \rightarrow sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	Forms a hydrogen halide	Hydrogen + halogen \rightarrow hydrogen halide e.g. Hydrogen + bromine \rightarrow hydrogen bromide	Dissolve in water to form acidic solutions.
With aqueous solution of a halide salt	A more reactive halogen will displace the less reactive halogen from the salt	Chlorine + potassium bromide \rightarrow potassium chloride + bromine	(HT) These are redox reactions. The halogen gains electrons and the halide ion from the compound loses electrons.

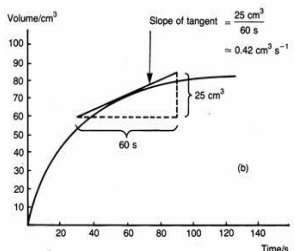
KS4 Chemistry Rates of Reaction and Energy Changes in Reactions

Rates of Reaction

Rate of chemical reaction	This can be calculated by measuring the quantity of reactant used or product formed in a given time.	Rate = $\frac{\text{quantity of reactant used}}{\text{time taken}}$ Rate = $\frac{\text{quantity of product formed}}{\text{time taken}}$
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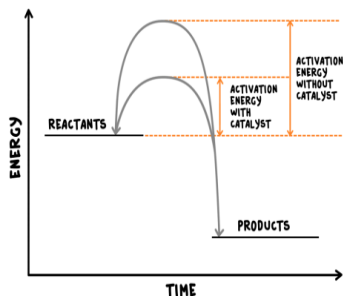
Factors affecting the rate of reaction

Temperature	The higher the temperature, the quicker the rate of reaction.
Concentration	The higher the concentration, the quicker the rate of reaction.
Surface area	The larger the surface area of a reactant solid, the quicker the rate of reaction.
Pressure (of gases)	When gases react, the higher the pressure upon them, the quicker the rate of reaction.



Quantity	Unit
Mass	Grams (g)
Volume	cm ³
Rate of reaction	Grams per cm ³ (g/cm ³) HT: moles per second (mol/s)

Catalyst	A catalyst changes the rate of a chemical reaction but is not used in the reaction.
Enzymes	These are biological catalysts.
How do they work?	Catalysts provide a different reaction pathway where reactants do not require as much energy to react when they collide.



Energy Changes

Endothermic		Products are at a higher energy level than the reactants. As the reactants form products, energy is transferred from the surroundings to the reaction mixture. The temperature of the surroundings decreases because energy is taken in during the reaction.
Exothermic		Products are at a lower energy level than the reactants. When the reactants form products, energy is transferred to the surroundings. The temperature of the surroundings increases because energy is released during the reaction.

Bond energy calculation	Calculate the overall energy change for the forward reaction $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$ Bond energies (in kJ/mol): H-H 436, H-N 391, N≡N 945
	Bond breaking: $945 + (3 \times 436) = 945 + 1308 = 2253 \text{ kJ/mol}$
	Bond making: $6 \times 391 = 2346 \text{ kJ/mol}$ Overall energy change = $2253 - 2346 = -93 \text{ kJ/mol}$ Therefore reaction is exothermic overall.

Keyword	Definition
Collision theory	Chemical reactions can only occur when reacting particles collide with each other with sufficient energy.
Activation energy	This is the minimum amount of energy colliding particles in a reaction need in order to react.
Heat energy changes	Occur in the following: <ul style="list-style-type: none"> - Salts dissolving in water - Neutralisation reactions - Displacement reactions - Precipitation reactions
Exothermic reactions	Heat energy is given out as bonds are being formed.
Endothermic reactions	Heat energy is taken in as bonds are being broken.

Physics Knowledge Organisers

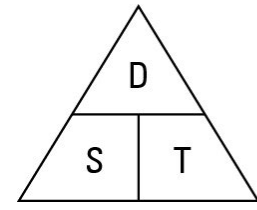
Motion

Scalar	Vector
Distance	Displacement
Speed	Velocity
Power	Momentum
Mass	Acceleration
Volume	Weight
Temperature	
Force	
Pressure	

Calculating speed/velocity

$$\text{Speed (m/s)} = \text{distance (m)} \div \text{time (s)}$$

How to remember the equation?
 "Don't Step on Turtles"



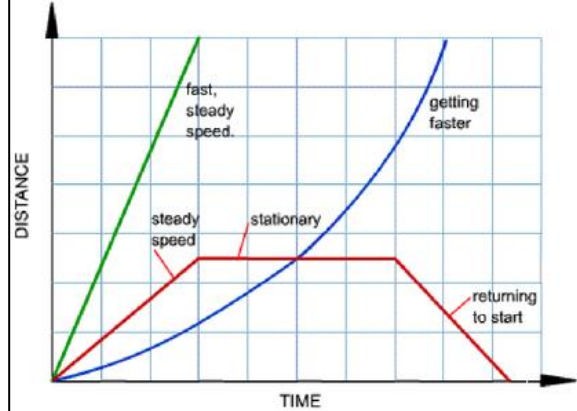
$$D = S \times T$$

$$S = D \div T$$

$$T = D \div S$$

Distance-time graph

Key features:

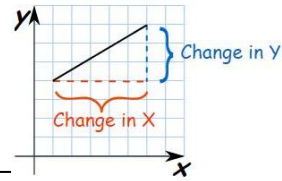


You can calculate speed from this distance-time graph.

Steeper gradient = faster speed.

Calculating a gradient

$$\text{Gradient} = \frac{\text{Change in } y}{\text{Change in } x}$$



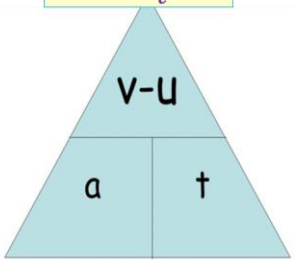
Calculating acceleration

Acceleration is the rate of change of velocity

$$\text{Acceleration (m/s/s)} = \frac{\text{Change in velocity (m/s)}}{\text{time taken (s)}}$$

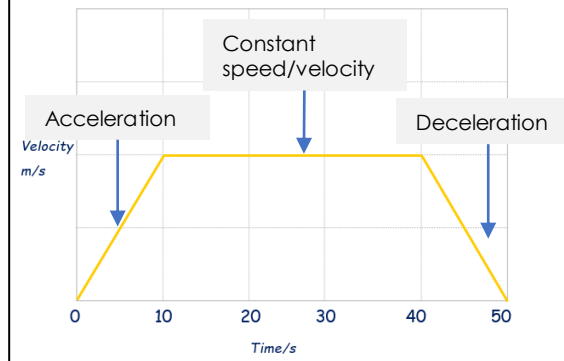
$$a = \frac{v - u}{t}$$

a = acceleration
 v = final velocity
 u = initial velocity
 t = time



Velocity-time graph

Key features:



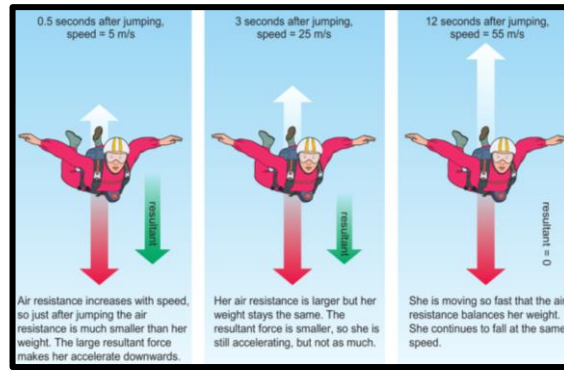
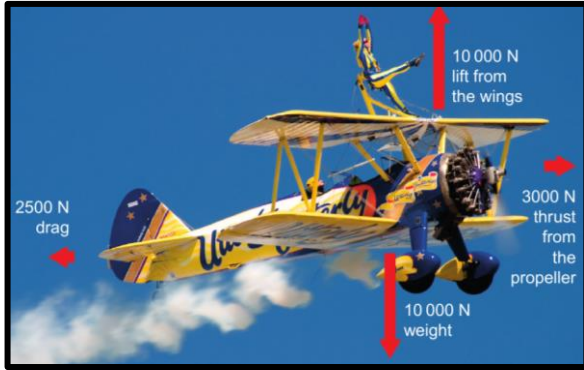
You can calculate acceleration from this velocity-time graph.

Calculating the **area beneath the lines**, is the same as the **overall distance travelled**

Steeper gradient = faster acceleration.

Speed	Scalar measurement that shows how fast an object is moving. Measure in m/s (meters per second).
Velocity	Vector measurement that shows how fast an object is moving in a specific direction. Measured in m/s (meters per second).
Distance	Measurement of how far an object is moving/has moved. Measured in m (meters).
Time	Measurement of time. Measured in s (seconds).
Acceleration	When an objects speed increases over time.
Conversion	Changing a measurement to another form.
Deceleration	When an objects speed decreases over time.
Scalar	A measurement that shows magnitude only.
Vector	A measurement that shows magnitude and direction.
Plateau	A straight horizontal line on a graph.
Gradient	Difference between two values, shown by a incline or decline on a line graph.
Constant	When something does not change. Shown by a straight line on a line graph.
Magnitude	Another term used for size.
Direction	The course which an object is moving. We show North, West, East, South or a combination of two.
Initial	The beginning.
Final	The end.
Displacement	A vector measurement to show the shortest distance to the final place an object ends up.

KS4 Physics – Forces and Motion



Newton's First Law of motion can be written as:

- a moving object will continue to move at the same speed and direction unless an external force acts on it
- a stationary object will remain at rest unless an external force acts on it.

The acceleration of an object is a measure of how much its velocity changes in a certain time. Sir Isaac Newton's Second Law of Motion describes the factors that affect the acceleration of an object.

The acceleration in the direction of a resultant force depends on:

- the size of the force (for the same mass, the bigger the force the bigger the acceleration)
- the mass of the object (for the same force, the more massive the object the smaller the acceleration).

Newton's Third Law is about the forces on two different objects when they interact with each other. This interaction can happen:

- when objects touch, such as when you sit on a chair
- at a distance, such as the gravitational attraction between the Earth and the Moon.

On Earth the **gravitational field strength** has a value of about 10 newtons per kilogram (N/kg). This means that each kilogram is pulled down with a force of 10 N. The gravitational field strength is different on other planets and moons.

The weight of an object can be calculated using the following equation:

$$\text{weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$

This is often written as: $W = m \times g$

Momentum is calculated using this equation:

$$\text{momentum (kg m/s)} = \text{mass (kg)} \times \text{velocity (m/s)}$$

This can also be written as $p = m \times v$, where p stands for momentum.

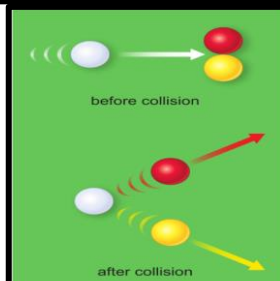
Momentum and acceleration
 Table C shows two equations involving acceleration. These can be combined to give:

$$\text{force} = \frac{\text{mass} \times \text{change in velocity}}{\text{time}} \quad \text{or} \quad \frac{m(v - u)}{t}$$

where v is the final velocity and u is the starting velocity.
 As mass \times velocity is the momentum of an object, this equation can also be written as:

$$\text{force} = \frac{\text{change in momentum}}{\text{time}} \quad \text{or} \quad \frac{mv - mu}{t}$$

H Momentum and collisions
 When moving objects collide the total momentum of both objects is the same before the collision as it is after the collision, as long as there are no external forces acting. This is known as **conservation of momentum**. Remember, momentum is a vector so you need to consider direction when you add the quantities together. If two objects are moving in opposite directions, we give the momentum of one object a positive sign and the other a negative sign.

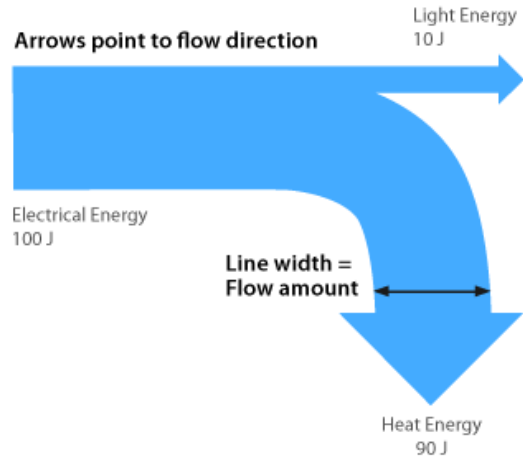


D The total momentum of the two coloured balls will be the same as the momentum of the white ball that hit them.

Keyword	Definition
acceleration	A measure of how quickly the velocity of something is changing. It can be positive if the object is speeding up or negative if it is slowing down.
balanced forces	When the forces in opposite directions on an object are the same size so that there is a zero resultant force.
resultant force	The total force that results from two or more forces acting upon a single object. It is found by adding together the forces, taking into account their directions.
scalar quantity	A quantity that has a magnitude (size) but not a direction. Examples include mass, distance, energy and speed.
speed	How fast something is moving. Often measured in metres per second (m/s), miles per hour (mph) or kilometres per hour (km/h).
unbalanced forces	When the forces in opposite directions on an object do not cancel out, to there is a non-zero resultant force.
vector quantity	A quantity that has both a size and a direction. Examples include force, velocity, displacement, momentum and acceleration.
velocity	The speed of an object in a particular direction. Usually measured in metres per second (m/s).
centripetal force	A force that causes objects to follow a circular path. The force acts towards the centre of the circle.
mass	A measure of the amount of material there is in an object. The units are kilograms (kg).
weight	The force pulling an object downwards. It depends upon the mass of the object and the gravitational field strength. The units are newtons (N).
gravitational field strength	A measure of how strong the force of gravity is somewhere. It is the force on a 1 kilogram mass, so the units are newtons per kilogram (N/kg).
inertial mass	The mass of an object found from the ratio of force divided by acceleration. The value is the same as the mass calculated from the weight of an object and gravitational field strength.
action-reaction forces	Pairs of forces on interacting objects. Action-reaction forces are always the same size, in opposite directions, and acting on different objects. They are not the same as balanced forces.
balanced forces	Forces acting on the same object. Balanced forces are always equal, in opposite directions, and always act on the same object. They do not have to be the same type of force. An object acted on by balanced forces will not change the way it is moving..
equilibrium	When a situation is not changing because all the things affecting it balance out.
conservation of momentum	The total momentum of moving objects before a collision is the same as the total momentum afterwards, as long as no external forces are acting.
momentum	The mass of an object multiplied by its velocity. Momentum is a vector quantity, with units kilogram metres per second (kg m/s).
kinetic energy	A name used to describe energy when it is stored in moving things. The amount of energy stored depends on the mass of the object and on its speed (or velocity) squared.
work done	The energy transferred when a force acts through a distance to move an object or change its speed. It is calculated using the size of the force and the distance moved in the direction of the force. The unit for work done is the joule (J).
acceleration	A measure of how quickly the velocity of something is changing. It can be positive if the object is speeding up or negative if it is slowing down.

Conservation of Energy

Energy Type	Example
Light Energy	Sun, light bulb, torch
Thermal Energy (heat)	Oven, electric fire
Sound Energy	Radio, speakers, TV
Electrical Energy	Electric car, laptop
Nuclear Energy	Nuclear power station, nuclear bomb
Chemical Energy	Food, batteries, coal
Gravitational Potential Energy	Book on a shelf, boulder on a cliff
Elastic Potential Energy	Bow, wind-up toy, stretch spring
Kinetic Energy (movement)	Person running, rolling ball



Energy Efficiency = Useful energy/total energy input

Keyword	Definition
heating	Put more jumpers on and turn off central heating
Hot water	Take showers, only boil the amount of water you need
Electrical appliances	Turn off devices that are on standby
Washing clothes	Air dry clothes, wash on a lower temperature
Heat lost from home	Install insulation – double glazing, loft/floor insulation

Renewable Energy	Quickly replenishes its energy used. Infinite	Wind power, solar power, hydroelectric power, tidal power, geothermal power, biomass
Non-renewable Energy	Is finite (will run out). Does not quickly replace energy used	Fossil fuels – coal, oil and natural gas Nuclear power

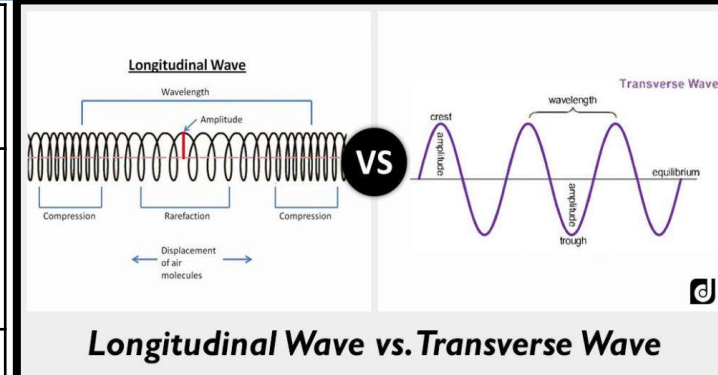
Energy Source	Advantages	Disadvantages
Fossil Fuels	Cheap to set up, power stations already present	Limited (will run out), causes pollution – greenhouse gases and gases that make acid rain, running costs
Nuclear power	Does not produce carbon dioxide or sulphur dioxide	Finite (will run out) danger from radioactive material
Wind power	Infinite, cheap to run, no pollution, cheap to run	Costly to build, only works when windy, noisy and ugly
Tidal power	Good for islands, potential to generate lots of energy, reliable – tide will always go in and out, doesn't release pollution	Costs a lot to build, hard to find suitable locations, could damage environment
Solar power	Infinite, building can have their own power supply, doesn't release pollution, cheap to run	Expensive to set up, only works when sunny
Geothermal power	Doesn't create any pollution, potentially infinite	Expensive to set up, only works in volcanic areas, volcanic activity may stop making station useless
Hydroelectric power	Doesn't create pollution, creates water reserves	Costly to build, can cause flooding, can have major ecological impacts
Biomass	Cheap, if replaced can be sustainable	Burning releases atmospheric pollution, replanting required

Keyword	Definition
Chemical	Energy store that is emptied during chemical reactions when energy is transferred to the surroundings.
Conduction	The transfer of heat by passing on energy (or electrical charge) to nearby particles.
Convection	The process by which heat travels through fluids (gases and liquids).
Elastic potential	An energy store that is filled when a material is stretched or compressed.
Electrical	Energy store resulting from the movement of electrical charge (electrons).
Energy	This is the ability to make something happen when it is transferred.
Gravitational potential	Energy store that is filled when an object is raised.
Joule	Unit of energy, represented by the symbol J.
Kinetic	An energy store filled when a moving object speeds up.
Light	A form of radiation that can transfer energy in a wave.
Non-renewable	An energy resource that will be used up, and not replenished in our lifetime.
Nuclear	An energy store associated with nuclear interactions.
Radiation	Radiation is the transfer of internal energy in the form of electromagnetic waves. This radiation lies in the infrared region of the electromagnetic spectrum. It does not require particles to move, it can travel through a vacuum.
Renewable	An energy resource that can be readily replenished in our lifetime.
Sound	A form of energy transferred by sound waves.
Thermal	An energy store that is filled when an object is heated.
Transformation	Energy transformation is the process of changing one form of energy to another.

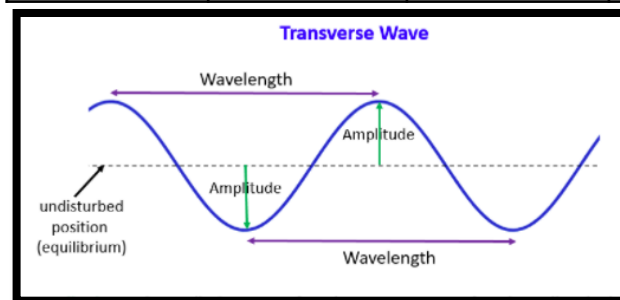
KS4 Physics – Waves

Wave	Vibrations that transfer energy from place to place.
Transverse	A wave where the vibrations are at right angles to the direction in which the wave is travelling.
Longitudinal	A wave where the vibrations are parallel to the direction in which the wave is travelling.
Frequency	The number of vibrations (or the number of waves) per second, measured in hertz.
Period	The time taken for one complete wave to pass a point. It is measured in seconds.
Wavelength	The distance between a point on one wave and the same point on the next wave.
Amplitude	The size of vibrations or the maximum distance a particle moves away from its resting position when a wave passes.
Refraction	The change in direction when a wave goes from one medium to another.
Normal	An imaginary line drawn at right angles to the surface of a mirror or lens where a ray of light hits it.

Frequency	The number of waves pass a point in a second.	Higher frequency = more energy transferred	Increasing frequency = higher pitch
Amplitude	Maximum disturbance from its undisturbed position.	Increasing amplitude increases energy transferred	Increasing amplitude = increase in volume
Wavelength	The distance between a point on one wave and the same point on the next wave.	Increasing wavelength = decrease energy transferred	



Longitudinal	Transverse
Particles oscillate (vibrate) in the direction of the wave's movement	Particles oscillate (vibrate) at right angles to the direction of the wave movement
Sound waves, ultrasound	Electromagnetic waves (light), water waves



Wave Formula

Wave speed = wavelength x frequency

Wave speed is measured in meters per second (m/s)	Wavelength is measured in meters (m)	Frequency is measured in Hertz (Hz)
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Example

Dylan is standing on the end of a pier. He measures the water waves going past him. The wavelength of each wave is 1.3m. He counts 2 waves every second. Find the wave speed

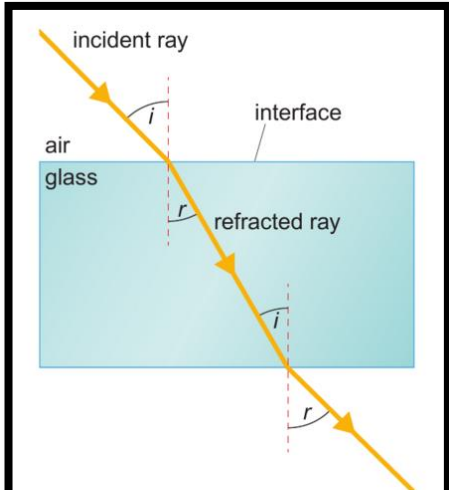
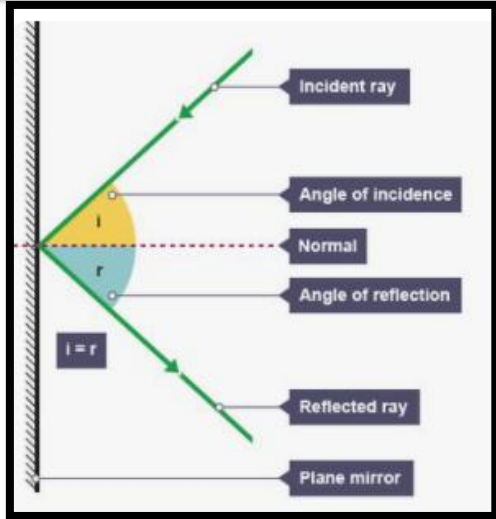
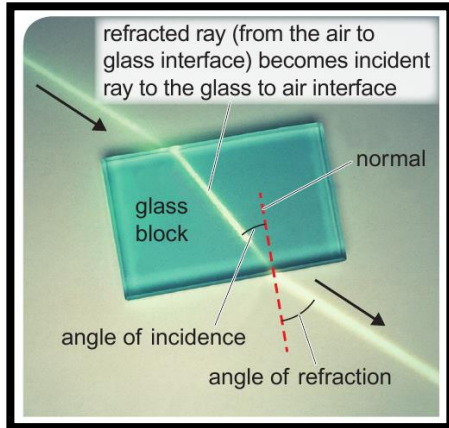
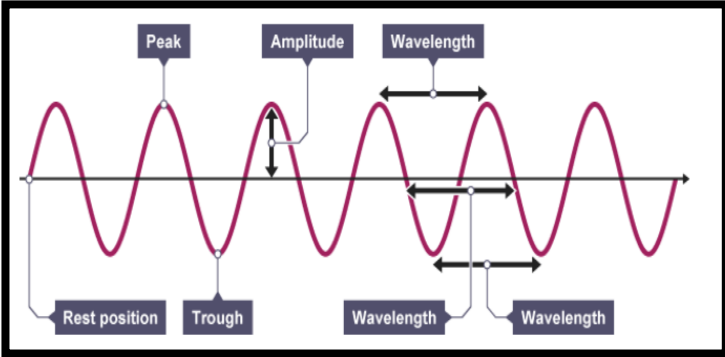
Wave speed = frequency x wavelength

Wave speed = 2 x 1.3

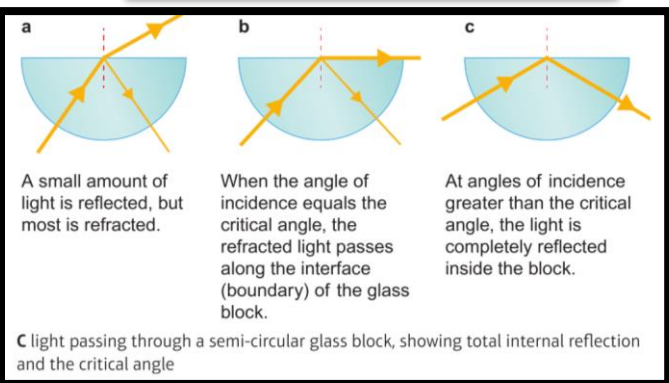
= 2.6 m/s

	Description	Diagram
Reflection = light bouncing off a surface	Light waves reflect from surfaces. When waves reflect, they obey the law of reflection: the angle of incidence equals the angle of reflection.	
Refraction = light bends	Waves change speed when they pass across the boundary between two substances with different densities, such as air and glass. This causes them to change direction and this effect is called refraction.	

KS4 Physics (CP5/SP5) – Light and EM Spectrum



B Light bends towards the normal if it goes into a medium where it travels more slowly. It bends away from the normal if it goes into a medium where it travels faster.

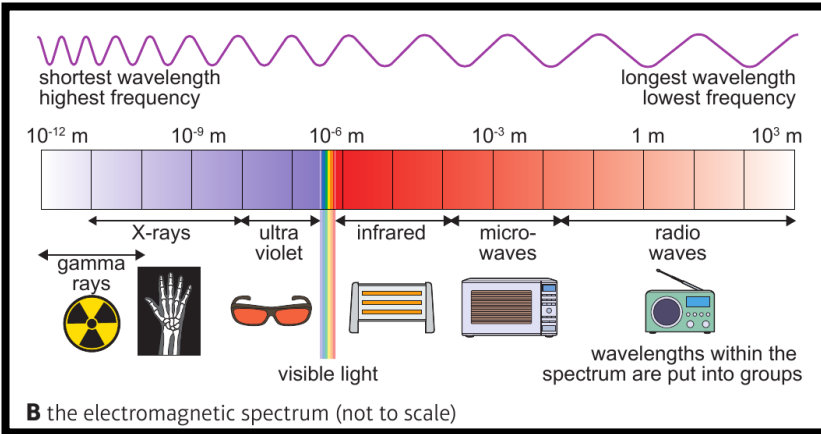
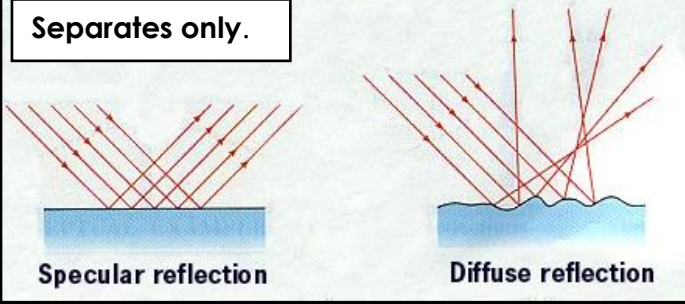


Separates only. Total internal reflection and critical angle.

Angle of incidence (i)	The angle between incidence ray and the normal.
Angle of refraction (r)	The angle between normal and the refracted ray.
Separates only - Critical angle	The angle at which total internal reflection happens. In a glass block this is 42°.
Separates only - Diffuse reflection	Reflected light scattered in all directions
Electromagnetic radiation	Form of energy transfer including radio waves, microwaves, infrared, visible light, ultraviolet, x-rays and gamma rays.
Electromagnetic spectrum	The entire frequency range of electromagnetic waves.
Electromagnetic waves	A group of waves that all travel at the same speed in a vacuum, and all are transverse.
Incident ray	The light ray approaching the interface (mirror edge, or edge of a perspex block)
(H) Oscillations	Movement backward and forward
Radiotherapy	Medical technique to kill cancer cells using gamma rays.
Ray diagram	A diagram that models what happens when light is reflected or refracted.
Refracted ray	The light ray that leaves a material like a glass Perspex block. This ray has changed direction.
Separates only - Specular reflection	Light is evenly reflected from smooth surfaces such as a mirror surface.
Separates only – Total internal reflection	When a ray of light is shone into a curved glass block and when the angle (critical angle) has been achieved to allow all the light to be completely reflected inside the glass.
Transverse waves	Vibrations are at right angles to the direction in which the wave is travelling

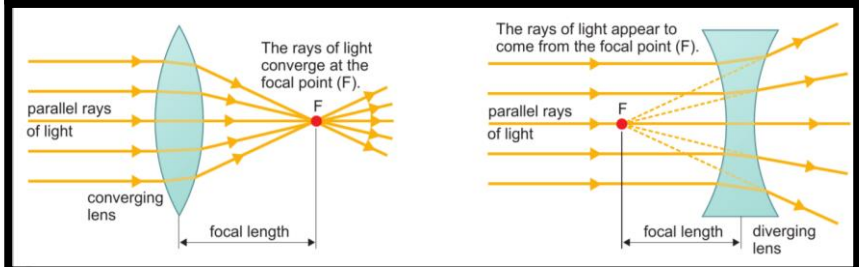
KS4 Physics (CP5/SP5) – Light and EM Spectrum

Separates only.



Separates only.

A **converging lens** is fatter in the middle than at the edges. It makes parallel rays of light converge (come together) at the **focal point**. The **focal length** is the distance between the focal point and the centre of the lens. A **diverging lens** is thinner in the middle than at the edges. The focal point is the point from which the rays seem to be coming after passing through the lens.



Long wavelength, low frequency	Uses	Dangers
Visible light	Light bulbs, our eyes detect it	From a laser can damage the retina in the eye
Infrared	Communication – TV remote, grills, toasters	Felt as heat, and can cause skin to burn
Microwaves	Communications, mobile phones, microwave for food	Can cause internal heating of body tissue
Radio waves	Radio broadcast, communications	Very large doses can cause cancer

Separates only.

Heat transfer by radiation - Heat can be transferred by infrared radiation. Unlike conduction and **convection** - which need the vibration or movement of **particles** - **infrared radiation** is a type of electromagnetic radiation. When infrared radiation is absorbed by an object it is heated and its temperature rises.

Short wavelength, high frequency	Uses	Dangers
Ultraviolet	Used to kill microorganisms in water, detecting forge bank notes	Too much exposure can lead to skin cancer
X-rays	Hospitals – to check for broken bones	High frequency, transfer a lot of energy and can penetrate the body. Excessive exposure may cause DNA mutation, possibly leading to cancer.
Gamma rays	Cancer treatment, sterilising hospital equipment	High frequency, transfer a lot of energy and can penetrate the body. Excessive exposure may cause DNA mutation, possibly leading to cancer.

Separates only.

- Dark matt surfaces are better at absorbing heat energy than light shiny surfaces.
- Dark matt surfaces are better at radiating heat energy than light shiny surfaces.

Separates only.

Surface	Absorption	Emission
Dull, matt or rough	Good absorber of heat radiation	Good emitter of heat radiation
Shiny	Poor absorber of heat radiation	Poor emitter of heat radiation

KS4 Physics (CP6/SP6) – Radioactivity

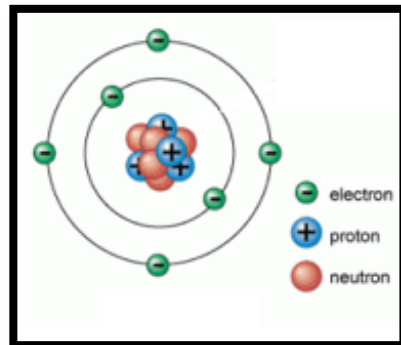
Dalton's model	Plum Pudding - Thomson	Rutherford	Bohr/Chadwick
John Dalton thought that all matter was made of tiny particles called atoms, which he imagined as tiny spheres that could not be divided.	Thomson carried out experiments and discovered the electron. This led him to suggest the plum pudding model of the atom. In this model, the atom is a ball of positive charge with negative electrons embedded in it.	Rutherford suggested a new model for the atom, called the nuclear model. In the nuclear model: the mass of an atom is concentrated at its centre, the nucleus the nucleus is positively charged	Bohr did calculations that led him to suggest that electrons orbit the nucleus in shells. The shells are at certain distances from the nucleus. Chadwick found evidence that the nucleus contains no charged particles called the neutron.

Atomic number (also called proton number)	Number of protons in an atom
Background radiation	Naturally radioactive substances in the environment that produce radiation.
Becquerels (Bq)	Unit to measure radioactivity. One Bq is one nuclear decay each second.
Count rate	Number of clicks on a GM tube when radiation is detected. It is the amount of radiation per second or minute.
Elements	Substances that contain the same type of atoms
Geiger-Muller (GM) tube	An instrument to measure radioactivity.
Half-life	Time taken for half the unstable nuclei in a sample of a radioactive isotope to decay.
Isotopes	Atoms of a single element that have different numbers of neutrons, but same number of protons.
Kinetic theory	Model that helps explains the properties of solids, liquids and gases.
Mass number (also called nucleon number)	Total number of protons and neutrons.
Nucleons	Smaller particles that make up the nucleus.
Neutrons	Sub-atomic particle found in the nucleus, with no charge.
Particle theory	Model that helps explains the properties of solids, liquids and gases.
Protons	Positively charged sub-atomic particle found in the nucleus.
Subatomic particles	Particles smaller than atom, and make up an atom. Protons, neutrons and electrons. 65

Atomic Mass
- The number of protons & neutrons in the nucleus.

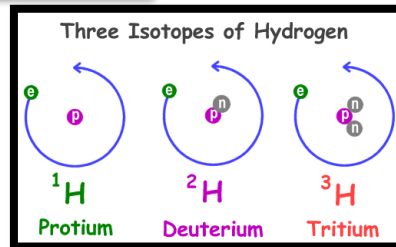
Atomic Number
- The number of just protons in the nucleus.

Number of protons = number of electrons



Atomic structure – protons and neutrons found in the nucleus. Electrons orbit the nucleus on electron shells.

Atoms of a single element that have different numbers of neutrons, but same number of protons.



	relative charge	relative mass
proton	+1	1
neutron	0 neutral	1
electron	-1	1 / 1840

KS4 Physics (CP6/SP6) – Radioactivity

These orbits (electron shells) are normally empty in neon atoms.

nucleus

If an atom absorbs energy, an electron can move to a 'higher' orbit.

When an electron returns to a lower orbit the atom emits energy as visible light of a particular wavelength.

Electrons can make all of these different orbit changes. Each different change produces a different wavelength of light.

B electronic configuration and energy level changes for neon

nucleus contains 3 protons

charge on nucleus is 3+

energy

D ionisation of a lithium atom

Ionisation
Sometimes an atom gains so much energy that one or more of the electrons can escape from the atom altogether. An atom that has lost or gained electrons is called an **ion**. Radiation that causes electrons to escape is called **ionising radiation**.

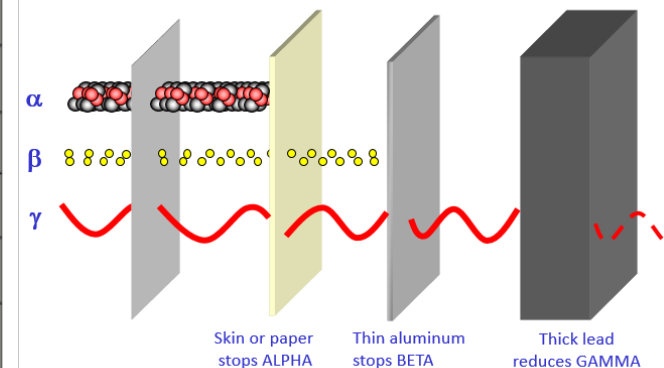
Type of nuclear radiation

Property	Alpha	Beta	Gamma
What is it?	Nucleus of a helium atom	electron	EM waves
Charge	+2	-1	None
Mass	Relative 4	Relative 0 (1/1840)	None
Range in air	3-5cm	15cm	Long range
Penetration ability	Low, stopped by paper	Increased, stopped by aluminium or lead	Great slowed by concrete, lead
Ionising ability	Highly <u>ionising</u>	Fairly	Least <u>ionising</u>
Effects of a magnetic field	Deflected	Deflected	Unaffected
Effects of an electric field	Attracted to negative electrode	Attracted to positive electrode	Unaffected

Particle	Symbol	
Alpha	α	${}^4_2\text{He}$
Beta	β^-	${}^0_{-1}\text{e}$
Positron	β^+	${}^0_{+1}\text{e}$
neutron		n

Dangers of radioactivity – can damage the DNA inside a cell. This damage is called mutation. Gene mutation that occur in gametes can be passed on to the next generation. Some mutations can cause cancer.

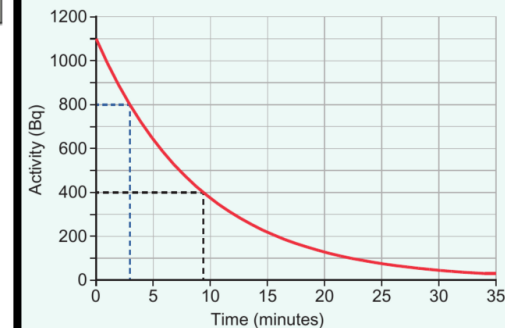
The penetration power of the three types of radiation.



Worked example

In figure D, the activity at 3 minutes is 800 counts per second. After one half-life the count rate will have decreased to 400 counts per second.

This occurs at 9.5 minutes, so the half-life is $9.5 - 3 = 6.5$ minutes.



D graph of activity against time for a radioactive substance

[Separates] Using radioactivity

- Killing microorganisms
- Radioactive detecting
- Diagnosing cancer - tracers
- Treating cancer
- Checking thickness of paper
- Smoke alarms – contains a source of alpha particles

[Separates] Radioactivity in medicine

- Radioactive materials are used to diagnose medical conditions without having to cut into a patient's body.
- Tracers that emit positrons – used to detect medical problems.
- Treating cancer – external radioactivity which uses a beams of gamma rays, x-rays or protons directed at the tumour.

Year 10 Art - GCSE DEVELOPMENT BOARD

- AO1: Developing ideas, artist research.
- AO2: Using resources, testing out ideas and media.
- AO3: Recording ideas, photos and drawings.

What needs to be included in a GCSE Development Board?

- Drawings /photographs to develop your own ideas - tonal and colour. (Linking to your artist's work.)
- X3 small experiments using artist's style/techniques.
- Artist response.
- Developed response..



How do I develop my ideas inspired by my artist's work?

- Decide what objects might link to your artist's work. Take photographs (Primary)find images on the internet of them (Secondary).
- Draw them in pencil, pen, pencil crayon and paint.



How do I create experimental pieces?

Take some of your drawings and try out your artist's materials and techniques on them to develop them further.

What is an artist's response and developed response?

- An **artist's response** is **your own work** developed further using the style/techniques/materials/ideas of your artist.
- A **developed response** makes you look again at what **other** materials and techniques your artist uses to further develop your own ideas.



A **Good development Board** should include drawings using a range of materials and techniques and show a clear journey towards your final piece.

Expert modelling example...



Development Board.



Response/Developed response

Wider Thinking:

[GCSE Art and Design - BBC Bitesize](http://www.studentartguide.com)
www.studentartguide.com

Stretch and Challenge:

Use materials and techniques with a high level of skill and control. Record finer surface textures and details.

Keyword	Definition
Tone	Refers to light and dark values.
Texture	Refers to the surface quality in a work of art. (How things look and feel.)
Colour	Colour has the strongest effect on our emotions. It is the element we use to create the mood or atmosphere of an artwork.
Record	To capture visual elements like proportion and form. For recording your ideas. It is important to observe your sources closely.
Artist Response	Your own work developed using your artist's work as inspiration.
Contextual	Connections made to the work of other artists from different and similar times, places and cultures.
Composition	Ways of arranging, organising and laying out elements in a piece of art and design.
Develop	Bring out potential.
Explore	Try out the qualities of materials, techniques or processes through practical investigation.
Imaginative	Develop ideas and concepts in new, engaging and inventive ways.
Refine	Improve initial work taking into account feedback and aims.



AO1 DEVELOP

DEVELOP ideas through investigations informed by **ARTISTS** and other sources, showing analytical and cultural **UNDERSTANDING**

AO2 EXPERIMENT

REFINE ideas through **EXPERIMENTING** and **SELECTING** appropriate resources, media, techniques and processes

AO3 RECORD

RECORD ideas, observation and insights **RELEVANT** to your **INTENTIONS**

AO4 PRESENT

Present a **PERSONAL** response, showing analytical understanding and realising **INTENTIONS** for your project, making connections in your work

Artist Response

Responding to the work of other **artists** is a great way to generate ideas. ... Starting with a direct **response** showing their understanding of the ideas and aesthetic of an **artist**.



How do I identify the formal elements of my major project: Cakes, Biscuits & Sweets?

- Artist's information/Inspiration
- What specific theme/genre are you going to study.
- Name a well known artist to take influence from within your chosen genre.
- Define Form/shape/pattern/experiment.
- Apply numerous techniques during development.

How do I create a response to chosen Artists work?

- Use the ideas behind an artists work to inspire your own designs.
- Watch a demonstration by your teacher.
- Use decorative/dyeing/printing/experimental Textiles techniques with skill and control.
- Create a response to your chosen artists work using influence from their work.

What needs to be included to ensure a successful final piece?

- Commit to design throughout project.
- Use shape, scale and proportion accurately.
- Make your work as detailed as possible using the Textiles techniques explored.
- Take inspiration from your chosen artist and show clear development in response to their work.
- Create a mock-up of a final product.
- Create final product signifying the conclusion to the journey you have created throughout your sketchbook.



<u>Keyword</u>	<u>Definition</u>
Observation	The action or process of closely observing or monitoring something or someone.
Silk Printing	A design is cut out of paper or another thin, strong material and then printed by rubbing, rolling, or spraying paint or ink through the cut out areas.
Fabric Manipulation	Experimenting with the fabric to change its appearance, drape or shape.
Influence	Something or someone that influences a person or thing, then, has an influence on that person or thing.
Moodboard	An arrangement of images, materials, pieces of text, etc. intended to evoke or project a particular style or concept.
Batik	A method (originally used in Java) of producing coloured designs on textiles by dyeing them, having first applied wax to the parts to be left undyed.
Applique	Layering pieces of fabric that are sewn or stuck on to a larger piece to form a picture or pattern.
Toile	An early version of a finished garment made up in cheap material so that the design can be tested and perfected.




Year 10 Business

LEARNING OUTCOME 4: Attracting and retaining customers


Knowledge Organiser - R064

- **Learning Aims 4.1+4.2:** Pricing a product, strategies and appropriateness of each






Factors to consider when pricing a product to attract and retain customers

Target market 	Price of competitor products 	Cost of production 
<p>When deciding on a price, a business will need to understand:</p> <ul style="list-style-type: none"> • The income levels of targeted customers • Whether or not the customers can afford the product <p>Example: family car versus sports cars</p>	<p>Research of similar products currently on the market will enable a business to sell their products at a lower price and attract customers away from competitors. Remember the price needs to be high enough to make a profit</p>	<p>A business needs to make sure that the costs involved when making the product are covered when pricing the product for sale. Otherwise, they will make a loss.</p> <p>Example, if it costs 49p to make a product and you charge 99p, a profit of 50p will be made each time the product is sold.</p>

Key Term

Pricing Strategies - various methods that a business uses to attract customers to a particular product by changing the regular price to one that is often cheaper to gain an edge against their competitors 

Pricing strategies

Type of strategy	Advantages 	Disadvantages 
<p>Competitive pricing: this is when a business sets the price of the product which is similar to their direct competitors</p>	<ul style="list-style-type: none"> • Will attract new customers to the business and retain existing customers • Competitors sales could decrease as they may not be able to compete with the low prices 	<ul style="list-style-type: none"> • Businesses must think of other ways to attract customers, not just price. • Profit could be low as the price may only cover the production costs of the product
<p>Psychological pricing: aimed at customers who like a bargain by setting a price for a product that appeals to customers because of the value for money that it appears to show</p> <p>Example: £299 instead of £300 </p>	<ul style="list-style-type: none"> • Could attract new customers which would increase revenue and profit for the business. • Items could be sold for a little less than their actual value • Attracts customers as the price appears to be a good deal 	<ul style="list-style-type: none"> • If customers are purchasing online, the price may appear to be good value, but when shipping costs are added, the purchase could be abandoned. • Most people are aware of this strategy so may not be convinced that it is a good deal.
<p>Price skimming: A business can charge a higher price due to a lack of competitors. Aimed at customers who like to have the latest product</p> <p>Example: Apple iPhone </p>	<ul style="list-style-type: none"> • High profits can be achieved by a business when there is no competition in the same market • High prices give an impression of a good quality product. 	<ul style="list-style-type: none"> • Competitors can produce a similar products for a cheaper price • Customers may be put off by a higher price, as not value for money. • Some customers may not be able to afford the new product.
<p>Price penetration: often used when a product launches, where a low price is set first to attract new customers and they gradually increased. </p>	<ul style="list-style-type: none"> • Achieves high sales for the duration of the offer. • Attracts customers to the product because of the price • Increase market share 	<ul style="list-style-type: none"> • Profit margins will be reduced during the offer period. • Not all products will suit this pricing method, such as short-term fashions.

LEARNING OUTCOME 4: Attracting and retaining customers

Key Term



Learning Aim 4.3: Types of advertising methods and the appropriateness of each

Businesses will use a variety of different method of advertising to inform customers of the different products that they are selling and to persuade them to purchase their products.

Advertising –how a business promotes the products and services that it sells to its customers using a variety of different ways depending on the budget they have to spent.

Knowledge Organiser – R064

Leaflets

Often used by small businesses to target customers in the local area – for example, menus at fast food take-away

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easy and cheap to produce • Inform customers about their products • Can target specific local areas • Large or small distribution • Attractive and eye catching 	<ul style="list-style-type: none"> • Are often discarded once read • Are a form of junk mail, which may not be read by customers • May be of poor quality, giving a poor impression of the business • Poor impact of sales.

Websites

Website inform customers of the products they sell and allow purchasing online

Advantages	Disadvantages
<ul style="list-style-type: none"> • Can increase sales by ordering directly from the business • Can target customer for special offers • Pay to put adverts on search engine results pages and for pop ups. • International customers 	<ul style="list-style-type: none"> • Customers who do not have internet access will not be informed about products. • Customer feedback could be negative • Customer details or company data could be hacked

Magazines

Usually issued on a weekly or monthly basis and are aimed at a specific target market

Advantages	Disadvantages
<ul style="list-style-type: none"> • They often compliment the content of the magazine • Readers tend to keep magazines longer than newspapers • Magazines will be given to others 	<ul style="list-style-type: none"> • Adverts can be very expensive in specialist magazines • They contain lots of other adverts, so businesses need to make sure their advert stands out.

Radio

Radio reaches local, national and worldwide audiences, therefore the adverts could be heard by a large audience, depending on the radio station

Advantages	Disadvantages
<ul style="list-style-type: none"> • Local radio adverts are cheap and easy to produce • Local radio adverts target a specific geographical audience • Music and words can grab the attention of the listener • National and international radio stations have a wide audience • 'listen again' enables listeners to hear a specific radio show again, including the adverts. 	<ul style="list-style-type: none"> • Peak listening times between 7-9am and 5-7pm will often be more expensive due to the increase in listeners. • The radio is often a background sound so some may not hear the adverts • 'listen again radio shows have an expiry date – normally 7 days.

Social Media

Social media is a useful method of informing users of new or existing product offers.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Users can access the material often • A cheap method of advertising • Fast communication with customers <ul style="list-style-type: none"> • Proven to increase sales • Could generate international customers. 	<ul style="list-style-type: none"> • Information needs to be update frequently • Customers must be social media savvy • Limited to a specific age group of customers • Resources for monitoring is needed daily

Newspapers

Adverts appear in various sizes, colours and shapes. Can be placed daily or weekly. Free and local papers are cheap

Advantages	Disadvantages
<ul style="list-style-type: none"> • Specific target groups per paper. • Free or low cost for local papers • Middle ages/ older target market • National papers have wide audience 	<ul style="list-style-type: none"> • Newspaper reading has fallen in the last 10 years. • National papers are more expensive • Younger readers are less likely to read.

Knowledge Organiser - R064

Learning Aim 4.4: Sales promotion techniques

Sales Promotion – offers that a business promotes to encourage more sales for their business.

Discounts are a good way to get customers to notice a product, such as:
Why a business reduces the price of a product for example 10% off
After a seasonal period has ended, further discounts could be offered which would be good for customers but not for profits



Advantages	Disadvantages
Products are noticed more by new customers which would generate more sales in the long term.	Profit made on the item is reduced during the promotion.

Competitions can general sales, if the prizes are something the customer wants to try and win. Usually appear on the side of packaging.



Advantages	Disadvantages
Competitions have been around for many years and can be a way of gaining new customers.	Often people do not see the competitions on the packaging or may not be interest in the prize.

Buy one get one free (BOGOF) is where a customer purchases one product at normal price and then gets another for free, making the value to the customer greater.



Advantages	Disadvantages
Businesses use this strategy to generate more sales of a product to sell off old stock or if they are going to rebrand a product with new packaging	The products profit margins are reduced as a result of this promotion method

Point of sale advertising is when customers go to the checkout to pay for items and the advertising of other items entices the customer to purchase an extra item.

Example: supermarkets which confectionary items



Advantages	Disadvantages
Impulse purchases are made by customers and the products are easily accessible for customers	It can encourage customers to buy unhealthy food choices and generate bad publicity for a business.

Free gifts can provide an incentive for a customer to purchase a particular product compared to a competitor. For example a free toy, quiz book or shower gel.



Advantages	Disadvantages
Free gifts can increase sales and profits at the time of the offer for the business.	Customers may expect to receive a gift every time they make a purchase and there is a time limit for the promotion before returning to normal offering.

Product Trials is when business want the views of customers about a new product For example taste testing



Advantages	Disadvantages
Instant feedback is gained from customers New sales can be generated increasing business sales	If the product is not liked, money will have been wasted on producing it. There may be regional variation

Loyalty schemes are popular with supermarkets. Customer collect points which can be exchanged at a later date for other goods.

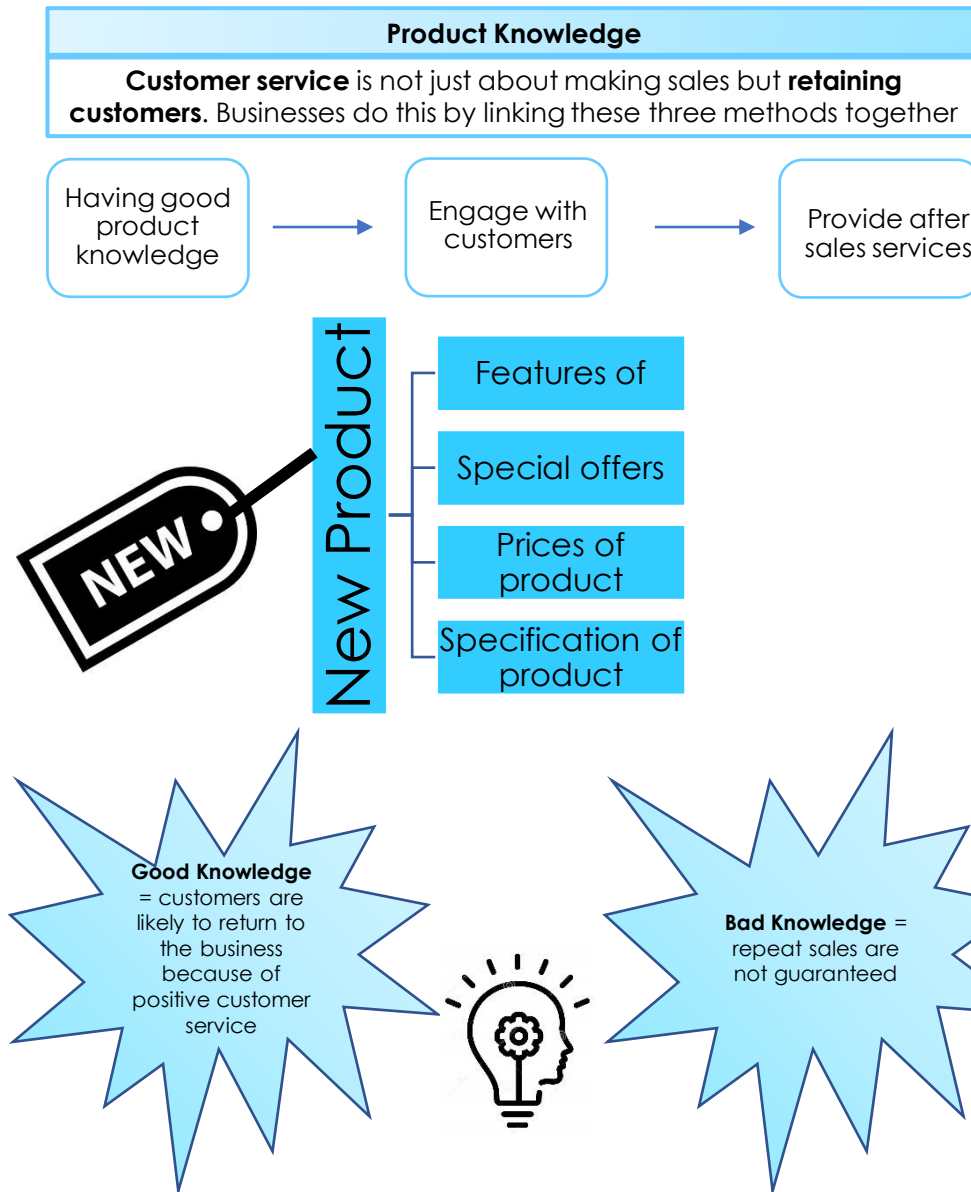


Advantages	Disadvantages
Encourages repeat customer for the business Market research can monitor shopping habits Special offers can be targeted to specific customers.	Customers may not be interest in a loyalty scheme Customers may forget their loyalty card, missing out on gaining points Loyalty cards are not as popular as they once were.

LEARNING OUTCOME 4: Attracting and retaining customers

- **Learning Aim 4.5:** How customer service attracts and retains customers

Knowledge Organiser - RO64



Key Terms



Customer service – a key functional area which deals with a variety of different needs and questions from customers, before, during and after sales have been completed.

Retaining customers – methods adopted to encourage customers to return to the business to purchase more products in the future.

Product Knowledge – is a detailed understanding of the product that a business sells.

Customer Engagement

Customer engagement means that staff needs to:

- Have good listening skills
- Be patient to understand the customers' needs and wants
- Know the customer requirements
- Have good product knowledge
- Have excellent personal presentation
- Remain professional at all times



After-sales service

After-sales service will be used by customers if there is an issue with the product that they have purchased. Businesses hire staff to deal with issues such as deliveries, faulty products, damaged goods, exchanges or advice on how to use the product.

It is important that they staff are trained to:

- Deal with angry or upset customers
- Resolve an individual's issue

They must remain helpful, friendly, calm and professional at all times



- **LO5: Understanding factors for consideration when starting up a business**

There are several different types of business ownership. In this section, we will learn about what these are, the main features, the responsibilities of the owners and how the type of ownership usually relates to the size and scale of the business.

Limited Company

A limited company is a business owned by shareholders and run on a day-to-day basis by directors

Private Limited Company (LTD)



Public Limited Company (PLC)

Both LTD and PLC have the same advantages and disadvantages

Advantages

- Each Shareholder has limited liability
- Easier to raise finance
- It is easier for the business to borrow money

Disadvantages

- Expensive to set up
- Less control over the company
- The company must pay an annual fee and product yearly documents

The **main difference** between a LTD and a PLC is that in a **private limited company the shares are not offered for sale to the general public** where as in a **public limited company they are!**

- **OWNERSHIP FOR BUSINESS START-UPS**

The Private Sector



The private sector includes businesses that are owned by private individuals. Business in the private sector include:

- **Sole Traders**
- **Partnerships**
- **Private limited companies (LTD)**
- **Public limited companies (PLC)**

The Public Sector



The public sector is made up of::

- **Central government**
- **Local government**
- **Business that are owned by the government – Post office**

Unlimited Liability

The owners of the business are personally responsible for the debts of that business. This applies to sole traders and partnerships.

Limited Liability

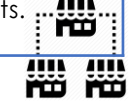
The owners of the business are **NOT** personally responsible for the debts of that business. If the business goes bankrupt the owners are not personally liable.

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **OWNERSHIP FOR BUSINESS START-UPS**

Sole trade	Partnership	Franchise
An individual person owns a business. unlimited liability They can employ other people. Some examples include – hairdressers, plumbers or electricians.	Two or more people own a business. unlimited liability Jointly responsible for the business. Some examples are solicitors, small restaurants, dentists, vets	A franchise is when one business, the franchisor. Gives permission to an entrepreneur, the franchisee, to set up a business using its brand name and its products.



Advantages



- Shared responsibility
- Shared workload
- Partner – brings different skills and attributes
- More capital – investment from different partners

Advantages



- Easy to set up with low cost
- Decide what happens to the profit
- Choose their own working hours and holidays
- Limited legal requirements in relation to accounting

The franchisee:

- Pays a start-up cost – this covers equipment and sometimes a premises.
- Pays a royalty each year – this is a percentage of the revenue earned.
- Must follow the rules laid down by the franchisor.

The franchisor:

- Provides equipment and resources
- Provides training

Disadvantages



- Growth slow – due to amount of money available
- Limited amount of work one person can do
- Long working hours (hard to take holidays)
- Unlimited liability – must pay for all debts

Disadvantages



- Cannot make a decision without all partners agreeing – time consuming
- Problems agreeing can lead to disagreements and conflict
- Share profits
- Partners reputation affects business

Advantages



- Easier to raise finance as the brand is well known
- Support and training is offered
- Easier to gain customers as brand is already established

Disadvantages



- Rigid rules to be followed
- Start-up costs and operating fees are expensive

- **LO5: Understanding factors for consideration when starting up a business**

- **SOURCE OF CAPITAL FOR BUSINESS START-UPS**








When starting and setting up a new business, it is vital that the owner is able to secure the capital (finance or money) required to fund the businesses.









The appropriateness of each source of finance will depend on a number of factors:

- Purpose – what does the business require the money for?
- Time period – how long does the business need the money for?
- Amount – how much money is required?
- Type of business – the size and ownership of the business will affect the type of finance that is available.

Source of Finance	Description
Bank Loan 	An amount of money is borrowed from the bank, then repaid (with interest) over a set period of time
Crowd funding 	Groups of investors that join together to offer funding to a business
Small Business Grant 	Money given to the business by the government or charity Used to help finance new projects – especially those that create new jobs
Business Angel 	Finance invested in small, risky business e.g. new business start-ups by experienced and wealthy entrepreneurs
Owners Savings 	Money put into the business by the owner

- **LO5: Understanding factors for consideration when starting up a business**

- **SOURCE OF CAPITAL FOR BUSINESS START-UPS**

Source of Finance	Advantages	Disadvantages
Borrow money from friends / family 	<ul style="list-style-type: none"> • May charge little or no interest • Do not have to provide security 	Could lead to disputes between family members and friends <ul style="list-style-type: none"> • May not be able to lend large amounts
Own savings 	<ul style="list-style-type: none"> • Does not have to be paid back 	There may be a limit to the amount of money which can be invested
Crowd funding 	<ul style="list-style-type: none"> • It can be a fast way to raise finance with no upfront fees • Can be a valuable form of marketing and result in media attention 	If the target is not reached, all the money will have to be paid back <ul style="list-style-type: none"> • Someone can steal your idea if it is not protected
Small business grants 	<ul style="list-style-type: none"> • Does not have to be paid back • Do not need to lose control of your Business 	there may be strict rules and not every business is eligible
Bank Loans 	<ul style="list-style-type: none"> • The repayments can be spread out over a long period of time • Access to larger amounts of finance 	Must be paid back with interest <ul style="list-style-type: none"> • Lender may require security for the loan
Business angels 	<ul style="list-style-type: none"> • BA have lots of experience which helps with decision making • Can bring in large amounts of finance • No repayments or interest 	the owners lose a certain percentage of the business

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **THE IMPORTANCE OF A BUSINESS PLAN**



What should a business plan include?

A simple description of the business or idea
 Business aims and objectives – the goals the business would like to achieve
 Key business targets – goals that need to be met
 Business strategies – long term plan of action
 Plans and forecasts – demonstrates how the business will operate e.g.

What is a purpose of a business plan?



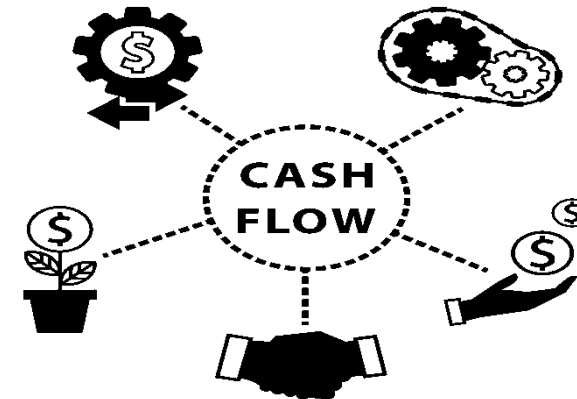
1. It helps the business to manage its cash flow – breakeven analysis, profit forecasts – how much to spend on, where to spend money on, when to spend money
2. It explains a business idea to others – you can show a business plan to a bank to help get a bank loan
3. It measures progress towards goals – e.g. time scales, sales forecasts, when will we the business get money back
4. It helps to identify potential problems – e.g. any financial shortages



Importance of cash flow?

If a business runs out of cash, it will not be able to pay for its workers or stock. If this happens, the business is then classed as insolvent. The owners will either have to raise additional money or close the business.

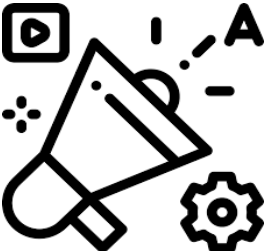





To prevent this from happening, a business will carefully monitor its cash flow to ensure it has sufficient money to pay its liabilities. The business will often plan ahead by preparing a cash flow forecast.



LEARNING OUTCOME 6:

- Learning Aim 6.1 The purpose of each of the functional activities that may be needed in a new business and the main activities of each functional area

Knowledge Organiser - R064

Functional Areas	
<p>Marketing Identifies the needs and wants of their customers. Develop products that customers would want to purchase</p>	   
<p>Finance Manage all the finances for the business and record and report on financial performance.</p>	
<p>Human Resources (HR) Responsible for managing individuals work for the business.</p>	
<p>Operations Organise and cost how the products will be processed, made and delivered to their customers.</p>	
<p>Marketing Responsible for completing market research, developing the 4p's, understanding and services that the business produces. This is sometimes known as the marketing mix. Satisfying the needs and wants of the business' customers</p>	<p>Finance Responsible for all things finance related.</p> <ul style="list-style-type: none"> • Paying employees ▪ Making and receiving payments ▪ Recording financial transactions ▪ Preparing annual financial accounts including statement of financial position and income statement ▪ Cashflow forecasts and financial performance
<p>Human Resources (HR) HR recruit and select employees what will work for the business. They manage the performance of the employees and ensure that health and safety and employment legislation is complied with. Focus: Training, Health, Employment (legislation) Safety, Recruitment, Performance</p>	<p>Operations Responsible for managing the production processes (logistics). They plan this process making sure that they have:</p> <ul style="list-style-type: none"> • All the necessary raw materials <ul style="list-style-type: none"> • Working machinery • Staff to operate equipment • Quality control (ensuring the finished products meets the standards that are expected)
<p>Key Terms</p> <p>Functional activities- The range of tasks that each functional area will complete within their area of specialism.</p> <p>Functional areas The different sections of a business which are divided into different areas of expertise.</p> <p>4P's-stands for Product, Price The different sections of a business which are divided into different areas of expertise.</p> <p>Logistics How a business manages the production of their product from manufacture to point of sale</p> <p>Quality control Ensuring the finished product meets the standards that are expected</p> <p>In a small business, some of the tasks may be completed by one or two people. In a larger business, they will have many people working within each functional area due to the size of the business.</p>	
<p>Advantages of having a small business</p> <ul style="list-style-type: none"> • Staffing costs are small • Communication is often much easier if information needs to be sought 	<p>Disadvantages of having a small business</p> <ul style="list-style-type: none"> ▪ may not have the knowledge all skills to complete all the tasks well ▪ Vital mistakes could be made ▪ Mistakes can cost the business their reputation or financial fines, for example if bills are not paid in time. 

Constant

Value STORED IN A **MEMORY LOCATION** that **never changes WITHIN A PROGRAM**

Variable

Value STORED IN **MEMORY LOCATION** that **can change WITHIN IN A PROGRAM**

Sequence: Completing steps in the order which they must happen

Selection: Where a choice is made in a program depending on a condition or outcome

Iteration: Act of repeating or lopping specific sections of code

Count controlled Iteration:

Repeats a set number of times

Condition controlled: Repeats until a condition is met or something in the program changes

Careers

- Software development
- Programing
- Software Engineering

Syntax Error

An error in the rules/grammar of the language Eg missing colon / spelling mistake

Logic Error

The program is written to do something other than what the programmer intended
Eg Resetting only the first 9 elements in an array instead of all 10.

Run Time Error:

More difficult to spot as it can run a program without reporting an error. E.g. runs but Doesn't give an output. Or the program hangs or Becomes inactive

Data Types

Real /Float

Number with decimal Point

Integer

Number without a decimal Point

String

A series of characters/TEXT

Character

A single letter or symbol

Date/Time

Date and Time in any format

Boolean

Yes no, true false value

Other Info

Concatenate

To join different data types together

Comments

Use these to add comments in to your code to explain what you have done

Validation: An computer check to ensure that the data entered is sensible and reasonable. It does not check the accuracy of data.

Comparison Operators

==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

Aritmetic Operators

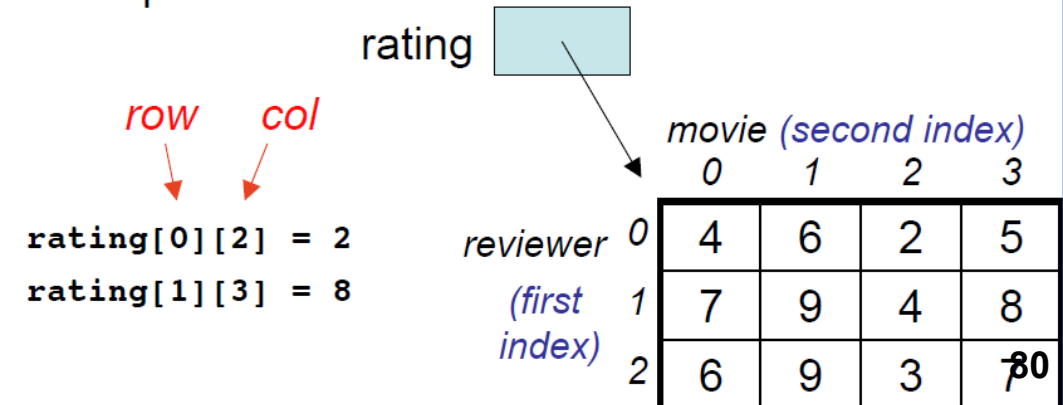
+	Addition eg $x=6+5$ gives 11
-	Subtraction eg $x=6-5$ gives 1
*	Multiplication eg $x=12*2$ gives 24
/	Division eg $x=12/2$ gives 6
MOD	Modulus eg $12\text{MOD}5$ gives 2
DIV	Quotient eg $17\text{DIV}5$ gives 3
^	Exponentiation eg 3^4 gives 81

Careers

- Software development
- Programing
- Software Engineering

TYPE	INFO	SYNTAX
LIST	MUTABLE DIFFERENT DATA TYPES	[] E.G. [1,"HELLO", 3.4]
TUPLE	IMMUTABLE DIFFERENT DATA TYPES	() E.G. (1,2, "Hello", 4.3)
ARRAY	IMMUTABLE SAME DATA TYPE	[] E.G [1,2,3,4]

- Two-dimensional (2D) arrays are indexed by two subscripts, one for the row and one for the column.
- Example:



Careers

- Software development
- Programing
- Software Engineering

Data Representation

Binary to denary

1 = On 0 = Off

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

$$32 + 16 + 4 = 52$$

Binary 00110100 = 48 Denary

Denary to Binary

24 =

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

Binary to Hex

00111010

8	4	2	1	8	4	2	1
0	0	1	1	1	0	1	0

3 A

Hex to Binary

4B

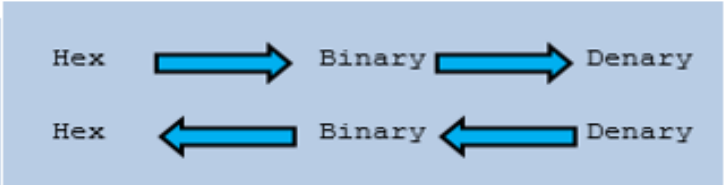
8	4	2	1	8	4	2	1
0	1	0	0	1	0	1	1

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

HEXDECIMAL
BASE 16. Uses 0-9 and then A-F
 Notice that we use the values A-F to represent 10-15

- 0-9
- A = 10
- B = 11
- C = 12
- D = 13
- E = 14
- F = 15

Binary	Base 2	0, 1
Denary	Base 10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hex	Base 16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F



- Careers**
- Software development
 - Programming
 - Software Engineering

Binary Addition

Binary addition rules:
 0 + 0 = 0
 0 + 1 = 1
 1 + 0 = 1
 1 + 1 = 0 carry 1
 1 + 1 + 1 = 1 carry 1

```

0 0 0 1
+ 0 0 1 0
-----
0 0 1 1
          
```

```

1 0 0 1
+ 1 0 1 0
-----
(1)0 0 1 1
          
```

```

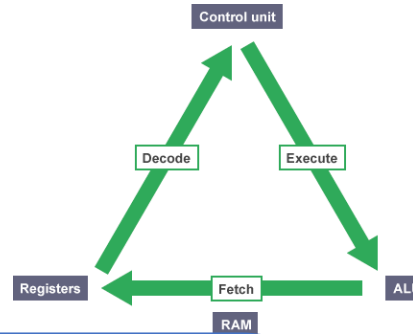
      1
1 0 0 0 1 0 0 1
+ 1 0 1 0 1 0 1 0
-----
(1)0 0 1 1 1 0 1 1
          
```

There is not enough bits available to store the answer, so an **overflow error** has occurred

VON NEUMANN ARCHITECTURE

describes a system where the CPU runs programs stored in memory. Programs consist of instructions and data which are stored in memory addresses as binary digits

In short this is the internal, logical structure and the organisation of the computer hardware



Possible Careers

- Computer hardware engineer
- Computer developer
- System Engineer

CPU - summary

- Fetches instructions (from memory)
- Fetches data (from memory)
- Decodes instructions
- Executes instructions

PROGRAM COUNTER (PC)

STORES THE LOCATION OF THE NEXT INSTRUCTION IN A PROGRAM WAITING TO BE FETCHED

MEMORY ADDRESS REGISTER (MAR)

STORES THE LOCATION FOR DATA TO BE FETCHED FROM OR SENT TO MEMORY

MEMORY DATA REGISTER (MDR)

STORES THE DATA THAT HAS BEEN FETCHED FROM OR IS WAITING TO BE SENT TO MEMORY

ACCUMULATOR

STORES THE RESULT OF THE CALCULATION PERFORMED BY THE ALU

CURRENT INSTRUCTION REGISTER

STORES THE INSTRUCTION READY TO BE DECODED BY THE ALU

ARITHMETIC LOGIC UNIT (ALU)

part of a (CPU) that carries out arithmetic and logic operations in computer instruction

CONTROL UNIT (CU)

WORKS WITH THE CPU TO CONTROL THE FLOW OF DATA WITHIN THE SYSTEM AND TO DECODE INSTRUCTIONS

CACHE

SMALL TEMPORARY VOLATILE MEMORY, STORES FREQUENTLY USED INSTRUCTIONS. QUICKER FOR CPU TO ACCESS THAN MAIN MEMORY

MAIN MEMORY (RAM)

This the volatile memory that stores data and programs **currently in use**.

Fetch- Decode – Execute cycle – How the CPU processes instructions:

FETCH:

The processor checks the program counter to see which instruction to run next.

The program counter gives an **address value** in the memory of where the next instruction is.

The processor fetches the instruction value from this memory location.

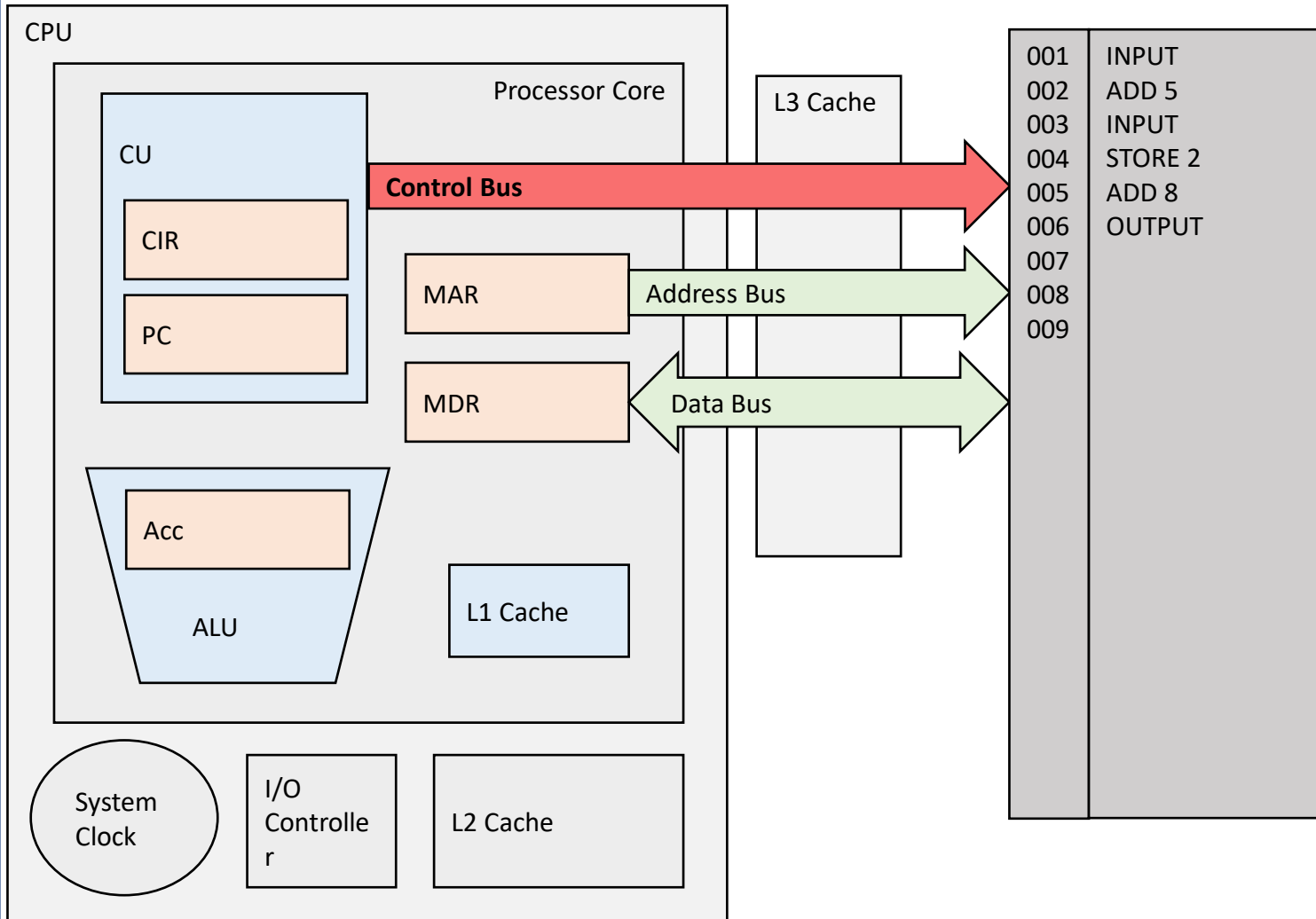
DECODE:

Decoding the instructions in the the **ALU**, storing the result of this in the CIR.

EXECUTE:

The instruction is performed. Once this is complete, the processor goes back to the program counter to find the next instruction.

This cycle is repeated until the program ends.



1. Contents of Program Counter (PC) assigned to Memory Address register (MAR)

2. PC incremented by 1 and assigned to PC.
 AT THE SAME TIME the addressed contents of memory is assigned to the MDR (memory Data register)

3. Then the contents of MDR is assigned to CIR (current Instruction register) the instruction is decoded and executed

4. The Instruction is decoded in the ALU where all logical and arithmetic calculations are performed. The results of this are stored in the Accumulator.
 The instruction is then executed and the cycle starts again

What is the purpose of the CPU?

It Processes Data by fetching, decoding and executing instructions.

HINT: when you answer this type of exam question – you need to EXPLAIN WHY - putting more cores = better performance isn't enough!

FACTORS AFFECTING PERFORMANCE OF CPU:

Clock Speed (measured in Hertz)

- Represents the number of fetch execute cycles / instructions the CPU can process in a given time
- The higher the clock speed the faster the CPU will run **WHY? – Because it will be doing more Fetch-Decode and Execute cycles per second which means more instructions are being processed.**

Cache Size

- The holding area for data from the RAM – stores frequently used instructions. More cache then the better the performance. **WHY? The more cache the CPU has the less time is spent accessing memory (RAM) this means it can retrieve instructions quicker and programs can run faster.**
Level 1 Cache – Quicker to access, doesn't store as much, Level 2 = slightly slower to access, holds slightly more than L1, Level 3 = Even slower to access than L2, but can hold even more

Number of Cores

- Number of Independent processors within the CPU.
- Multiple Instructions able to be processed simultaneously in the same cycle
- The more cores the quicker the performance – **WHY? Quad Core = 4 cores. Can perform 4 instructions at same time in same cycle, 8 cores can perform 8 instructions simultaneously so more cycles/instructions are being processed per second**

EMBEDDED SYSTEMS:

They are dedicated systems that are designed for a fixed purpose. They are a system within a larger system
e.g. Washing machines, car park barriers, microwaves, car engines, MP3 etc

GENERAL PURPOSE SYSTEM:

A machine that is capable of carrying out some general data processing under program control. Your PC /laptop is an example of this but also it could be something far more basic too.



Operating Systems

Manages hardware and software in a computer system

Memory Management

Controls where the programs go in memory when being run.

User Interface

Provides a method of interaction with the user.

MultiTasking

Allows more than one program to run at once by sharing CPU time between programs.

Peripheral Management & driver software

Manages all Input, Output and Storage devices. Allows the OS and the external hardware such as printers, USB's etc to talk to each other

Security

Protects the machine is free from harmful viruses or unwanted access.

File and Disk Management

Helps to store files (images, music, documents etc) and their file extensions, helps you organise and search for files

Disk management such as space on hard drives, and utility software such as disk defragmentation software.

User management

The OS can deal with User accounts – single or multi users – eg. More than one person can use a computer at once. It also allows for user access, e.g. logging in to a system and having access to certain files and permissions etc. OS is also responsible for things like biometric anti-theft measures, fingerprint, and retina scanners.

Possible Careers

- Software Developer
- Data Analyst
- System Analyst
- Teaching

Systems software – Designed to run and maintain a computer system
Examples

UTILITY SOFTWARE

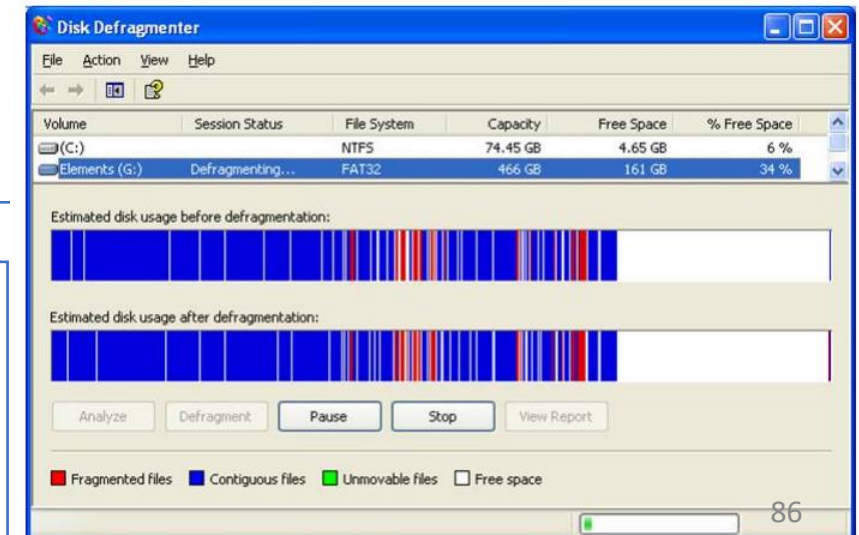
Helps to maintain or configure a computer. Most are installed in the OS but you can add others.

Disk Defragmenter

Moves (parts of) files around so that all parts of a file are stored together (allowing files to be accessed more quickly)

Free space is collected together (allowing large files to be saved easily)

Disk Defragmenter



System Cleanup (Utility)

(Searches for and) deletes files/programs which are no longer used
... eg deletes temporary files / installation files
... deletes settings / registry values which are no longer used

System Information Utility

displays important data about the current state of the computer
· e.g. temperature, free memory, network speed, % processor used

UTILITY SOFTWARE

Helps to maintain or configure a computer. Most are installed in the OS but you can add others

Back-ups

Back up data – copy of a system files and settings stored somewhere externally

Full back up – copy of EVERY file is taken. **Faster to restore from**
Uses A LOT of storage space, can take a long time to create

Incremental Back up – only files created and edited since the last back up are copied. **Uses LESS storage and much QUICKER to create. BUT full system restore is SLOW**

Data Compression

Reduces the size of files so they take up less disk space. Can help upload and download files quicker or send them across email. Standard formats include .zip and .rar to compress the files

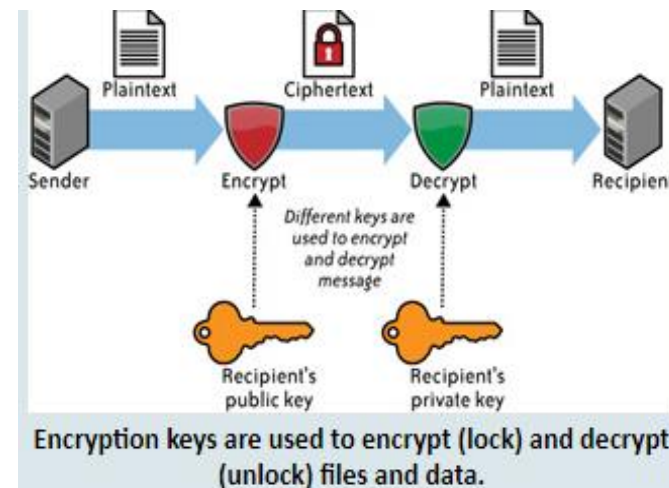
Encryption

Scrambles (encrypts) data – this stops people from accessing it. Encryption happens by scrambling the message, you can only decrypt this if you have a special 'key'

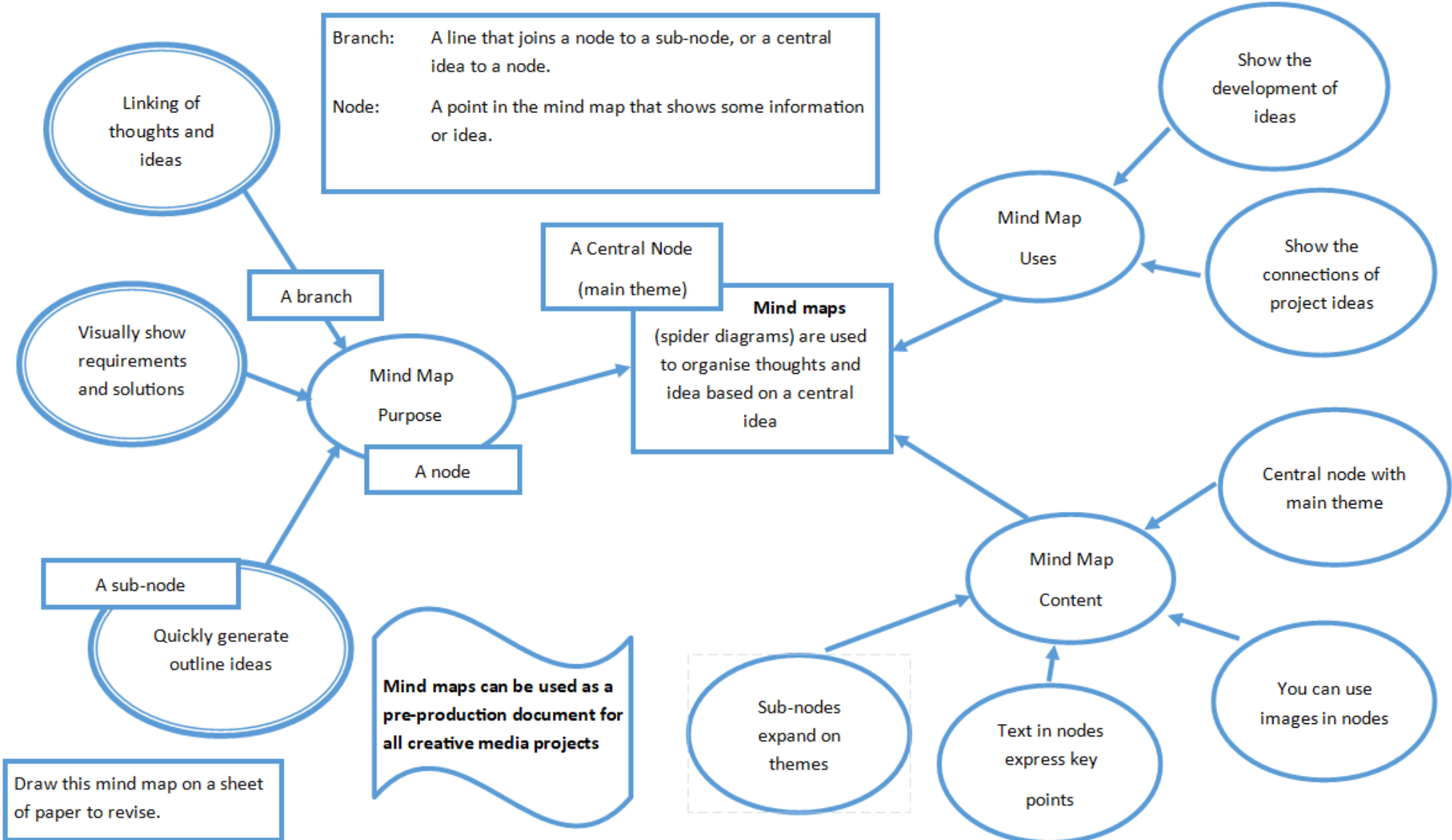
Encrypted text is called – Cipher text

Decrypted is called Plain text

Encryption is essential for sending data over a network e.g. internet so it is kept secure



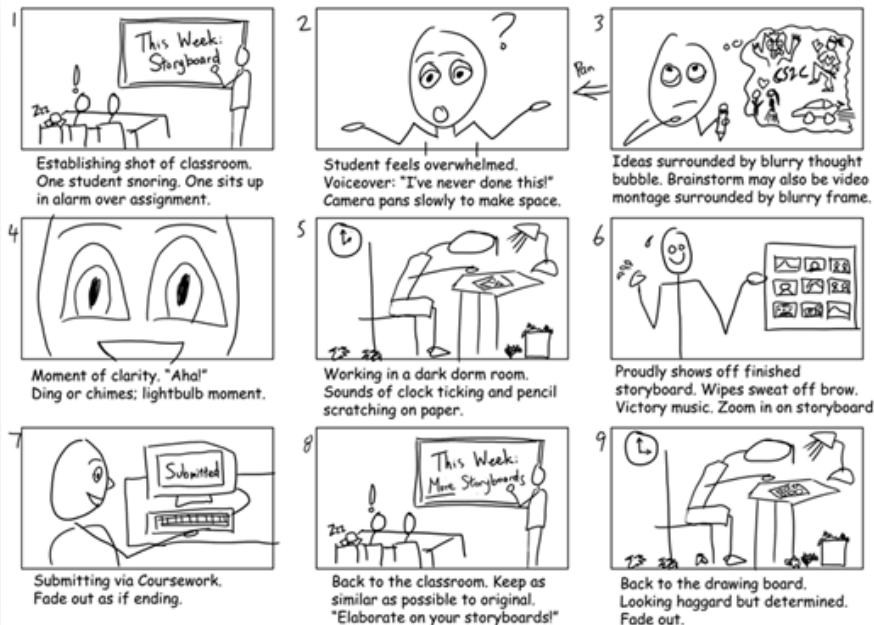
You must be able to understand the purpose and use the content of different pre-production documents



You must be able to understand the purpose and use the content of different pre-production documents

Storyboards

- ⇒ A storyboard is used by many people to illustrate a sequence of **moving** images.
- ⇒ A storyboard shows the flow of scenes that occur in a timeline, a succession of events.
- ⇒ This is different to a visualisation diagram which are used for a single of events.
- ⇒ Each scene of the story is placed in chronological order (in the order



Why use storyboards?

Best way to share your vision for the project

- ⇒ A visual aid makes it much easier for you to share and explain your vision for your video with others.
- ⇒ When you have a storyboard, you can show people exactly how your video is going to be mapped out and what it will look like. This makes it much easier for other people to understand your idea.

Makes production much easier

- ⇒ When you storyboard a video you're setting up a plan for production, including all the shots you'll need, the order that they'll be laid out, and how the visuals will interact with the script.
- ⇒ The storyboard is a starting point or suggested storyline around which you can plan your story (all the angles you will shoot of a scene). This really comes in handy when you're making your video, as it ensures you won't forget any scenes and helps you piece together the video according to your vision.

Saves you time

- ⇒ While it may take you a little while to put your storyboard together, in the long run it will save you time in revisions later.
- ⇒ Not only will it help you explain your vision to your team, it will also make the creation process go more smoothly.

You must be able to understand the purpose and use the content of different pre-production documents

Storyboard and camera angles

- ⇒ The storyboard could be used by several people who could be involved in the production process.
- ⇒ Camera shots and angles are important aspects to a storyboard
- ⇒ The camera operator or animator will use the storyboard to decide how to create each scene.
- ⇒ Each scene is usually defined by changes to the camera use for each shot.



Establishing Shot



Full Shot



Medium Shot



Close Shot



Extreme Close Shot



Up Shot



Down Shot



Over The Shoulder



Two-Shot



POV shot

wiki How to Draw Storyboards

Purpose of a storyboard

- ⇒ To provide a visual representation of how a media project will look along a timeline
- ⇒ To provide a graphical representation of what a sequence of movements will look like
- ⇒ To provide guidance on what scenes to film or create
- ⇒ To provide guidance on how to edit the scenes into a story

Uses of a storyboard

- ⇒ Any project where movement or a sequence is required, especially along a timeline, for example
 - ◇ Video projects
 - ◇ Digital animations
 - ◇ Comic books to illustrate the story
 - ◇ Computer games, to illustrate game flow, narrative or story
 - ◇ Multimedia projects, to illustrate the sequence between scenes

Content of a storyboard

- ⇒ Images, for content of each scene
- ⇒ Locations
- ⇒ Camera shot type and angles
- ⇒ Cameral movement
- ⇒ Shot length and timings

Year 10 – Cambridge National IT - Visualisation Diagrams

You must be able to understand the purpose and use the content of different pre-production documents

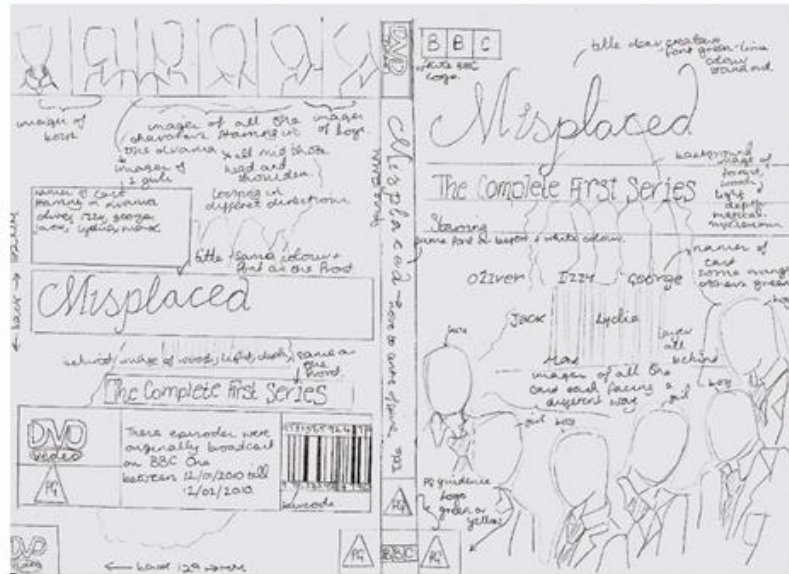
Visualisation Diagrams

Visualisation diagrams are a rough drawing or sketch of what the final static image product is intended to look like. They will have annotations to describe the design ideas. Typically, a visualisation diagram is hand drawn, but it does not need any artistic skills to communicate ideas.

It is intended to demonstrate the layout and content of the product that is being illustrated

You might produce several drafts to demonstrate ideas to your client. Your client might choose the draft they like the most. There must be sufficient information in the visualisation diagram for the client to make a decision about their preferred design.

Visualisation diagrams are valid for static designs, that is an image that does not move. It is, therefore, relevant for designs such as a magazine cover, a DVD cover, or an image for a website. It would not be suitable for a video or an animation.



Look closely at the detail in the example visualisation diagram. Compare the concepts in the visualisation diagram and compare them to the final product that was produced. Do you notice the similarities and the differences.

Notice how the visualisation diagram was not modified as ideas developed in the pro-

Purpose:

- ⇒ Plan the layout of a static or still image in a visual manner
- ⇒ To show how a finished item might look like

Uses :

- ⇒ CD/DVD cover design
- ⇒ Poster, such as for a film, event, leaflet or advertisement
- ⇒ A single game scene or display of a single scene

- ⇒ Comic book page layout
- ⇒ Web page layout
- ⇒ Magazine front cover

Content:

- ⇒ Multiple images, layout and positions of items.
- ⇒ Colours and colour schemes
- ⇒ Position and styles of text
- ⇒ Fonts, font colours and size
- ⇒ Notes as annotations which provide

Key Vocabulary

Algorithms	A set of rules or instructions to be followed.
Flowcharts	A graphical way of showing an algorithm.
Selection	Deciding what code to run based on a decision or answer to a question. E.g an IF statement.
Sequence	A set of instructions that are completed in the exact order that they are written.
Iteration	Where a set of instructions is repeated. E.g a while loop, for loop and repeat until loop.
Input	Data that is given to the computer or program to then use.
Output	Information that is provided by the computer or program.
Procedure	A group of instructions grouped together that can be used by the main program.
Variable	A name given to a value in a program that can change when the program is running.

Data Types

Real /Float

Number with decimal Point

Integer

Number without a decimal Point

String

A series of characters/TEXT

Character

A single letter or symbol





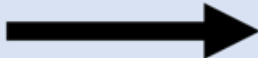
Date/Time

Date and Time in any format

Boolean

Yes no, true false value

Flowchart Symbols

	Used at the start and end of a flowchart.
	Controls all the inputs and outputs.
	General instructions and calculations carried out by the computer.
	Where a question/decision is asked. Must have a 'Yes' and 'No' output.
	Used to connect flowchart symbols to show the direction of flow in the program.



Always start and end with this

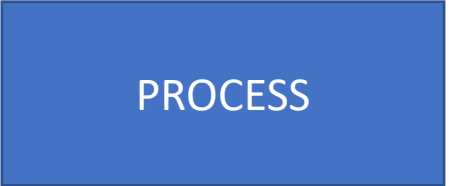


Sequence that performs a specific task.

You can use this within your flowchart to show more detail in a specific section

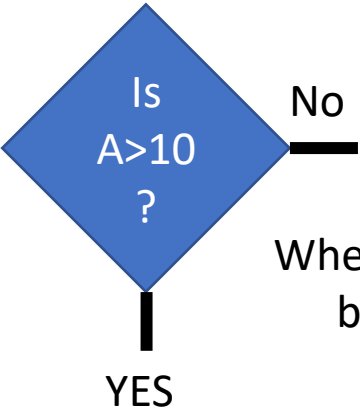


Use when there is an input or output required e.g. user inputs their name, program displays their name

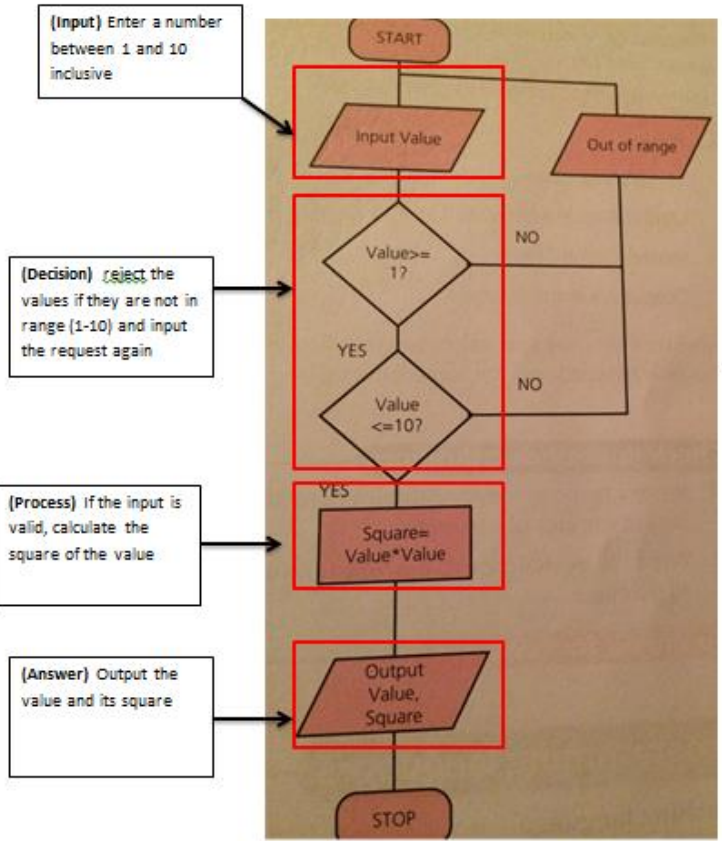


To do something in the program e.g a calculation

Decision



When a **choice** has to be made in the program



(Input) Enter a number between 1 and 10 inclusive

(Decision) reject the values if they are not in range (1-10) and input the request again

(Process) If the input is valid, calculate the square of the value

(Answer) Output the value and its square



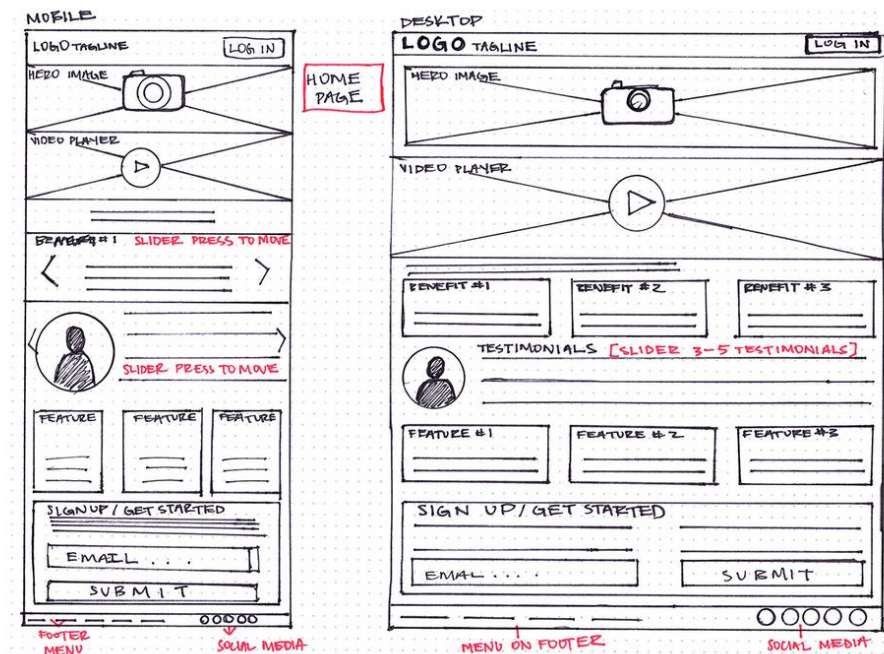
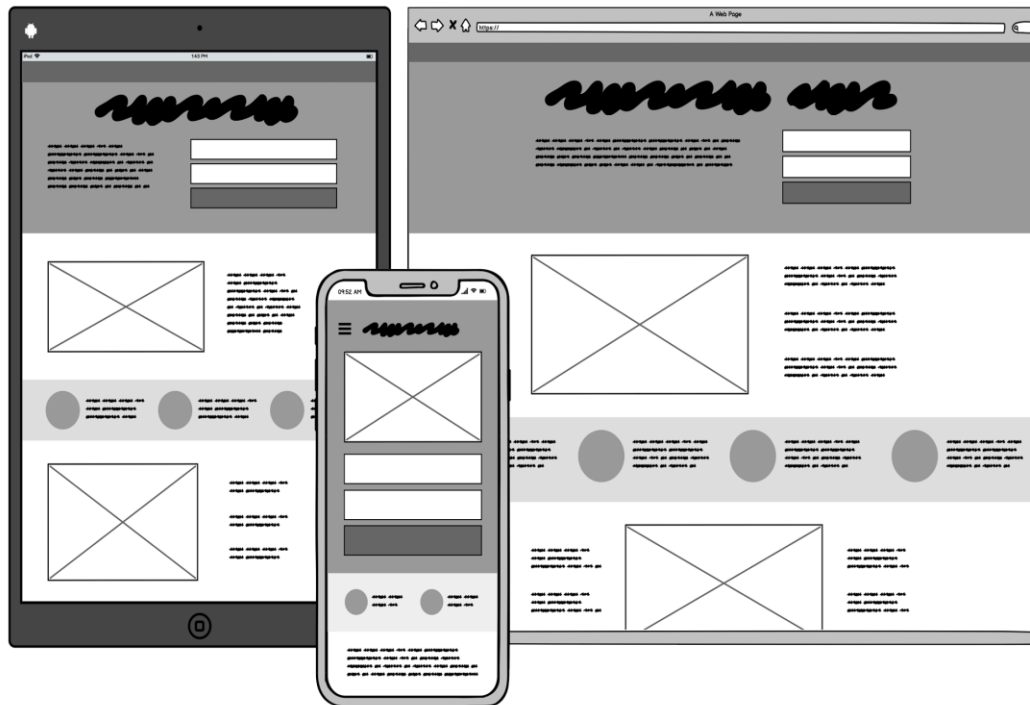
Flow lines – show the flow of information in the algorithm

What is a wireframe?

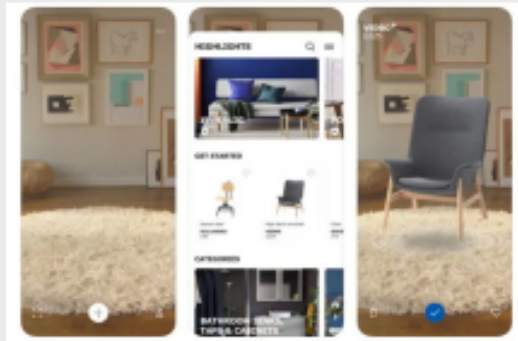
A sketch or a guide before you build an actual form/document

A 'skeleton graph' that shows how the contents will be laid out.

Frames with no colours, images or any graphics.



Augmented reality is a new technology where companies have developed software on a higher scale than ever for mobile phones and proprietary devices. This is in order to allow users to see the real world overlaying additional information onto the scene. For example, augmented reality allows users to see the real world with trees blowing in the breeze, dogs chasing after a ball, or children playing football, dogs playing with a digital version of themselves or children playing with an alien goalkeeper when scoring a goal.



With the latest developments in augmented reality, the technology is used regularly in shopping apps such as Argos and IKEA, as well as with product apps such as trainers including Nike. This software allows the customer to see items of furniture in their rooms before making a purchase.

The most well-known use of augmented reality in the 2010s is *Pokémon Go*, where users searched for *Pokémon* in the real world by throwing *Pokéballs* at *Pokémon* in an augmented reality world. Between 2016 and 2020, the app has been downloaded 1.1 billion times making \$4.34 billion in revenue during the same period.

Examples of augmented reality:

- Navigation systems use augmented reality to superimpose routes over a live view of the road.
- During football games, broadcasters use augmented reality to draw lines on the pitch to show and analyse movements and how the goal was scored.
- Military fighter pilots see an augmented reality projection of their height, speed, and other data on their helmet visor, which means that they do not need to waste focus looking down to see the information on their data panels.
- Sometimes, neurosurgeons use augmented reality projection of a 3D brain to assist them in performing surgery.
- At historical sites such as Rome in Italy, AR can be used to project scenes of ancient civilizations over today's ruins, bringing the past to life.
- Airport ground crew at Singapore's Changi airport wear AR glasses to see information on the goods being loaded into the hold, speeding up loading times.

Advantages and disadvantages of AR

Advantages	Disadvantages
The best of both worlds: combining the digital world with the real world.	Privacy and security concerns: collecting private and personal information about the users.
Virtual communication: improves digital communication by making it more immersive with virtual information.	Intrusiveness issues: the software records the world around the user which raises questions regarding taking photos of the public.
Supports business activities: retailers can use augmented reality to display their products.	Promotes dangerous behaviour: by focusing on augmented reality information accidents could happen in the real world.
Extends smart devices so they play an additional role in users' lives.	It can be expensive to install and maintain augmented reality software and hardware.

What does augment mean?

- enhance
- alter
- make more effective.

What does real-world environment mean?

- our surroundings
- our planet
- our world.

What does reality mean?

- natural
- real.

The sectors where AR can be used in

- architecture
- education
- entertainment
- retail
- lifestyle.

The uses of AR:

- training
- virtual tours
- marketing
- visualisation of designs, interiors, and concepts



What is AR and what is its purpose?

- Technology:
 - overlay of computer-generated inputs:
 - text
 - graphics
 - photographs
 - audio
 - video.



Forms of reality

- Augmented reality:
 - the overlaying of computer-generated inputs onto a real-world environment.
- Mixed reality:
 - the interaction of computer-generated inputs with physical objects in the real-world environment.
- Extended reality:
 - a term used for all forms of real and virtual environments.
- Virtual reality:
 - a computer-generated simulated environment.

Types of AR:

- object recognition/marker-based
- location-based/markerless
- superimposed (sometimes referred to as superimposition).

Types of augmented reality applications



Marker-based



Location-based



Projection-based



Outlining

Consideration when Designing Types of AR

- Questions to ask:
 - What content do we want to display on the live camera view?
 - Where should we place the content within the user's view?
- Answers dependent on:
 - AR software application being used – each require different user interaction.

Markerless

- More versatile than marker-based.
- More adaptable to a wider variety of functions/activities.
- The user decides where to place virtual object.
- It relies on device's hardware to gather information.
- An accelerometer detects the orientation of a smart device.
- A digital compass:
 - is a sensor that finds direction
 - uses Earth's magnetic fields
 - always finds North.
- GPS (global positioning system) uses satellites to establish the location of an object.

Object recognition/marker-based

This is the use of specifically designed markers to trigger augmented experience.

- Markers:
 - visual prompts
 - trigger virtual object/information
 - created using distinct patterns
 - act as anchors.
- Triggers:
 - activate AR experience.
- Anchors:
 - objects recognised by AR software.

Superimposed

- Uses object recognition.
- Replaces original image partially or fully.
- Used a lot in healthcare sector e.g. to superimpose x-ray onto patient's body.



Markerless



Location-based

- Digital content tied to specific location.
- Often used for navigation.



Types of user interaction/layers

- static
- interactive.

Types of user interaction

- User interaction:
 - reflects the real user experience after an interaction with the user interface
 - experiences are generated by the user.
- Design consideration:
 - think about how the user is going to interact with the AR app
 - depends on the devices they are going to use.

Layers

- Layers contain information and/or objects laid on top the real world viewed by the user.
- Static:
 - digital content such as text, 3D models and visual cues
 - appearance does not change during user interaction
 - no display of continuous movement.
- Interactive:
 - digital content such as animation and videos
 - changes appearance during user interaction
 - changes continuously with time
 - displays flow of continuous movement.

User interaction for AR headsets

- Types of interaction:
 - gaze
 - hand gestures.
- Gaze:
 - gaze-based navigation
 - tracks where the user is looking
 - targets items in the environment.
- Hand gestures:
 - hand gestures used to interact with targeted item.

User interaction for AR headsets

- Important considerations:
 - user's hands must remain in the viewing area of the headset
 - will not function correctly if user's hands out of view of headset
 - user's should be notified if hands reach the boundaries of headset view
 - design must use hand gestures accepted by the headset
 - keep interactions simple.

AR headset



User interaction for mobile devices

- Type of interaction:
 - hand gestures by touching the screen
 - interaction occurs in 3D (real-world) space.
- Hand gestures are based on touching the screen:
 - swipe
 - pinch
 - tap
 - rotate.
- Important considerations:
 - interactions should be kept simple
 - user should receive feedback when placing or interacting with an object.

Voice interaction

- Type of interaction:
 - voice control.
- Voice control considerations:
 - Commands should be kept simple and concise.
 - Commands must be able to be stopped, reversed, undone.
 - Do not use similar sounding commands.
 - Do not use commands that are pre-set system commands.

Voice interaction

- Additional important considerations:
 - User should receive feedback as with any other form of interaction.
 - Consider that users can have different dialects and access.
 - Test with different people.
 - Give the user prompts to use a command.

Types of devices AR can be used on:

- mobile devices
- smart devices
- laptop/PC.

Categories of devices

Device	Mobile device	Smart device	Laptop/PC
Smartphone	X	X	X
Tablets/phablets	X	X	X
AR headsets	X	X	X
AR glasses	X	X	X
Kiosk systems/AR installations		X	X
Desktop computer			X
Laptops	X		X

Category: smart device

- AR kiosks and installations:
 - greater computer power
 - higher graphic quality
 - user does not require any additional device, e.g. smartphone.



Category: laptop/PC

- Desktop AR creates an illusion of 3D objects floating in front of the screen.
- Users wear anaglyph glasses (red and blue) when using the AR app.
- They may use 3D monitors.
- There can be a better user experience using a laptop/PC.

Category: smart device

- A smart device is an interactive, electronic gadget.
- It can connect to, share with and be interactive with other devices and with users.
- Includes:
 - smartphones
 - tablets/phablets
 - AR headsets
 - AR glasses
 - AR kiosks
 - AR installations.

Category: smart device

- AR headsets:
 - users can see images superimposed on real-world environment
 - are more immersive than AR glasses (cover the eyes completely)
 - work in a way that is similar to AR glasses.
- AR glasses:
 - use a front-facing camera
 - superimpose 3D images, animation and video on real-world environment
 - can retrieve information from other devices
 - support Wi-Fi, Bluetooth and GPS.

Category: mobile device

- A mobile device can be easily moved from one location to another.
- It can also be a smart device.
- Includes:
 - smartphones
 - tablets/phablets
 - laptops.
- Design considerations:
 - AR apps can be used anytime, anywhere (depending on their purpose)
 - tablets/phablets have greater computer power and larger screens (phablet: combination of a phone and a tablet – Phone + Table).

Layers and user interaction

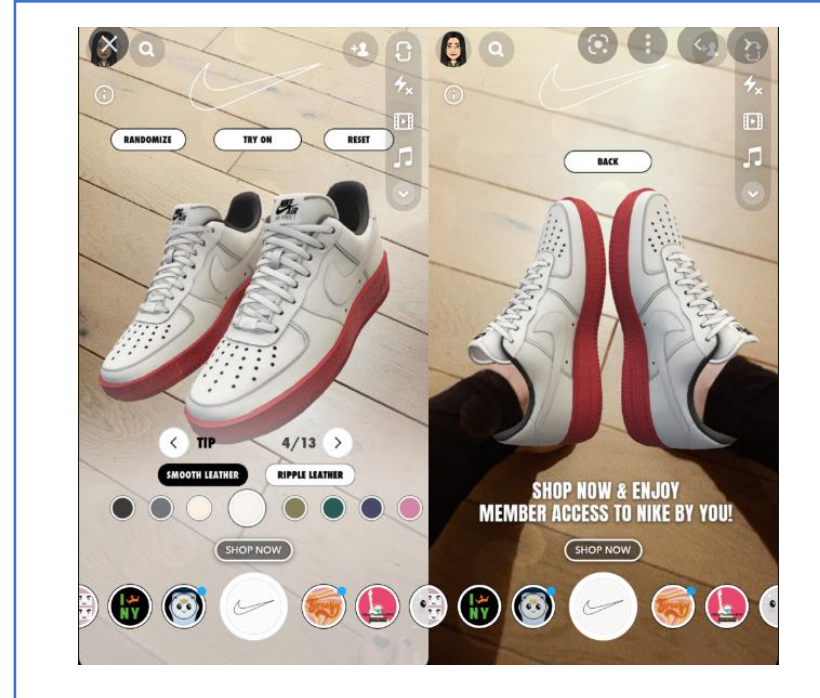
- Static:
 - Will the digital content change during the user interaction or remain the same?
 - Digital content that does not change is referred to as static.
- Interactive:
 - Will the digital content change during the user interaction or remain the same?
 - Digital content that changes is referred to as interactive

Layers and user interaction

- Layers:
 - information and/or objects laid on top the real world viewed by the user.
- User-interaction:
 - reflects the real user experience after an interaction with the user interface
 - experiences are generated by the user.
- Questions to ask
 - What content do you want to display on the user's live camera view?
 - Where do you want the content to be placed within the user's view?

Layers and user interaction

- Action flow:
 - How will the user interact with the AR app to move from one area to another?
 - Will there be multiple layers?
 - How will the action flow?



Triggers

- Triggers:
 - sometimes referred to as marker image
 - scanned by the device using the AR App
 - the scanned image 'triggers' the device to show the augmented digital content.
- Markers:
 - visual prompts
 - trigger virtual object/information
 - created using distinct patterns
 - act as anchors.

Triggers

- Location-based:
 - digital content tied to specific location
 - often used for navigation.
- Superimposed:
 - uses object recognition
 - replaces original image partially or fully
 - used a lot in healthcare sector, e.g. to superimpose x-ray onto patient's body.

Triggers

- Object recognition/marker-based:
 - use of specifically designed markers to trigger augmented experience.
- Markerless:
 - more versatile than marker-based
 - more adaptable to a wider variety of functions/activities
 - user decides where to place virtual object
 - relies on device's hardware to gather information.

Planning and design considerations

- Four key principles
 - How will you represent the physical setting?
 - How will you anchor the content?
 - How will you format the content?
 - How will you source the content?

Content and assets

- Considerations for photographs/images:
 - must have high level of detail and contrast
 - must be unique
 - do not use logos as marker images
 - avoid using same images, symbols in the same design (use them only once)
 - must not be blurred.
- Considerations for text:
 - must remain legible even when user moves
 - must be legible even with different background colours
 - Helvetica is a popular font for AR.

Content and assets

- Content:
 - can be displayed in many formats, e.g. text, images, video, sound, etc.
 - can come from a variety of sources
 - sources can be digital or paper-based
 - must comply with legislation, e.g. copyright and licensing laws.
- Assets:
 - digital content referred to as assets
 - can be: audio, video, graphics, photographs, text.

Planning and design considerations

- Physical setting
 - What is the physical environment like?
 - How will the computer vision detect flat surfaces, walls or surface planes?
- Anchoring the content
 - Devices and AR software must be able to recognise something in the real world.
 - Where and how will you place the augmented content (the anchor)?
 - Use anchors to trigger the AR experience.

Content and assets

- Considerations for video:
 - may or may not include sound (depends on the purpose)
 - if audio used with video, must be clear and easy to hear.
- Take your time!
 - Think carefully about what you are trying to achieve.
 - Spend time selecting the most suitable content.
 - Obtain good quality sources.

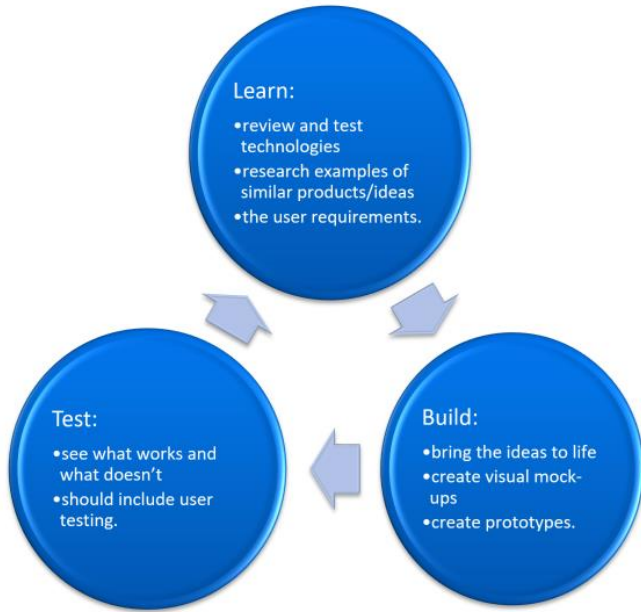
Content and assets

- Considerations for charts and graphs:
 - used to help explain and analyse data
 - must be appropriate for the data being presented
 - must be clearly and accurately labelled
 - must be of good quality and easy to read.
- Considerations for hyperlinks/weblinks:
 - Will the links be available for the lifetime of the AR app?
 - How will the user interact with the links (touch screen, voice control)?

Content and assets

- Considerations for audio
 - What is its purpose?
 - It must be clear and easily understood.
 - It can include sound effects, but must also be of good quality.

The design process

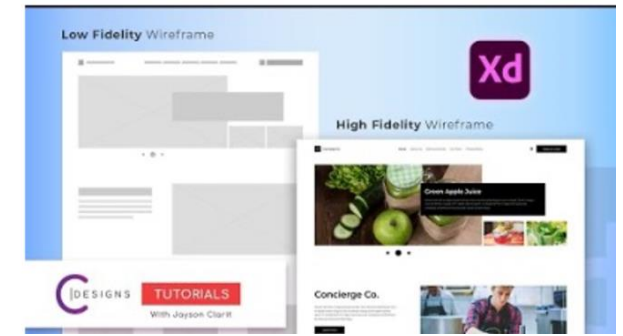


AR model prototype

- High-fidelity prototype:
 - looks real and simulates how the design will work
 - used to present ideas to clients and end-users
 - used to gather feedback from clients and end-users
 - allows user interaction
 - looks as close as possible to the final product.
- Live-data prototype:
 - has access to live data
 - should not have an impact on any process using the live data outside of the design.

AR model prototype

- High-fidelity prototype:



AR model prototype

- Feasibility prototype:
 - try out new technological/software-related ideas
 - aids understanding of technical risks associated with performance
 - used to test specific design elements/features.
- Low-fidelity prototype:
 - basically an interactive wireframe and does not look real
 - used to simulate processes to identify potential user issues
 - does not include user interaction, or includes minimal user interaction.

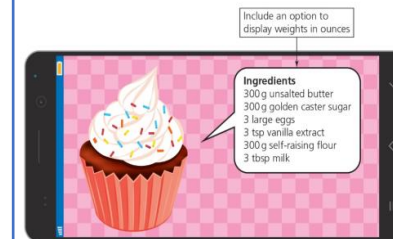
AR model prototype

Characteristics of prototypes:

- A prototype is not a full product.
- It confirms the functionality of, e.g., the HCI and how triggers and layers work.
- It shows how the product looks and feels to the user.
- It has access to real data.
- If the purpose of the app is to access and use real data (think of a SatNav), then the prototype must show that this can happen.

AR model prototype

- Feasibility prototype:
- Low-fidelity user prototype:



Characteristics

Triggers:

- sometimes referred to as a marker image
- scanned by the device using the AR app to 'trigger' the AR experience and display the augmented digital content
- one of the basic building blocks when creating an AR app.

Types

- Markerless:
 - scans a marker which triggers the AR experience.
- Superimposition:
 - partial or full replacement of the original view of an object with an augmented view of the same object
 - object recognition is used to identify the original object; once identified, the superimposition trigger takes over and replaces partially or in full the object with an augmented object.

A trigger image:

Should ...	Should not ...
be unique (different trigger images to trigger the different AR content)	contain anything reflective as it reduces the quality of the image, e.g. water, mirrors, white paper
contain plenty of detail	be moving
have good image size (to provide a recognisable view)	be something that is not flat
	contain blurred images (will not show sufficient detail if blurred)
	contain too much text
	contain too much white space

Types

- Remember the context!
- The type of trigger you use will depend on your reason for using the trigger so ask yourself:
 - Do I want to provide information on an object?
 - Do I want to overlay onto an object (e.g. street names on a street)?
 - Do I want the user to select where to place the virtual object?

Types

- Marker:
 - an image or an object that can be recognised by an AR enabled app, used to trigger the augmented reality features.
- Object recognition/marker-based
 - a specifically designed marker, used to trigger the augmented experience.
- Location-based:
 - triggers action based on the location of the device.

Interactive access for the user

- Swipe:
 - think about the way you use a smartphone or tablet
 - dragging the finger across the screen to change views.
- Click/select:
 - click on an image or menu to select an action to be carried out.

Interactive access for the user

- Voice:
 - simple voice commands to tell the AR app the action to be carried out
 - voice commands must be able to be stopped or reversed
 - do not work well in noisy environments
 - must provide feedback to the user.

Layers

- Single layer:
 - One trigger is created and an AR asset is overlaid on the top of it.
 - Assets can be images, audio, video, photographs, charts/graphs, etc.
 - The user activates the trigger.
- Multiple layers:
 - One or more triggers are used to overlay multiple assets.
 - For example: https://youtu.be/w_IDI4ag5aQ

Access to layers

- Static:
 - has no view of continuous movement
 - does not change appearance with user interaction.
- Interactive:
 - shows continuous movement
 - appearance changes with user interaction
 - the user physically controls the layers of the AR app by using a variety of controls, e.g. swipe, click/select/voice.

Layers

Points to consider:

- Do not overcomplicate the layers – keep them simple.
- Think about the user interaction with the AR app when triggering the layers.
- Merge multiple layers together (link them into layers).
- Give layers names that indicate what they include, what they do and how they are organised.
- Layers use the triggers, so must be set up to use them.

Types of test plans

- User testing:
 - sometimes referred to as usability testing
 - user testing carried out with several users from target audience
 - tests must include the different features, e.g., user interaction, action flow, etc.
 - tests are set on the test plan by the technical tester
 - results and feedback analysed to identify issues and potential improvements.

Types of test plans

- Technical testing:
 - used to test prototypes (and eventually full products)
 - tests the **functionality** of the prototype/product, e.g., user interaction, action flow, triggers, layers, information output
 - analysis of results and report written to confirm the issues that arose, that they were addressed and any potential improvements
 - tests are identified by the technical tester and a test plan developed.

Using a test plan

Content and use of a test plan:

- test number – all tests should have a test number
- what is being tested - brief statement of what is being tested (tests should **not** be grouped, e.g., testing triggers) and how it is being tested
- expected results – what you want to happen
- actual results – a short description of what actually happened (particularly important if there are issues)
- remedial action – if there was an issue, what you did to address it
- re-test!
- must be carried out iteratively (as you are developing the model prototype)

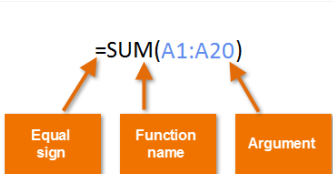
Test plans:

Purpose of a test plan:

- ensures that the AR model prototype (and eventually the final product), works as intended
- should be carried out iteratively (as you are creating the model prototype)
- allows users to physically use the prototype (easier to understand something that can be seen and used)
- showing prototypes of potential fully functional products and proving they work can attract investors
- a check against the original design to ensure it meets design priorities.

Type of Functions

There are many types of Functions that can be used in spreadsheets helping to make calculations a lot easier. Some common uses are **MIN** of Minimum, **MAX** for Maximum, **AVG** for Average and **SUM** for Sum total



This is the correct way to structure a function – Remember always start with a =

Absolute Cell Referencing

Absolute Reference in Excel

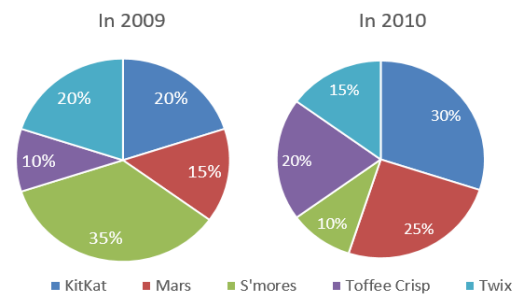
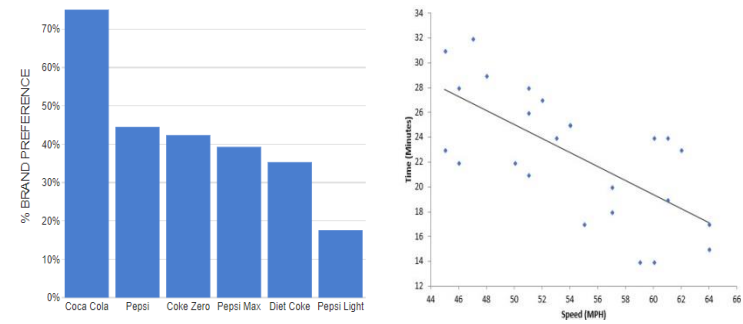
Formula bar: `=E35*E33`

Item	Quantity	Price (Rs.)	Total Price	Total Price with GST
Marie Gold Biscuits	5	40	200	=E35*\$E\$33

Select a cell which you need to permanently look at and press **F4** on your keyboard to make the absolute cell referencing \$ to appear around the selected cells.

Type of Graphs

- Bar chart**: Visual tool, uses bars easy to see difference, long bar means greater value
- Pie chart**: size of portion represents the quantity, visually simple to flow, good for summaries
- Scatter graph**: show relationship between 2 variables, maximum and minimum values are easy to work out



Keywords	Definition
Absolute Cell Referencing	When you want a formula to consistently refer to a particular cell.
Function	is a predefined formula that performs calculations in a particular order
Formula	is an expression which calculates the value of a cell
Conditional formatting	is a feature which allows you to apply a format to a cell or a range of cells based on certain criteria

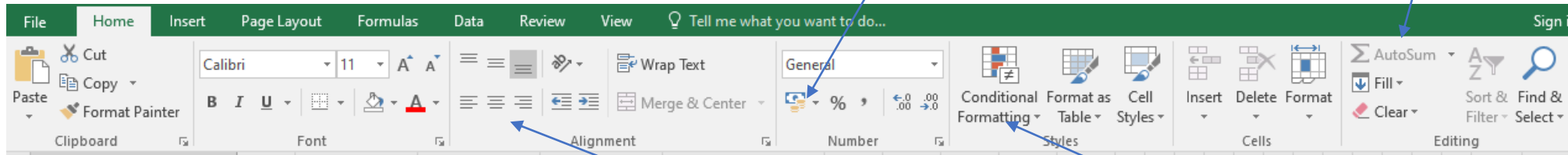
IF Statement...

Formula bar: `=IF(B2<=50,"Fail","Pass")`

Student Name	Scores	Result	Criteria	Result
BRUCE GEYER	37	Fail	Below or Equal to 50	Fail
ELIZABETH STERN	73	Pass	Above 50	Pass
MASATOSHI HENDERSON	62	Pass		
CHRISTINE YOSHIMURA	43	Fail		
JOHN ADAMSON	35	Fail		
IRVING PIANKA	86	Pass		
EILEEN HAAS	81	Pass		
VINCENZO KWAN	50	Fail		

The **IF** function can perform a logical test and return one value for a TRUE result, and another for a FALSE result.
For example, a "Fail" is scores below 50:
=IF(B2<=50,"Fail","Pass")

Excel Spreadsheet toolbar



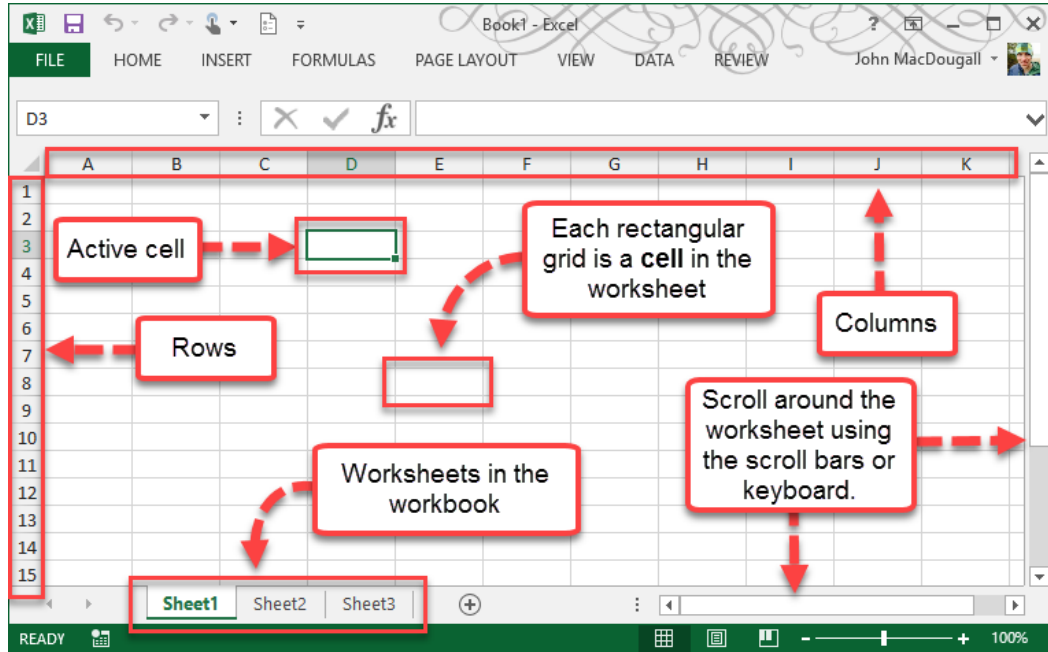
Currency / Accounting format

Used to add currency to the numbers in the cell

AutoSum

Automatically add totals of selected cells

Layout of a spreadsheet



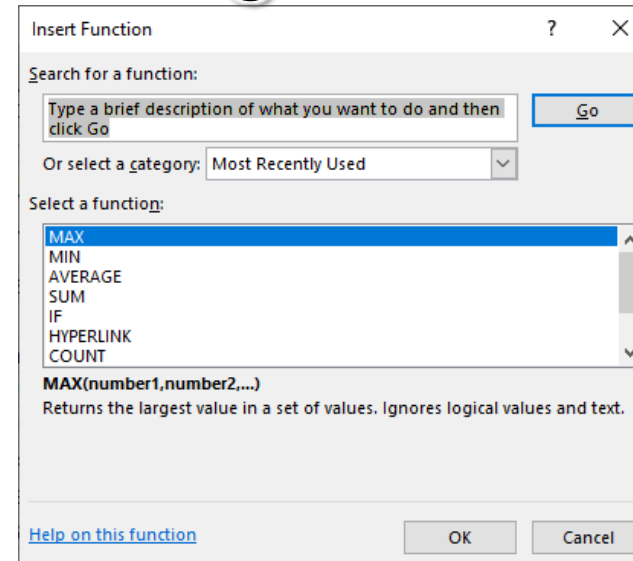
Text Alignment

Helps user align the text within the selected cell/s

Conditional Formatting

Used to spot trends and patterns in your data

Finding a function



is a predefined **formula** that performs calculations using specific values in a particular order

Year 10 – Cambridge National IT - Excel

Key Words	
Absolute referending	A cell reference within a spreadsheet which remains the same when copied (replicated) to another cell.
Alignment.	The way that text is set out, for example, right, left, centred or justified.
AutoSum	This feature will add up the numbers you have entered in your sheet and displays the total in a cell of your choosing.
Cell	A box on a spreadsheet that can contain text numbers or a formulae.
Cell attributes	The way the spreadsheet cell displays data such as numbers or dates.
Cell format	The way the spreadsheet cell looks, for example changing the column width or alignment.
Cell protection	Locking the contents of the cell to prevent them from being changed.
Charting	Drawing a graph from a set of numerical data, usually from a spreadsheet program.
Columns	Vertical parts of a spreadsheet.
Complex formulae	Complicated formulae's used in a spreadsheet.
COUNTA	Count the number of non-blank cells
COUNTBLANK	Count cells that are blank
Data	A general term used for numbers, characters, symbols, graphics and sound which are accepted and processed by a computer system.
Delete	To remove data
File	Information held on backing storage or in memory.
Formulae	A calculation involving one or more cell references in a spreadsheet.
Hard Copy	A printed copy of your work, usually on paper.
Insert	To put Information.
Insert column	To add a column .
Insert row	To add a row.
Integer	A whole number, with no fractional part or decimal point.
Merged Cell	When two or more cells are combined, it's become what is known as a merged cell.

Key Words	
Print file	To obtain hard copy.
Relative Referending	When a formulae in a spreadsheet is changed relative to its position, during copying or replication.
Replicate	To duplicate
Rows	Horizontal parts of a spreadsheet.
Ribbon	Above the workbook is a section of command tabs called the Ribbon.
Spreadsheet	A program used mainly for dealing with number data. It divides the screen into rows and columns. The cells can contain text, numbers and formulae.
Table	A table is made up of data arranged in rows and columns like a spreadsheet and data is placed in the cells.
Workbook	The workbook refers to an Excel spreadsheet file.
Worksheet	Within the workbook is where you will find documents called worksheets.

Functions	
SUM	adds values in selected cells
MINIMUM(.) or MIN(.)	A function used to find a minimum value in a range.
MAXIMUM(.) or MAX(.)	A function used to find a maximum value in a range.
AVERAGE(.)	A function used to find the average value in a range.
COUNT	counts how many of the selected cells have numbers in them
IF	change the value of a cell if something is true, eg if a customer's total bill is over £100, deduct 10% from their bill.
COUNTIF	adds up cells that meet a certain rule, eg count the number of students that achieved level 6.
VLOOKUP	is an Excel function to lookup and retrieve data from a specific column in table.

Symbols used in formulas			
+	add	*	multiply
-	subtract	/	divide

Column

Row

Cell

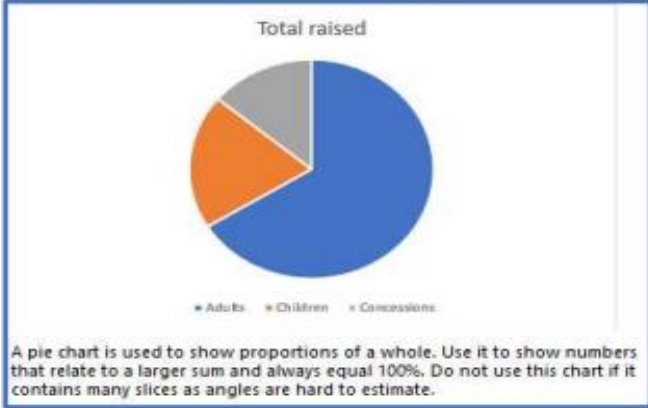
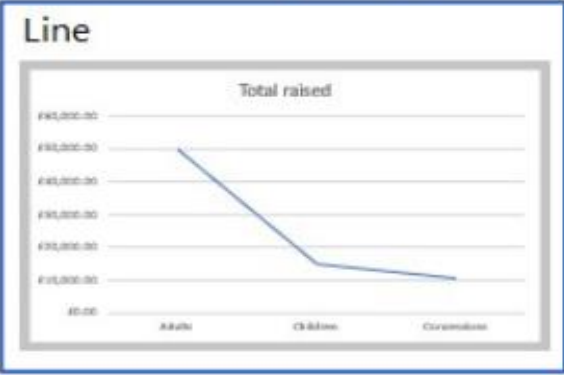
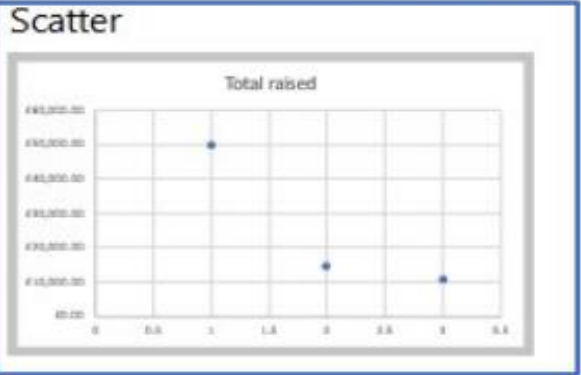
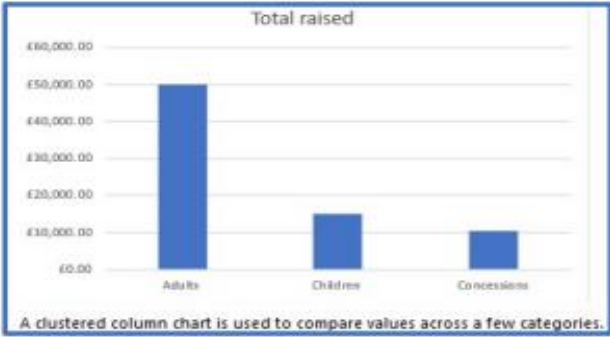
	A	B	C	D	E	F	G	H	I
1	Surname	Forename	Year of Birth	House	Form	Birth Place	Behaviour Points	Reward Points	
2	Anderson	Brian	2001	Mason	M1	Hull	0	30	
3	Banks	Peter	2000	Mason	M2	York	1	67	
4	Delta	Simon	2000	Hockney	H7	Hull	0	54	
5	Carrington	Frank	2000	Palin	P3	Hull	1	30	
6	Ellis	James	2000	Mason	M3	Beverley	0	3	
7	James	Martin	2001	Hockney	H3	Selby	3	25	
8	Hughes	Jake	2000	Garrett	G2	Hull	0	30	
9	Reed	Ben	2001	Garrett	G1	Hull	5	15	
10	Bassett	James	2002	Palin	P3	York	0	30	
11	Williams	Jordan	2003	Hockney	H3	Hull		35	
12	Robinson	Sam	2004	Hockney		York		30	
13	Green	Alex	2005	Mason	M4	Selby		67	
14	Dean	Mark	2006	Mason	M9	Hull	0	30	
15	Griffiths	Tom	2007	Hockney	H7	Hull	1	23	
16	Rose	Thomas	2008	Garrett	G8	Selby	0	30	
17	Senior	William	2009	Garrett	G3	Hull	10	24	

Every cell has a unique name called a Cell Reference.
The cell reference for this cell is D12

	A	B	C	D	E
1	Surname	Forename	Year of Birth	House	Form
2	Anderson	Brian	2001	Mason	M1
3	Banks	Peter	2000	Mason	M2
4	Delta	Simon	2000	Hockney	H7
5	Carrington	Frank	2000	Palin	P3
6	Ellis	James	2000	Mason	M3
7	James	Martin	2001	Hockney	H3
8	Hughes	Jake	2000	Garrett	G2
9	Reed	Ben	2001	Garrett	G1
10	Bassett	James	2002	Palin	P3
11	Williams	Jordan	2003	Hockney	H3
12	Robinson	Sam	2004	Hockney	H9
13	Green	Alex	2005	Mason	M4

Charts and graphs

line graph	to show a change over time
pie chart	show the individual parts that make up a whole
bar chart	compare things that aren't directly related
scatter graph	look for a pattern or link between two sets of data



Design Brief: A Design Brief is a short paragraph explaining the situation you have been given and the problem you need to solve.

Purpose:

- Identify a Problem
- Identify the client
- How to go about solving the problem
- Solutions

Client Needs/Brief: What the client requires of a product, here are some examples:

- Function
- Disabilities
- Social
- Anthropometrics/Measurements
- Material/Finishes
- Health and Safety
- Costing

Design Specification: A list of points to state what the product must have to meet the needs:

Possible Sections: Material, Safety, Ergonomics, Environmental, Costing, Manufacture, Finishes, Age Range, Functions, Secondary Function and Quality Assurance.

Sustainability:

What does it mean?

To preserve resources, materials and processes for future generations.

Examples:

- Recycled wood allows afforestation to occur
- If you have to incinerate a material it causes Co2 emissions
- Re-using electronic components saves on the processing of materials and saves on wastage and energy.

6R's
Click to add text

Recycle - Take an existing product that has become waste and re-process the material for use in a new product.

Reuse - Take an existing product that's become waste and use the material or parts for another purpose, without processing it.

Reduce - Minimise the amount of material and energy used during the whole of a products life cycle.

Refuse - Don't accept a product at all if you don't need it or if its environmentally or socially unsustainable.

Rethink - Our current lifestyles and the way we design and make.

Repair - When a product breaks down or doesn't function properly, fix it.

Timbers

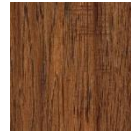


Softwoods:

- Coniferous trees
- Pale in Colour
- Soft/Easy to Cut
- Used for Furniture and Construction Trade
- More sustainable

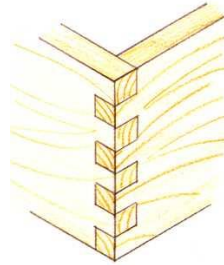
Hardwoods:

- Deciduous trees
- Durable
- Hard to shape and cut
- Long time to Mature
- Furniture
- Some are rare to find



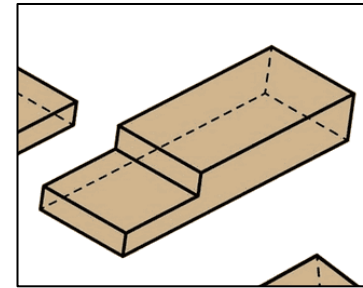
Manufactured Boards:

- made through human intervention
- consist of recycled woods part
- mixed with a liquid for example Glue or resin
- Flat Pack Furniture
- Cheap to manufacture



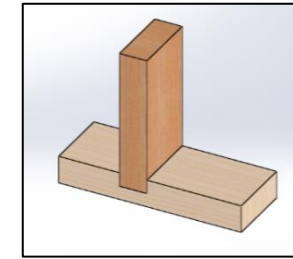
Finger Joint

If the joint is cut accurately the 'fingers should fit together without any gaps and the glue ensures that they are virtually indestructible. They are used for a wide range of products including jewellery boxes



Lap Joint

The shoulder can be seen clearly and has been pushed into the shoulder and this means it is level with the sides. It is very common and is used for furniture and box constructions such as jewellery boxes.



Housing Joint

A housing joint is a very simple, very strong woodworking joint that joins two work-pieces at right angles. It is done by cutting a slot into one piece and fitting the other piece into it.

Metals

Non Ferrous: A metal that does not contain Iron.

Ferrous: A metal that does contain iron.

Alloy: a metal that is made of 2 or more metals combined with improved properties.

Polymers

Thermo-plastics: A plastic that can be heated and changed shape without breaking. It can also be reheated and remoulded many times as it has a memory structure, once set becomes rigid.

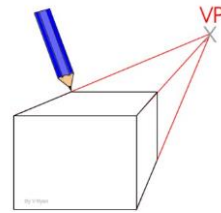
Thermo-Setting Plastics: A plastic that once set it cant be remoulded as it has a very rigid structure once set. If heated it will become flammable.

3d Drawing Techniques

3D drawings are used to present ideas so clients are able to understand features more clearly.

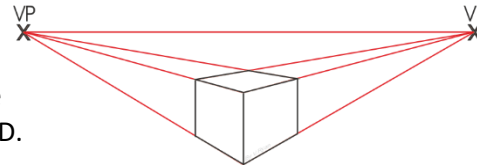
One-Point Perspective:

- Uses one vanishing point
- Used for Room interiors
- Front surface 2D and flat



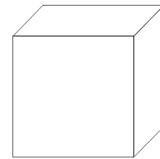
Two-Point Perspective:

- Uses two vanishing points
- Connected by a horizontal line
- Used for developing ideas in 3D.



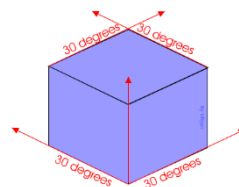
Oblique Projection:

- Horizontal going backwards drawn at 45 degrees
- Front surface is drawn in 2D
- Looks out of proportion
- Simpler process to isometric drawing



Isometric Projection:

- 30 degree angle is applied to its sides
- In proportion
- All vertical lines parallel to paper
- Drawing Board and isometric set square needed



Material Properties

- **DURABLE:** able to withstand wear, pressure, or damage; hard-wearing (Wood for a bench)
- **PLASTICITY:** The ability of a material to be change in shape permanently (Plastic in a vac former)
- **ELASTICITY:** The ability of a material to absorb force and flex in different directions, returning to its original position (Elastic band)
- **STRENGTH:** The ability of a material to stand up to forces being applied without it bending, breaking, shattering or deforming in any way (Metal when being shaped for a product)
- **TOUGHNESS:** A characteristic of a material that does not break or shatter when receiving a blow or under a sudden shock (Wood work bench)
- **BRITTLENESS:** absorb relatively little energy prior to fracture (Glass table top)
- **MALLEABILITY:** The ability of a material to be reshaped in all directions without cracking (Metal when casted into a shape)
- **FATIGUE:** weakness in materials caused by repeated variations of stress (this happens to all materials depending on their ability to withstand)

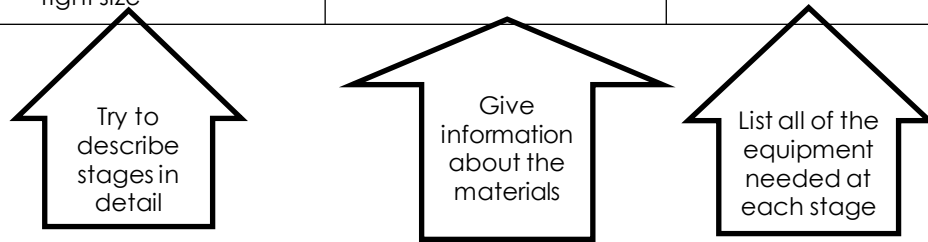
Assemble Products:

Below are a number of different methods to assemble products

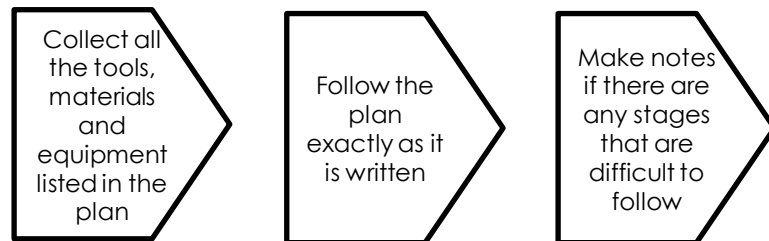


Production plan

Stage	Description	Material	Tools and equipment
1.	Check the aluminium is the right size	Aluminum	Ruler and drawing equipment



Following a plan: When you follow a plan you should:



- **Improving a plan**
- Simplifying the task.
- Removing unnecessary stages of the process.
- Reducing the number of tools and/or components that are needed.
- Reducing the number of machines that are to be used

Prototyping

Prototyping is an important part of the development of most products, not just those in engineering. Some products are only ever produced in prototype form, as only one is needed. The main reason for prototyping is to prevent expensive mistakes from happening. The use of prototypes allows an engineer to find any faults and problems with a design before it is made on a large scale.

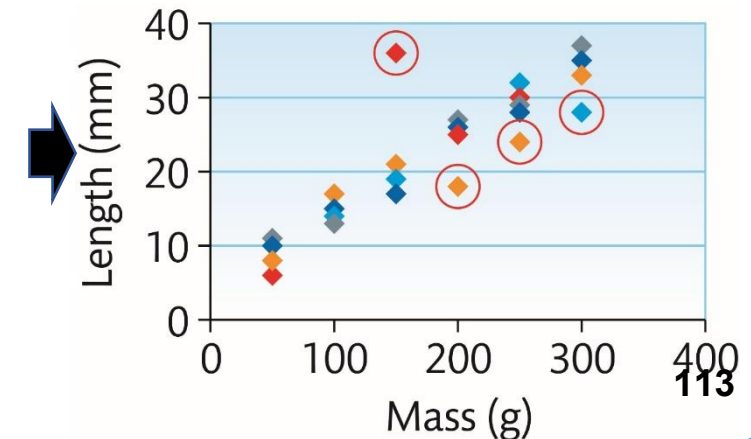
Prototypes can be:
physical models
computer simulations

Using gauges

The go/no-go gauge is used for checking the diameter of holes. The 'go' gauge, coloured green, must be able to fit through the hole. If the 'go' gauge does not fit, the hole is too small.

Anomalous results

An anomalous result is one that does not fit in with the expected pattern or trend



BTEC Engineering Component 3 Learning Aim A (Year 10 Spring)

Measuring and recording data

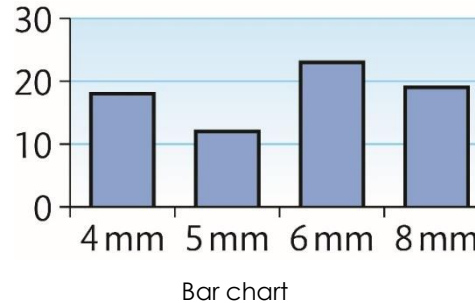
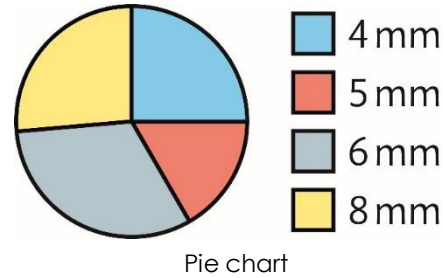
- **Accuracy** – is the data recorded correctly?
- **Precision** – how is the data divided into categories/groups?
- **Units** – what unit is appropriate for measurements?

Collecting data
Data can be collected in lots of ways, including tally charts

Diameter of screw (mm)	Tally	Total
4		18
5		12
6		23
8		19

Displaying data using charts and graphs

Different types of chart can be used to show the same information.

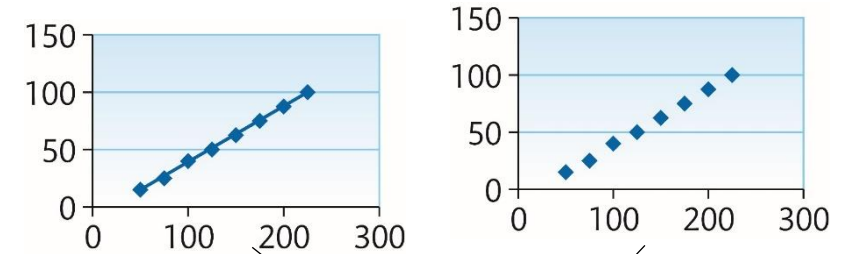


Screw size	Pictograph
4 mm	
5 mm	
6 mm	
8 mm	

||||| = 5 screws

Pictograph

Graphs can also be used to represent data



Each graph represents the same data from an investigation

Displaying data using scatter graphs

Data can often:
be sorted into groups
follow a pattern.
Sometimes when we carry out investigations into how a material or component reacts to different conditions, the results cannot usually be grouped, or presented as perfect straight-line graphs. In these cases, we will need to produce a scatter graph.
Make sure you record all of the values accurately when you plot them on the graph.

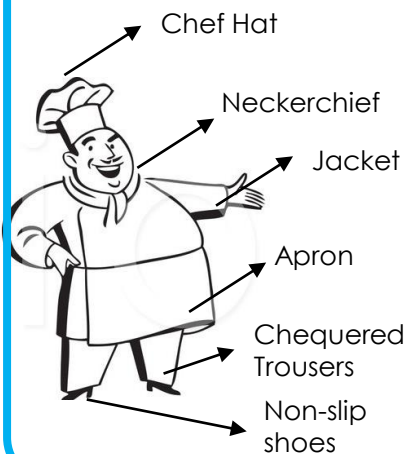
Kitchen Workflow

1. Delivery
2. Storage
3. Food preparation
4. Cooking
5. Holding
6. Food service
7. Wash up
8. Waste disposal

Types of Documentation

- Temperature charts (fridge, freezer)
- Time sheets (staff working hours)
- Accident report form (to log first aid/accidents)
- Equipment fault reports

Kitchen Dress Code (PPE)



Small Equipment



Large Equipment

All large scale equipment such as a floor standing mixer, walk in fridge/freezer and a large oven must be:

- o Turned off before cleaning
- o Use correct cleaning materials
- o Any attachments should be stored correctly
- o If equipment is not working correctly it must be reported
- o Ensure there is no food left on the equipment as it will contaminate future use

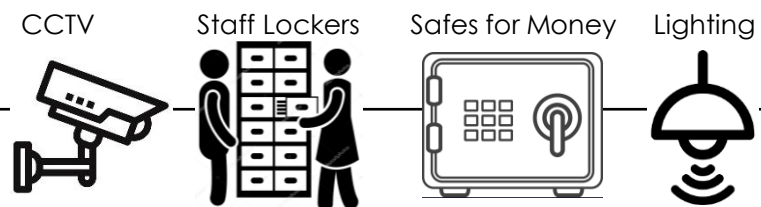


Types of Customer

Leisure	Local Residents	Business/Corporate
Customers who visit the establishments in their leisure time e.g. a meal with friends, a family day out, tourists.	Customers who live in the local area who visit the establishment often e.g. regular Sunday lunch	E.g. business lunches. Use business facilities in establishment for meetings or presentations, courses and conferences

Safety and Security

All businesses should carry out a regular health and safety risk assessment. This involves looking at your business and identifying potential hazards that may affect staff or members of the public. Your risk assessment should tell you whether you are doing enough to mitigate these risks. Ways to achieve this is through:



Customer Rights

- ❖ The right to be protected (against hazardous goods)
- ❖ The right to be informed (quality, quantity, allergies)
- ❖ The right to have their complaints be heard
- ❖ The right to seek compensation
- ❖ The right to receive satisfactory goods that match their product description

Good Customer Service

- ✓ Respectful and polite
- ✓ Helpful and attentive
- ✓ Smart and professional
- ✓ Friendly
- ✓ Patient
- ✓ Deals with customer problems effectively
- ✓ Knowledgeable
- ✓ Makes the customer feel welcome, to want to return.



Keyword	Definition
Perishable Foods	Foods with a short shelf life such as meat, fish and dairy
Staple Foods	Foods with a longer shelf life such as canned products
Stock Control	Using the First In First Out (FIFO) rule to rotate food stock
Consumer Rights Act 2015	A legal right to reject goods that are of unsatisfactory quality, unfit for purpose or not as described
Food Safety Act 1990	Businesses do not include, remove or treat food in any way that would be damaging to the health of people.
Equality Act 2010	All must be treated equally regard to age, gender, race...
Disability Discrimination Act 2010	Unlawful to discriminate against mental and physical disabilities

HASAWA

- ❑ All employers must take care of their own health and safety and not endanger others.
- ❑ The HSE exists to protect peoples health and safety by ensuring risks are properly controlled.
- ❑ HASWA also protects employees from risks to their health and safety arising out of the activities of people at work.
- ❑ The law applies to everyone at work and anyone can be prosecuted if they do not act safely.

RIDDOR

- ❑ The law requires employers and other people in control of work premises (known as the 'responsible person') to report to the Health and Safety Executive (HSE) and keep records of the following:
 - ✓ Work related fatalities
 - ✓ Work related accidents causing certain serious injuries
 - ✓ Certain work related diagnosed occupational diseases such as severe cramp of the hand due to work related issues

COSHH

- ❑ These Regulations require employers to control exposure to hazardous substances to prevent ill health.
- ❑ Substances covered by COSHH:
 - ✓ Chemicals including cleaning chemicals
 - ✓ Micro-organisms
 - ✓ Dusts
 - ✓ Medicines, pesticides, gases
- ❑ COSHH Symbols:
 - Oxidising
 - Gas under pressure
 - Reproductive Toxic



PPE



- ❑ The Food Safety (General Food Hygiene) Regulations 1995 require every person working in a food handling area to wear suitable, clean, and (where appropriate) protective clothing.

MHR



- ❑ Any transporting or supporting of a load by hand or bodily force
- ❑ Lifting, putting down, pushing, pulling, carrying or moving

Risk Assessment

- ❑ Five steps to assessing risks:
 1. Identify the hazard.
 2. Decide who might be harmed and how.
 3. Evaluate the risk.
 4. Record the findings and implement them.
 5. Review the assessment and update if necessary



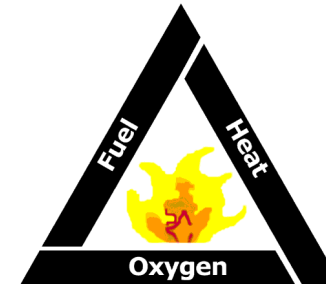
Risk/Hazard	Location	Who is at risk? (Employer, Employee, Supplier, Customer).	Level of risk.
Incorrect storage of food.	Kitchen	Customer	High
Faulty Wiring	Bedroom	Employee, Customer.	High

Main Injury Types

Burns	Cuts
Strains	Slips, trips, falls



Fire Safety



EMERGENCY SIGN



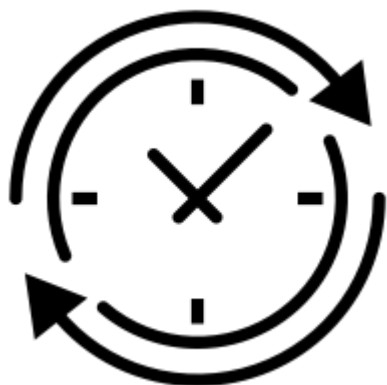
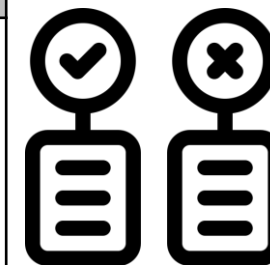
Keyword	Definition
HASAWA	Health and Safety at Work Act
HSE	Health and Safety Executive
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
COSHH	Control of Substances Hazardous to Health
PPE	Personal Protective Equipment
MHR	Manual Handling Regulations
Provision	An establishment that provides food and drink



A. Comment est-ce que tu utilises des réseaux sociaux ? How do you use social media?					
Normalement Normally	j'utilise I use	eBay	sur mon ordinateur on my computer	pour to	chatter avec des amis. chat with friends.
D'habitude Usually	je n'utilise pas I don't use	Facebook	sur mon portable on my mobile		contrôler mon activité physique. control my physical activity.
Quelquefois Sometimes	j'aime utiliser I like to use	Fitbit	sur ma tablette on my tablet		envoyer des messages. to send messages.
Souvent Often		Instagram			faire des achats. to do shopping.
		Netflix			jouer aux jeux-vidéos. to play video games.
		Snapchat			partager des vidéos. to share videos.
		Spotify			regarder des séries. to watch series.
		TikTok			surfer sur Internet. to go online.
		WhatsApp			télécharger de la musique. to download music.



B. Quels sont les avantages et les inconvénients des réseaux sociaux ? What are the advantages and disadvantages of social media?					
D'un côté, les réseaux sociaux sont On the one hand, social media are	divertissants entertaining	de l'autre côté on the other hand	un inconvénient c'est qu' a disadvantage is that	il y a le danger there is the danger	d'y devenir accro. of becoming addicted.
	gratuits free of charge		un désavantage c'est qu' a disadvantage is that		d'être victime du harcèlement. of being the victim of bullying.
	pratiques practical	en revanche on the other hand			d'être victime de la cybercriminalité. of being the victim of cybercrime.
	populaires popular				de rencontrer des gens avec de mauvaises intentions. of meeting people with bad intentions.
					de voir du contenu inapproprié. of seeing inappropriate content.



C. C'est comment ta routine quotidienne ? What is your daily routine like?			
Avant d'aller à l'école Before going to school	je me brosse les dents I brush my teeth	à une heure at 1 o'clock	et quart quarter past et demi half past moins le quart quarter to
Après l'école After school	je me couche I go to bed	à deux heures at 2 o'clock	
	je me détends I relax	à trois heures at 3 o'clock	
Le matin In the morning	je me douche I have a shower	à quatre heures at 4 o'clock	
	je m'habille I get dressed	à cinq heures at 5 o'clock	
L'après-midi In the afternoon	je me lève I get up	à six heures at 6 o'clock	
	je fais la grasse matinée (jusqu') I have a lie in (until)	à sept heures at 7 o'clock	
Le soir In the evening	je fais mes devoirs I do my homework	à huit heures at 8 o'clock	
	je prends le petit-déjeuner I have breakfast	à neuf heures at 9 o'clock	
	je prends le dîner I have dinner	à dix heures at 10 o'clock	
	je rentre à la maison I go back home	à onze heures at 11 o'clock	
		à midi at midday	
		à minuit at midnight	



D. Décris-moi une fête que tu as fêtée/tu aimerais fêter. Describe a festival that you celebrated/you would like to celebrate.

L'année dernière Last year	j'ai fêté I celebrated	l'Aïd Eid le Dipavali Diwali le Hanouka Hanukkah le Pâques Easter le Ramadan Ramadan la Noël Christmas	et c'était and it was	agréable pleasant divertissant entertaining formidable terrific impressionnant impressive incroyable incredible passionnant exciting	car because	j'ai chanté. I sang. j'ai dansé. I danced. j'ai fait de nouveaux amis. I made new friends. j'ai mangé des repas délicieux. I ate delicious meals. j'ai passé du temps avec ma famille. I spent time with my family. j'ai reçu des cadeaux. I received gifts. il y avait des feux d'artifice. there were fireworks. il y avait de grands repas. there were big meals.
Quand je serai vieux/vieille When I'm older	une fête que j'aimerais fêter, c'est a festival which I would like to celebrate is	le Carnaval Carnival Mardi Gras la Fête nationale Bastille Day	parce que ce serait because it would be	une opportunité de/d' an opportunity to	s'amuser. have fun. apprendre de la culture. learn about culture. décompresser. relax. découvrir de cultures différentes. discover different cultures. manger de la cuisine typique. eat typical food. passer du temps avec les autres. spend time with others. voir des défilés. watch parades.	
Dans le futur In the future	une fête à laquelle j'aimerais aller, c'est a festival to which I would like to go is	la Chandeleur la Saint-Sylvestre New Year's Eve la Saint-Valentin Valentine's Day				
À l'avenir In the future						

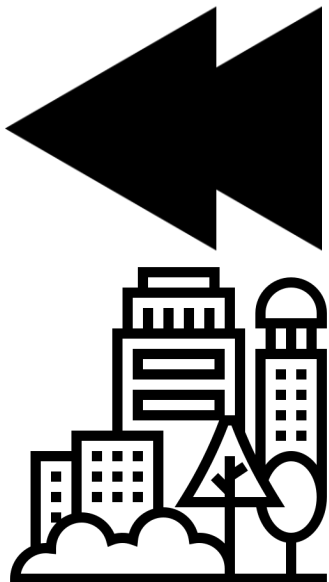


E. Qu'est-ce que tu vas faire pour être en bonne santé ? What are you going to do to keep healthy?

Pour être en bonne santé To be in good health	je vais I am going to	avoir un régime équilibré have a balanced diet boire de l'eau drink water bien dormir sleep will	sinon je risque d'être if not, I risk being	accro. addicted. malade. ill. obèse. obese. stressé. stressed.
	je dois I must	éviter la malbouffe avoid fast food faire de l'exercice do exercise faire du sport do sport manger sainement eat healthily me reposer rest	sinon je risque d'avoir if not, I risk having	un cancer (des poumons). (lung) cancer. une crise cardiaque. a heart attack.
	je peux I can		puisque c'est bon pour as it is good for	le corps. the body. le mental. the mind. la santé. the health.
	je ne vais pas I am not going to	boire trop de l'alcool drink too much alcohol me droguer take drugs m'enivrer get drunk fumer smoke	étant donné que c'est given that it is	dangereux. dangerous. illégal. illegal. inquiétant. worrying. mauvais pour la santé. bad for your health. une perte d'argent. a waste of money. une perte de temps. a waste of time.
Pour rester en forme To stay in shape	je ne dois jamais I must never			



A. Qu'est-ce qu'il y a là où tu habites ? What is there where you live?						
Dans ma région In my region	il y a there is/there are	un aquarium an aquarium un bowling a bowling alley un centre commercial a shopping centre un centre sportif a leisure centre un cinéma a cinema un marché a market un stade a stadium un théâtre a theatre	par contre on the other hand	dans le passé in the past	il y avait there was/there were	un aquarium un bowling un centre commercial un centre sportif un cinéma un marché un stade un théâtre
Dans ma ville In my town		une bibliothèque a library une cathédrale a cathedral une église a church une gare a train station une mosquée a mosque une piscine a swimming pool une poste a post office				il n'y avait pas de* there wasn't
Dans mon village In my village	il n'y a pas de* there isn't	des galeries galleries des musées museums des monuments monuments des parcs parks des restaurants restaurants	pourtant however		il n'y avait pas de* there wasn't	des galeries des musées des monuments des parcs des restaurants
Dans mon quartier In my neighbourhood						



B. Qu'est-ce que tu as fait récemment dans ta région ? What have you done recently in your region?							
Hier Yesterday Hier soir Yesterday evening La semaine dernière Last week Le weekend dernier Last weekend Récemment Recently	je suis allé[e] I went nous sommes allés we went	à l'aquarium to the aquarium à la piscine to the swimming pool au centre commercial to the shopping centre au cinéma to the cinema à un concert to a concert à un match de foot to a football match prendre un verre for a drink	à mon avis in my opinion sans doute without doubt	c'était it was ce n'était pas it wasn't	absolument absolutely extrêmement extremely tellement so plutôt rather	divertissant. entertaining. fascinant. fascinating. génial. great. sensass. sensational. affreux. awful. barbant. boring. casse-pieds. Irritating. décevant. disappointing.	
	j'ai I nous avons we	appris de l'histoire learnt about history appris de la culture learnt about culture fait du shopping did shopping fait du sport did sport fait du tourisme did sightseeing fait de la natation did swimming fait des promenades did walks fait des randonnées did hikes joué au basket/tennis played basketball/tennis mangé des repas chinois/indiens/italiens ate Chinese/Indian/Italian meals visité le musée visited the museum visité la galerie visited the gallery					



C. Où vas-tu habiter à l'avenir – en ville ou à la campagne ? Where are you going to live in the future – in the city or in the countryside?				
Quand je serai vieux/vieille When I'm older	je vais habiter I am going to live	en banlieue in the suburbs		il y a beaucoup de magasins. there are lots of shops. il y a plus de distractions. there are lots of things to do. il y a plus de possibilités d'emploi. there are more employment opportunities.
Quand j'aurai x ans When I'm x years old	je ne vais pas habiter I am not going to live	en ville in town	parce que/qu' because	il y a tellement de bruit. there is so much noise. il y a trop de circulation. there is too much traffic. il y a trop de pollution. there is too much pollution. il y a trop de déchets par terre. there is too much rubbish on the ground.
À l'avenir In the future	je vais vivre I am going to live	au centre-ville in the town/city centre	vu que/qu' seeing as	il y a plus d'air frais. there is more fresh air. il y a plus d'espaces verts. there are more green spaces. il y a plus de pistes cyclables. there are more cycle paths. il y a de beaux paysages. there are beautiful landscapes.
Dans le futur In the future	j'aimerais habiter I would like to live	à la campagne in the countryside	néanmoins nevertheless	il n'y a rien pour les jeunes. there is nothing for young people. il n'y a rien à faire. there is nothing to do. il y a plus de chômage. there is more unemployment.
	je voudrais vivre I would like to live	dans un petit village in a small village		



D. Quels sont les problèmes pour les SDF ? What are the problems faced by homeless people?			
	les gens au chômage, unemployed people		ils ont faim. they are hungry. ils ont froid. they are cold. ils ont soif. they are thirsty.
Je considère que I consider that	les gens vivant dans la pauvreté, people living in poverty		ils n'ont pas d'argent. they don't have any money. ils n'ont pas d'amis. they don't have any friends. ils n'ont pas de médicaments. they don't have any medicine.
J'estime que I feel that	les sans-abris, homeless people	ils se sentent they feel	abandonnés. abandoned. déprimés. depressed. inutiles. useless. socialement exclus. socially excluded. seuls. alone. vulnérables. vulnerable.
	les SDF, homeless people	ils peuvent être they can be	victime d'une attaque. victims of an attack. en danger. in danger.

E. Qu'est-ce qui te préoccupe le plus dans le monde aujourd'hui ? What concerns you most in the world today?			
Ce qui me préoccupe le plus, c'est What concerns me the most is	le changement climatique climate change le chômage unemployment le déboisement deforestation le racisme racism le sexisme sexism	car c'est because it is puisque c'est as/since it is	catastrophique. catastrophic. effrayant. scary. inacceptable. unacceptable. inquiétant. worrying. préoccupant. concerning.
Ce qui m'inquiète le plus, c'est What worries me the most is	la corruption corruption la faim hunger/famine la guerre war la pauvreté poverty la pollution de l'air air pollution la surpopulation overpopulation		
Le plus grand problème pour la planète, c'est The biggest problem for the planet is	l'environnement environment l'inégalité inequality l'injustice injustice		
	les catastrophes naturelles natural disasters		

À mon avis In my opinion	on a besoin de/d' we need	campagnes publicitaires. advertising campaigns. coopération internationale. international cooperation. investissement dans l'éducation. investment in education. investissement dans les énergies renouvelables. investment in renewable energies. lois plus strictes. stricter laws. paix dans le monde. peace in the world. projets d'aide. aid projects.
Selon moi According to me	il faut plus de/d' we must have more	
Sans doute Without doubt		



F. Qu'est-ce qu'il faut faire pour protéger l'environnement ? What must we do to protect the environment?					
Bien que ce soit difficile, Even though it is difficult, Bien que ce soit embêtant, Even though it is annoying,	pour protéger l'environnement to protect the environment	il faut you must	consommer moins d'énergie. consume less energy. créer d'espaces verts. create green spaces. économiser de l'eau. save water. faire du compost. compost. faire des achats responsables. shop responsibly. installer des panneaux solaires. Install solar panels. recycler. recycle utiliser les transports en commun. use public transport.	Personnellement, je vais Personally, I'm going	aller à l'école à vélo. to go to school by bike. baissier le chauffage. to turn down the heating. éteindre la lumière. to turn off the lights. recycler. to recycle. prendre une douche. to take a shower. réduire mon empreinte carbone. to reduce my carbon footprint. trier les déchets. to separate rubbish.
	pour protéger la planète to protect the planet	on doit we must	faire du compost. compost. faire des achats responsables. shop responsibly. installer des panneaux solaires. Install solar panels. recycler. recycle utiliser les transports en commun. use public transport.		
	pour lutter contre la pollution to fight against pollution	on peut we can	gaspiller de l'eau. waste water. manger de la viande. eat meat. prendre un bain. take a bath. utiliser les sacs en plastique. use plastic bags. voyager en voiture. travel by car.		
		il ne faut pas you mustn't on ne doit jamais we must never			

Geology

- The study of rocks and different rock types
- Sedimentary = formed in layers (e.g. chalk)
- Igneous = formed from cooled lava (e.g. granite)
- Metamorphic = formed under intense heat and pressure (e.g. marble)



Erosion

- There are four types of erosional processes that occur in both coastal and river landscapes.
 - Abrasion
 - Attrition
 - Hydraulic Action
 - Solution

Weathering

- There are three main types of weathering processes that can affect rocks.
- Biological Weathering (e.g. plant roots)
- Chemical Weathering (e.g. acid rain)
- Mechanical/Physical Weathering (e.g. freeze-thaw)



Transportation

- There are four main ways that sediment is transported in river and coastal environments.
 - Traction
 - Saltation
 - Suspension
 - Solution
- Longshore drift is also a method of transportation in coastal environments.

Coastal Landforms

Depositional	Erosional
Beach	Headlands and Bays
Spit	Coves
Bar	Caves, Arches, Stacks and Stumps
Tombolo	Wave cut platforms

Formation of a Wave-Cut Platform

1. Weather weakens the top of the cliff.
2. The sea attacks the base of the cliff forming a wave-cut notch.
3. The notch increases in size causing the cliff to collapse.
4. The backwash carries the rubble towards the sea forming a wave-cut platform.
5. The process repeats and the cliff continues to retreat.

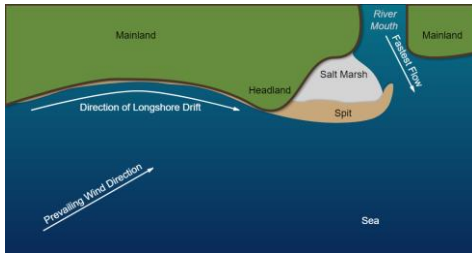
Strategies to Reduce Coastal Erosion

Strategy Type	Strategy	Advantages and Disadvantages
Hard Engineering	Sea Wall – concrete walls built at the top of a beach	+ Effective at stopping the sea - Very expensive to build and maintain
Hard Engineering	Rip Rap – large boulders piled at top of a beach	+ Force waves to break, protecting cliffs + Relatively cheap and easy to maintain - Restrict access to beach - Do not fit in with local geology
Hard Engineering	Groynes – wooden or rock structures built along the beach at right angles	+ Quick to construct + Trap sediment and widens the beach reducing wave energy - Stopping movement of sediment can affect elsewhere on coast - Can be ugly
Soft Engineering	Beach Nourishment – adding sediment to a beach	+ Can absorb more wave energy + Easy and cheap to maintain - Needs constant maintenance
Soft Engineering	Sand Dune Regeneration – grasses and bushes are planted to stabilise dunes	+ Maintains a natural coastal environment - Areas of beach have to be fenced off

Keyword	Definition
Erosion	The wearing away and removal of material by a moving force e.g. rivers or waves.
Abrasion	Erosion caused by sediments rubbing against the river bed, bank or cliff.
Attrition	Erosion where particles in rivers or the sea are worn down as they collide with each other.
Hydraulic Action	Erosion caused by the sheer force of water wearing away cliffs, river beds or banks.
Solution	Erosion where some rock minerals slowly dissolve in water, which is slightly acidic.
Transportation	The movement of sediment by rivers or waves.
Traction	Transport of sediment through a rolling action along the river bed or sea floor.
Saltation	Transport of sediment being bounced along the river bed or sea floor.
Suspension	Transport of sediment carried within the water flow.
Solution	Transport of sediment particles that have been dissolved in the water.
Longshore Drift	The movement of material along a beach transported by wave action.
Weathering	The breakdown and decay of rock by natural processes acting on rocks, on cliffs and valley sides.
Mass Movement	The movement of material down a slope due to gravity.
Deposition	A process where sediments are dropped by the river or waves that carried them.
Hard Engineering	Strategies using artificial structures (e.g. concrete) to prevent river or coastal flooding
Soft Engineering	Flood defences that work with natural processes to reduce the risk of river or coastal flooding.

Formation of a Spit

1. Prevailing wind blows at an angle to the coastline.
2. Waves come in at an angle, resulting in longshore drift.
3. Longshore drift moves sediment along the coastline.
4. A spit is formed when the material is deposited.
5. Over time, the spit grows and can develop a hook if wind direction changes further out.
6. Where the spit meets a river, or where there is faster water, the spit stops forming as deposition no longer occurs.
7. There is a sheltered area behind the spit. Silt (fine sediment) is deposited and mud flats or salt marshes form.

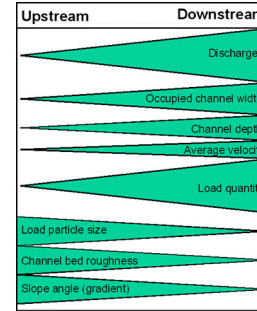


Formation of Caves, Arches, Stacks and Stumps

1. Caves occur when waves force their way into cracks in the cliff face. The water contains sand and other materials that grind away at the rock until the cracks become a cave. Hydraulic action is the predominant process.
2. If the cave is formed in a headland, it may eventually break through to the other side forming an arch.
3. The arch will gradually become bigger until it can no longer support the top of the arch. When the arch collapses, it leaves the headland on one side and a stack (a tall column of rock) on the other.
4. The stack will be attacked at the base in the same way that a wave-cut notch is formed. This weakens the structure and it will eventually collapse to form a stump.

How does a river channel change as it travels downstream?

- The Bradshaw Model is used by geographers to describe how the characteristics vary between the upper course and lower course of a river.
- Key characteristics are that width, depth, velocity and discharge all increase further downstream whereas particle size and gradient of the channel decrease further downstream.



Causes of River Flooding

- Intense rainfall
- Long duration of rainfall
- Impermeable rocks
- Steeper relief of land
- Deforestation
- Urbanisation



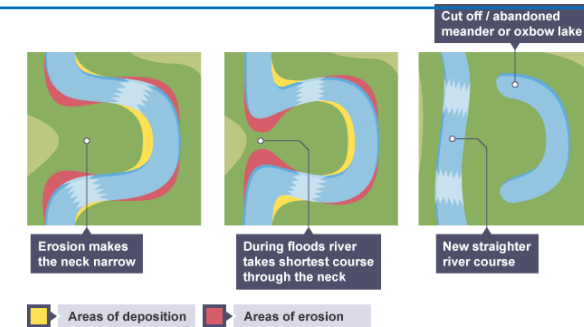
Strategies to Reduce River Flooding

Strategy Type	Strategy	Advantages and Disadvantages
Hard Engineering	Levees – high banks on/near riverbanks	+ Stop water spreading into areas where it could be problematic - Can burst under pressure
Hard Engineering	Channelisation – deepening or straightening the river	+ Allows water to run through channel more quickly - Water taken downstream may put other places at risk
Soft Engineering	Washlands – areas on floodplain allowed to flood	+ Give a safe place for floodwater to go - May limit the use of the land (e.g. for recreation)
Soft Engineering	Flood-plain Zoning – allocate areas to different uses	+ Prevents using high risk zones for businesses and housing - May cause accessibility issues for the public

Formation of a Meander

As the river makes its way to the middle course, it gains more water and therefore more energy. Lateral erosion starts to widen the river. When the river flows over flatter land they develop large bends called meanders.

1. As a river goes around a bend, most of the water is pushed towards the outside. This causes increased speed and therefore increased erosion (through hydraulic action and abrasion).
2. The lateral erosion on the outside bend causes undercutting of the bank to form a river cliff.
3. Water on the inner bend is slower, causing the water to slow down and deposit the eroded material, creating a gentle slope.
4. The build-up of deposited sediment is known as a slip-off slope (or sometimes river beach).



Formation of an Oxbow Lake

1. Due to erosion on the outside of a bend and deposition on the inside, the shape of a meander will change over a period of time.
2. Erosion narrows the neck of the land within the meander and as the process continues, the meanders move closer together.
3. When there is a very high discharge (usually during a flood), the river cuts across the neck, taking a new, straighter and shorter route.
4. Deposition will occur to cut off the original meander, leaving a horseshoe-shaped oxbow lake.

Formation of a Waterfall

Waterfalls form when there are horizontal bands of resistant rock (hard rock) positioned over exposed, less resistant rock (soft rock).

1. The soft rock is eroded quicker than the hard rock and this creates a step.
2. As erosion continues, the hard rock is undercut forming an overhang.
3. Abrasion and hydraulic action erode to create a plunge pool.
4. Over time this gets bigger, increasing the size of the overhang until the hard rock is no longer supported and it collapses.
5. This process continues and the waterfall retreats upstream.
6. A steep-sided valley is left where the waterfall once was. This is called a gorge.

Global Atmospheric Circulation

Three atmospheric cells (Hadley, Ferrell, Polar) in which heat circulates (moves) globally.

- Hadley cells: warm, moist air rises at equator creating rainforests. Tropical air flows north and south creating areas of desert.
- Ferrel cells: air sinks over deserts creating dry conditions (warm deserts).
- Polar cells: air sinks over deserts creating dry conditions (cold deserts).



Movements of air

- Rising air = low pressure = moist conditions.
- Sinking air = high pressure = dry conditions.
- Ocean currents transfer heat energy across the globe

Global Climate Change

We live in the quaternary period (the last 2 million years).

The climate is changing naturally:

- Eccentricity/orbit: Our orbit changes shape every 100,000 years. Circular orbit = interglacial period (warmer). When the Spherical = glacial period (colder)
- Precession: the earth wobbles on its axis creating warmer summers/colder winters as it wobbles towards/away from the sun.
- Large volcanic eruptions can block out solar radiation and cause glacial periods.



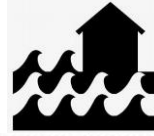
Humans are causing climate change.

- Transport: cars become more affordable, people's disposable income increases. Burning fossil fuels release greenhouse gases.
- Industry: more disposable income means more goods need to be made by factories. More fossil fuels are burnt.



Negatives of Climate Change

- Sea level rise: melting ice in Antarctica adds to the amount of water in oceans.
- Flooding: money lost as tourism reduces. Beaches close, coastal businesses close. Eg: The Maldives.
- Coral reefs: are bleaching which affects animal habitats.
- Food production: will be lower in some areas. Can cause malnutrition in developing countries.



UK Climate

- Climate is temperate (mild temperatures, steady rainfall).
- Temperature is warmer in the south of England (nearer the equator).
- Precipitation is higher in the north and west of the UK because of the mountainous relief.
- The UK has gone through 2 major changes: medieval warm period (the year 1,000) and the little ice age (the year 1,700).



The UK's climate is affected by its location:

- Maritime influence: the UK is surrounded by sea, meaning air over the UK is moist.
- Altitude: if air has to rise over mountain... it has to drop water as rainfall first.
- North Atlantic Drift: this warm ocean current from Mexico is driven by the prevailing wind. This makes our winter colder than expected.



Keyword	Definition
Altitude	The height of the land from sea level
Bleach(ing)	When the water is too warm, coral (below) loses its colour and is more likely to die
Circulates	Continuously moves
Coral	A hard stony material underwater in warm locations that is living
Disposable income	The money people have to spend on what they choose, not what they need
Fossil fuels	Coal, oil, gas. Are non renewable
Glacial	Colder periods of time when ice spreads on the land
Greenhouse gases	Gases such as carbon dioxide which cause global warming
Interglacial	Warmer periods of time where there ice is melting on the land
Malnutrition	A serious lack of food
Maritime	Describes anything related or connected to the sea
Orbit	The movement of the earth around the sun
Precipitation	Rainfall from clouds
Solar radiation	Energy that the sun gives out
Tourism	Travel for pleasure. For example, holidays
Transfer	The movement of one thing to another

Tropical Cyclones

- Large rotating storms that start over oceans.
- Features: eye (center, calm). Eye wall (heavy clouds).

Formation:

- High temperatures cause air to rise over oceans.
- This evaporation of the ocean creates heavy rain clouds.
- Cool air sinks towards the ocean surface which is then re – heated.
- The Coriolis effect causes the rapidly rising air to spin.

Storms need:

- Warm air, over 27 degrees.
- Winds at the surface of the ocean.
- 30 degrees north and south from the equator.



EVAPORATION



Causes of Drought

- Arid areas are based on dry climatic conditions whereas drought is an extreme weather condition.
- Causes of drought can be meteorological, hydrological or human.

Meteorological:

- A lack of precipitation (rainfall).
- Climate change can affect and change patterns of rainfall.



Hydrological:

- A lack of water stored. If water isn't stored and kept for when a country is in drought, more people will be without water.



Human:

- Dams: they stop water moving down the river.
- Deforestation: means tree roots can't absorb water from underground, nor can the water be evaporated through transpiration.



Impacts of Tropical Storms

- High winds – can damage buildings.
- Intense rainfall – can cause flooding.
- Storm surges – these tall waves can destroy coastal areas.
- Coastal flooding – can affect farming and tourism.

The impacts are worse in developing countries because:

- They are slower to respond.
- There are no well trained response teams.
- Buildings are weak and easily collapse.
- The government can't track the tropical storm so they don't know when it will hit.
- People don't own vehicles so find it difficult to evacuate.



Impacts of Drought

- Social: people become ill due to drinking poor quality water. Migration as people move away from affected areas.
- Economic: unemployment rises as businesses close. Food prices increase as there is a lack of food.
- Environmental: river habitats are destroyed. Endangered species become extinct.

The impacts are worse in developing countries because:

- They don't have water stored.
- There aren't enough hospitals to help the ill people. The government can't predict when the drought will start.
- People are too poor so can't afford the higher food prices.



Keyword	Definition
Arid	Little or no rain, dry
Climatic	The weather over a long period of time
Coriolis	A force that causes rotation
Cyclone	A storm created by the weather. Also called hurricanes (around America) and typhoons (around south east Asia)
Dams	A barrier built on rivers to hold back water
Deforestation	The cutting down of trees
Endangered	At serious risk of being lost forever (extinct)
Evaporation	The sun heating up water and it turning into a gas (water vapour)
Hydrological	Water and the way it moves around the land
Meteorological	The weather high in the atmosphere
Migration	Permanent movement of people or animals from one place to another
Rotating	Spinning
Storm Surge	A rising of the sea and waves at approximately 3m higher than usual
Transpiration	Water evaporated from leaves on plants/trees
Unemployment	The loss of a job

The World's Ecosystems

- Biomes are large ecosystems spread across the world.
- Each biome has a different climate and type of vegetation.



Examples of Biomes

- Tropical Rainforest: hot & wet all year, tall trees.
- Deserts: very hot all year, very dry all year, plants have deep routes to find water.
- Tundra: freezing temperatures for most of the year, low precipitation. Very few plants grow.



The Biosphere (The Earth's Surface)

- Humans use the biosphere for water, for fossil fuels and minerals like gold, silver and metal.
- Humans have exploited the biosphere.



The Nutrient Cycle

- Nutrients move around the biosphere.
- Nutrients move between soil, biomass and litter.
- As animals die the nutrients fall into the litter store. As the animal body decomposes the nutrients move into the soil. As plants take nutrients from the soil the nutrients move back into the biomass (it's a cycle).
- The climate affects how quickly this cycle happens.



UK Ecosystems

- UK terrestrial ecosystems are: woodland (deciduous trees), moorland (upland areas), wetlands (areas around rivers and lakes), heathland (sandy soil, can't be farmed).
- UK marine ecosystems are used for tourism and leisure activities.

The Benefits of UK Ecosystems

- Bring in £3bn into the economy and provide 200,000+ jobs.



Marine Ecosystems – Human Exploitation

- Chemicals used by farmers are being washed into rivers/lakes/seas.
- Large windfarms change bird migration routes.

Tropical Rainforests

- High temperatures & rainfall = high biodiversity (lots of plant and animal species).
- Trees grow tall but have shallow routes because only the top layer of the soil is fertile.
- Nutrient cycle: biomass is the biggest store of nutrients. Small litter store because of decomposition.



Tropical Rainforests – Importance

- They provide goods: timber, oxygen, medicine.
- They provide services: store carbon dioxide, provide animal habitats, bring in tourists.



Adaptations To The Rainforest

- Buttress roots – think roots that spread across the soil to give tallest trees stability.
- Poison dart frog – its poison skin helps protect it from predators.



Tropical Rainforests Are Changing

- Climate change: creating drier conditions which is increasing the risk of forest fires.
- Climate change: drier conditions are reducing biodiversity and causing animals to migrate away.



Deforestation

- Trees are cut down for social and economic reasons.
- Social: population is increasing which means we need more space for housing and farming (growing food).
- Economic: more money can be made from farming animals, trees need to be removed so we humans can extract minerals.



Deforestation Affects Animals

- Habitats are destroyed which might cause extinction of plant and animal species.
- Food chains are affected which means the number of animals is affected.



Keyword	Definition
Biodiversity	The number of plant and animal species
Biomass	Living things. Eg plants, animals
Biomes	A large area where plants and animals live together
Climate	The weather over a long period of time
Decomposes	Breaks down, usually an animal body
Economy /Economic	The number of jobs and money in an area
Fertile	Land that is good for growing crops
Fossil Fuels	Coal, oil, natural gas. When burnt, they create electricity
Litter store	Nutrients that are in dead plants or animals
Migration	The movement of plants or animals
Reduce	A less or smaller amount
Terrestrial	Land
Timber	Wood from trees for building
Tourism	Businesses and companies that support people going on holiday, eg hotels or restaurants.
Tundra	The Arctic area that is flat and permanently frozen
Vegetation	Trees and plants

Managing & Protecting The Rainforest

- Selective logging: only older trees are cut down to allow younger trees to grow taller.
- Agribusiness: growing crops in between the trees of the rainforest.
- Reforestation/afforestation: re – planting trees.

Governmental policies: where the government encourage the protection of the rainforest.



Case Study: Amazon Rainforest

- The Amazon rainforest, Brazil, is being cut down for: logging, minerals, building roads, houses and farming.



The rainforest is being protected by:

- Agribusiness: farmers are encouraged to plant crops amongst the trees.
- Education: local people are being educated about why the rainforest needs protecting.
- Afforestation: trees are being replanted.



Temperate Deciduous Woodland

- Climate: 4 seasons. Cool summers. Mild winters. Rainfall all year.
- High biodiversity – lots of plants and animal species.
- Mostly deciduous trees. Nutrient Cycle In The Deciduous Woodland
- Summer: warm temperatures mean rapid decomposition = soil full of nutrients.
- Winter: decomposition is slow = soil lacks nutrients.



Deciduous Trees

- Drop leaves in the winter because of the lower temperature.
- Deep roots to find water and nutrients.



Temperate Deciduous Woodland - Importance

They provide goods.

- Timber used to build with.
- Fuel: some UK power stations now burn wood to create electricity.



They also provide services.

- Recreation: woodland is popular for dog walking, cycling, horse riding.
- Carbon capture: trees absorb and store carbon. This helps stop global warming.
- Conservation: forest areas are protected by law and protect animal/plant species.



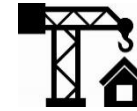
Temperate Deciduous Woodland Are Changing

- Climate change: if winters become milder (slightly warmer) then diseases amongst trees can spread.
- Climate change: climate becomes drier = more droughts and forest fires.



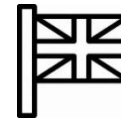
Deforestation of the Woodland

- Space is needed for people moving into cities (urbanisation).
- The timber from trees is used for building houses etc.
- Space is needed for land for farming.



Case Study: The New Forest in the south of England

- Tourism in the area brings in £500m.
- The 15m visitors damage the area by:
 - Walking, cycling, driving, horse riding.



The Area is Protected and Managed

- Conifer trees cut down are replaced by deciduous trees.
- Chemicals are rarely used in The New Forest.



The New Forest is used Sustainably

- Cycle paths and routes keep people away from damaged areas.
- A visitor leaflet called '5 ways to love the Forest' explains how people can protect the forest.



Keyword	Definition
Carbon	A gas produced when burning fossil fuels
Conifer	A tree that has needle like leaves
Conservation	Protect or look after, make last longer
Deciduous	A tree that drops its leaves every year
Decomposition	Breaks down, usually an animal body
Drought	A severe lack of water and rainfall in an area
Logging	Trees being cut down
Policies	Something that is recommended by a government
Rapid	Very quick
Recreation	Activities that people do to have fun or relax
Seasons	Autumn, Winter, Spring, Summer. Changes in temperature and weather
Selective	Chosen, in this example chosen trees
Timber	Wood from trees for building
Tourism	Businesses and companies that support people going on holiday, eg hotels or restaurants.

Geography – Topic 4 Changing Cities – Mumbai, India

(Major City in an Emerging Country)

Mumbai's Location

- Coastal city in the west of India.
- Has an international airport with major connections.
- Good road + rail connections to all of India.



Mumbai's History

- Was a British colony called Bombay.
- City developed because of its textiles industry, coastal location and its port.
- The CBD is the historic center of the city.



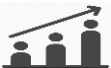
Quality of Life in Mumbai

- Urbanisation brings in migrants, they move to the slums, eg Dharavi.
- Rapid increase in population has led to huge unemployment.
- Richer people live in gated communities because of the drug + crime problems in the city.



Mumbai's Rapid Growth

- Population: 20m in 2014. Predicted to be 30m in 2021.
- Industry: now a global financial hub and home to Bollywood.
- Birth rate is declining as women work.
- Life expectancy now higher as healthcare improves.



Dharavi Slum (Informal Housing)

- Rapid growth has led to land being very expensive.
- Cost of housing is high in Mumbai – led to 9m people living in slums. 1m people live in Dharavi.
- Dharavi slum is Asia's 2nd largest slum.



Negatives of Dharavi

- Health issues. Diphtheria + typhoid spread.
- 1 toilet per 1, 4440 people.
- Poverty. Many live on less than \$1 a day.



Positives of Dharavi

- Strong community, people help each other.
- Slum businesses create \$40m for local economy.
- 85% of people have a job in the slum.



Improving the Quality of Life in Mumbai

- The Dharavi Slum Redevelopment Project
- \$2bn development project planned for the land Dharavi is built on.
 - The people of Dharavi will be relocated to apartment blocks so the land can be used for gardens and shopping centers.
 - The people do not want this as it will break up their communities. The people would prefer small improvements.
 - Bottom up development.
 - Build green outdoor spaces for local people.
 - Build clean water pumps and toilet blocks.



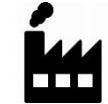
Keyword	Definition
Birth rate	The number of babies born (usually per person)
Bollywood	The Indian movie business
Bottom up Development	Where local people and/or charities are involved with improving something
British Colony	An area of land, or a country, that was owned by Britain
CBD	Central business district (the centre of the city, full of businesses and offices)
Coastal	Where the land meets the ocean
Connections	Where two or more things meet
Diphtheria	A serious infection of the nose and throat, can be deadly if not treated
Economy	The jobs, money and resources in a country
Industry	A type of business
International	From one country to another
Life Expectancy	The average age people are expected to live to
Migrants	People who have moved to a new area, usually looking for work, for at least 6 months
Population	The total number of people
Rapid	Very fast
Relocated	Moved to somewhere else
Textiles	Either a type of cloth or jobs around the making of clothes
Typhoid	A serious disease spread through contaminated (dirty) food and water
Unemployment	Without a job
Urbanisation	The movement of people into cities

Geography – Topic 4 Changing Cities – Mumbai, India (Major City in an Emerging Country)

Birmingham's Location

History

- 1700s went from a small market town to creating industries in jewellery and guns.
- 1830s – canals and railways were built. This connected Birmingham to the country.
- Was an industrial city – secondary industry.



Today

- CBD – is redeveloped. Expensive land. Lots of offices, theatres, hotels and shops
- Housing – tower blocks and terraced housing in the inner city. Larger semi detached housing in the suburbs.



Birmingham – Changes in the 1900s

*Urbanisation: happened in the 1800s because of the jobs in the city.

1920s/30s

- Suburbanisation happened.
- Semi detached homes built with greenery.



1970s - 1990

- Counter urbanisation happened.
- People left the city for a quieter lifestyle in rural areas.
- People could afford cars so they could commute back into the city for work.



After 1990

- Re – urbanisation happened.
- New apartments were built in the city center.
- Old factories were changed into apartments.



Population

- 1.1m people live in Birmingham.
- Birmingham is ethnically diverse. 42% from non – white backgrounds.



Migration

- Young people move into the city for work or for university (there are 78,000 students in Birmingham).
- 1950s – migrants came from old colonies such as India + Pakistan to work in transport and steel.
- 2000 – migrants came from eastern Europe to work.



Industry in Birmingham

- Secondary industries are now in decline.
- Factories are moving abroad because of cheaper wages, land and better global transport.
- This has created unemployment and brownfield sites.



Deprivation in Birmingham

- Areas are deprived because of deindustrialisation. Eg: South West of the city.
- Sparkbrook: deprived area, high unemployment, poor housing, health issues.
- Sutton Coldfield: wealthy area.



Retail (Shopping) in Birmingham

- 1970s: decentralisation. Shops moved to the suburbs for space and cheaper land.
- 1980s onwards: CBD is redeveloped. The Mailbox has expensive shops and restaurants in.
- The Bullring shopping center is built in 2003 to attract people back into the city.



Birmingham – trying to become sustainable

- The city is recycling 30% of waste. This is increasing.
- Bus + cycle lanes are being built to reduce greenhouse emissions.
- More schools are being built to improve education.
- Homes are built more energy efficient with insulation



Keyword	Definition
British Colony	An area of land, or a country, that was owned by Britain
Brownfield site	An area of land that has been built on before
CBD	Central business district (the centre of the city, full of businesses and offices)
Connections	Where two or more things meet
Decentralisation	Shops moving out of the city center (CBD)
Deindustrialisation	Factories and businesses moving abroad
Deprived	An area without basic things, eg good schools, good housing
Housing	Terraced – rows of smaller houses Semi detached – 2 houses joined together Detached – houses that aren't joined together Apartments – expensive flats
Industry	A type of business
International	From one country to another
Mailbox	A building in Birmingham that was turned from a Royal Mail building into expensive apartments and shops/restaurants
Migrants	People who have moved to a new area, usually looking for work, for at least 6 months
Re – urbanisation	The movement of people back into the city center
Redeveloped	When something is improved
Secondary Industry	Jobs that were in manufacturing/making things using materials, eg turning steel into guns.
Suburbanisation	The movement of people into the suburbs (edge of the city)
Sustainable	Improving something for the future, eg a city
Urbanisation	The movement of people into cities

Development – an Introduction

- About improving people's quality of life.
- Examples:
 - Levels of literacy improve because teachers are trained.
 - Rural areas get electricity because there are more power lines.
- Factors that affect development:
 - Economic – average income, the unemployment rate.
 - Social – life expectancy, literacy rate.
 - Technological – % of people with internet access, % of people with electricity.



Measuring Development

- Gross Domestic Produce (GDP): the total value of what is made in a country. Eg: if 2 cars are made and they cost £20,000 each. GDP = £40,000.
- GDP per capita: divide the GDP by the population.
- Human development index is a score between 1 – 0. 1 = most developed. It looks at:
 - Life expectancy
 - Literacy rate
 - Gross national income
- Single indicators are not as reliable as composite indicators. Composite indicator = HDI.
- Political corruption: the corruption index grades countries from highly correct to very clean.



Food Security

- 800 million people live without enough food because:
- It isn't available in the right places for when people need it.
 - People don't have the money to buy it.
 - People in developed countries are consuming (eating) too much.



Water Security

- People don't have access to clean water because:
- Water is being wasted in the developed world for industry and food production.
 - Water in oceans, rivers, lakes and reservoir is being polluted.



Uneven Development - World

- There is a development gap between the wealthiest and poorest countries.
- The Brandt Line – shows the developed north and the developing south. Now outdated, Made in 1980s.
- Countries have variation in development. Urban areas are more developed than rural areas.
- Gini coefficient: shows income inequality in countries.



Reasons why there is a gap in development:

- Physical environment: landlocked countries can't trade, some countries have natural disasters.
- Demography: a lower birth rate = economic growth.
- Politics: open economies (eg UK) encourage foreign investment. Closed economies (eg Russia) don't.
- History: European countries exploited the world's resources through colonialism.
- Social investment: countries that invest in education and health develop fastest.



Uneven Development - UK

- The UK: has a north Vs south divide. London has the highest income per house. The south east has the highest average household price.
- Why:
 - Mountainous areas in northern Scotland, Southern England is quite flat (easy to build).
 - De – industrialisation happened in the north as factories moved abroad for cheap labour.



The Impact of Uneven Development

- 30% of the world's population live in slums
- 6.6m children under 5 die every year
- 775m people cannot read or write
- 805m people are undernourished



Keyword	Definition
Capita	Person
Colonialism	Taking over another country and taking its resources (gold, diamonds, oil etc)
Corruption	People using their power for themselves
Composite	Made up of more than 1 thing
Demography	Population and its birth/death rate
De – industrialisation	Factories leaving to go abroad
Development (gap)	The difference between rich and poor
Domestic	Produced in that country. The home country
Exploited	Taken advantage of
Industry	Businesses and/or factories
Landlocked	Surrounded by land/other countries
Life expectancy	The age you are predicted to live until
Literacy rate	The amount of people that can read + write
Rural	Countryside, open green fields
Undernourished	Without proper food
Unemployment rate	The number of people without a job
Urban	City
Variation	Differences

Reducing Uneven Development

- Fair trade: retailers in developed countries pay more for a product.
- Giving aid: developed nations give aid. Countries can buy resources, build infrastructure.
- Cancelling debts: helps countries develop as they can spend more on infrastructure.



Top Down Development

- Experts from developed countries plan large projects.
- Doesn't involve local people.
- Eg: dam and reservoir project.



Bottom Up Development

- Done by non government organisations.
- Involve local people and spend money where it is needed most.
- Eg WaterAid. More sustainable.



India – An Emerging Country That Is Developing

Introduction

- 7th largest country in the world.
- Population: 1.2 billion.
- Climate: tropical south, monsoon weather.



Uneven Development

- Western India is most developed. Industries: Finance, ICT.
- Eastern India is least developed because of physical geography (mountains, desert).



Mumbai: core region.

- Largest + wealthiest city.
- Home to Bollywood, ICT and TNCs such as Bank of America.
- 40% of houses are slums.
- Work on an Industrial corridor is underway. \$100bn project with Japan.



Bihar: periphery area.

- 100m population.
- High fertility rate.
- Many live in poverty.
- 80% of people are farmers in rural areas.
- Lacks investment in education + health.
- Poor quality leadership by the government.



India's Changing Economy

- Quaternary's GDP contribution is increasing (research + development).
- India's low cost labour force is providing ICT services. Makes \$100bn for India a year.
- Since 1990, its economy has opened up and allows foreign investment (2014: \$34bn).



India's Demographic and Social Change

- Fertility rates have fallen.
- Mortality rates have fallen.
- Life expectancy improved to 68 years.
- Literacy rate has improved to 74%.



India's Geopolitics

India Vs Pakistan

- Gained independence from Britain in 1947 and the land was split into India and Pakistan.
- India and Pakistan have argued over where the border should be. Particularly an area called Kashmir (northern India).
- Both countries have nuclear weapons.



India Vs China

- Both countries have nuclear weapons.
- Arguing over shortages of water from the Himalayan mountains.



Impacts of Rapid Development

- Air is heavily polluted. Delhi is world's #1 polluted city.
- Deforestation for growing cities and space for industry.
- Coal is the main source of energy – gives off greenhouse gases.



The Smart Cities Mission:

- Is a plan to improve quality of life across 100 cities.
- Aims to: improve water + electricity supply, build affordable housing for the poor and improve health + education.

Keyword	Definition
Affordable	Not expensive
Core area	The central area
Deforestation	The cutting down of trees
Fertility rate	The number of babies born per person
Himalayan	Mountains that are in India and Pakistan
independence	Being controlled by your own government, not of another country
infrastructure	Roads, bridges, schools, hospitals
Investment	Money spent in an area, eg schools
Mortality rate	The number of people that die
Non government organisations	Charities and businesses that aren't controlled by the government
Nuclear power	Very powerful weapons created by atoms and science
Periphery area	The areas outside the core area (see core)
Population	The total number of people
Quaternary	Jobs that are around research and development
Reservoir	A man made lake built to store water
Slums	Informal housing, usually built by the people themselves on illegal land
Sustainable	To look after future generations
Undernourished	Without proper food

Types of Resources

- Abiotic: found from things that can't reproduce. Eg: soil, water.
- Biotic: found from things that can reproduce. Eg animals and plants.
- Non – renewable: resources that either cannot be remade or would take millions of years to make again. Eg: fossil fuels.
- Renewable: resources than can be used again and again or re-created in a short amount of time. Eg: wind, solar, hydro electric power.



Why are we using more resources?

- People are richer and can afford more cars.
 - The population is increasing.
 - People are buying more technology.
- All of this means we need to build/make more which takes up resources.



Where do we get our electricity from?

- In the past, we have always burnt fossil fuels (non renewable energy sources).
- Recently, we have started to use renewable energy sources.
- All energy sources have positives & negatives



The Energy Mix (where countries get there electricity from)

- 80% of the world's energy comes from non renewable sources.
- 60% of the UK's energy comes from non renewable sources.
- Factors that affect a country's energy mix: size of population, wealth of the country, what energy resources are nearby.



The Location of Natural Resources Around the world

- Gold and diamonds are found near volcanoes.
- Fossil fuels are found where there is sedimentary rock.
- Oil is found in countries such as America, Iraq, United Arab Emirates.



In the UK

- Iron and coal helped Britain in the industrial revolution but there is little left in Britain.
- Oil and gas are found in the north sea but these supplies are running out.



Problems in the UK

- Rainfall is higher in the north and west of the UK but this isn't where people live.
- The water is in the wrong place. The supply of water cannot meet the demand.



Consumption of Resources Around the world

- People are using more resources everywhere in the world, but the biggest increase is in Asia.
- America is eating up the most calories. This leads to undernourishment in other countries.



Coal – a fossil fuel

Advantages

- ✓ Should last for another 200 years.
- ✓ Cheap and easy to mine.
- ✓ Creates large amounts of electricity.

Disadvantages

- Releases greenhouse gases, polluting the air.
- Destroys animal habitats.



Wind energy – renewable energy

Advantages

- ✓ Does not pollute greenhouse gases.
- ✓ Creates cheap electricity for customers.

Disadvantages

- Can ruin the look of the landscape.
- Doesn't work when it isn't windy.
- Can be expensive to build.



Keyword	Definition
Calories	Energy that comes from eating food
Expensive	Costs a lot of money
Fossil fuels	Coal, oil, natural gas. All non renewable
Greenhouse gases	Harmful gases that are released into the air. For example when burning fossil fuels
Habitats	Places where something lives
Hydro electric power	Electricity that is made from water powering machines
Industrial revolution	Happened in the 1700s where people had jobs in factories
Landscape	The land, the environment. Eg fields
Population	The total number of people in an area
Reproduce	Make more of
Sedimentary rock	Layers of rock that have fossils (dead plants/animals) in them
Undernourishment	People that do not have enough food to eat

Nuclear Power Plants

Advantages

- ✓ Produce electricity all year round.
- ✓ Produces huge amounts of electricity.
- ✓ Produce less carbon dioxide than fossil fuels.

Disadvantages

- Expensive to build.
- Can be dangerous if they explode.



Fracking Natural Gas

- This is a new way of finding natural gas.
- Involves drilling down to shale rock.
- Blasting water, sand and chemicals into the rock.

This breaks the rock and allows the gas to come out.

Advantages

- ✓ Produces large amounts of gas.
- ✓ Has made natural gas cheaper to use/buy.
- ✓ Produces less greenhouse gases than coal.

Disadvantages

- Can be dangerous as gas enters the water supply and can come through kitchen taps.
- The use of chemicals can damage animal habitats.



Managing & Protecting Our Energy

Individuals can:

- Measure their carbon footprint.
- Use public transport like buses, not private transport like cars.
- Insulate homes and use solar panels.



Companies can:

- Restaurants can re use cooking oil as fuel for lorries.
- Use LED lights which use less electricity.

Governments can:

- Use smart meters in homes.
- Build renewable energy sources.
- Improve renewable energy sources by improving technology.



Case Study: China, an emerging country

- 70% of its energy comes from burning coal.
- 7 cities in China are classed as 'heavily polluted'.

Why does China have pollution problems?

- More people are owning cars.
- China's roads are heavily congested.
- Poor quality petrol causes air pollution.

What has China done to solve these problems?

- 2006: China introduced the 'China Renewable Energy Law'. Which aims to minimise the use of coal and use more nuclear and wind power.
- China built the 'Three Gorges Dam' to create hydro electric power.
- Solar farms (rows of solar panels) have been built in the Gobi desert.



Case Study: Germany, a developed country

- Germany wants to use less nuclear power because of the Fukushima disaster in Japan, 2012.
- By the end of 2020 Germany plans to reduce greenhouse emissions by 40%, and by 80% in 2050.

How will it meet these targets?

- Germany has built the Bavaria solar park with 60,000 panels. This will reduce carbon emissions by 100,000 tonnes.
- Germany has invested in new wind turbines in the north sea, called Norsesee Ost farm. This will increase how much energy is created.



Keyword	Definition
Carbon dioxide	A gas that is given off when burning fossil fuels
Carbon footprint	The amount of carbon dioxide each person emits (gives out) because of their lifestyle. Eg, a person who drives will have a larger carbon footprint than someone who walks
Congested	Heavy traffic
Dam	A barrier built on rivers to hold back water
Emissions	Gases released into the air
Fossil fuels	Coal, oil, natural gas. All non renewable
Fukushima	An area of Japan where a nuclear power plants exploded because of a powerful earthquake
Greenhouse gases	Harmful gases that are released into the air. For example when burning fossil fuels
Hydro electric power	Electricity that is made from water powering machines
Invested	Money spent in a new area to improve something
LED lights	The best lights for the environment
Minimise	Reduce, make less
Nuclear	Electricity created by using atoms
Shale rock	A type of rock where natural gas can be found
Smart meters	A small computer that tells you how much electricity you are using each hour
Wind turbines	Large wheel that is turned by wind which creates electricity

The UK's Population

- Is increasing. 2020: 67m. 2050: 77m people.
- This increase will put pressure on resources:**
- More housing means more greenfield sites are needed to be built on.
- More food will mean natural habitats are destroyed to make space for farms.
- More energy might mean more greenhouse gases if fossil fuels are burnt.



To solve these problems:

- Use brownfield sites for building.
- Encourage people to limit their food intake and have a healthy lifestyle.
- Use sustainable, renewable energy sources for electricity.



Transport in the UK

- Global transport releases emits huge amounts of greenhouse gases.
- The UK is trying to reduce greenhouse gases:
- Improve public transport so people leave their cars at home.
- London has created cycle routes and Boris bikes for people to rent for the day or longer.
- Congestion charges: charging people for driving through city centers has reduced traffic and pollution.



Greenfield Sites

Advantages:

- Cheaper and quicker to build on.
- Environment is usually cleaner and more pleasant to look at.



Disadvantages:

- Valuable farms or open spaces are lost.
- Animal habitats are destroyed.

Brownfield Sites

Advantages:

- Less countryside is lost.
- Old dis – used urban areas are cleaned up.

Disadvantages:

- Often more expensive because old buildings need to be destroyed/rebuilt.
- Higher levels of pollution in these areas.



The UK's Economy

The 2 speed economy: London and the south east's economy grows faster than the north of England.



Why is this?

- More government money is invested in the south to attract more businesses.
- The big businesses in London attract the brightest people from the north of England. These people move south to work.



How is the government trying to stop the north Vs south divide?

- A high speed railway (HS2) is being built from London to northern cities. This will create jobs in the north.
- Airports in the north are improving to encourage travel and businesses to set up in the north.



Migration

- Immigrants: mainly from India + China.
- Emigrants: mainly leave to Australia.
- Reasons for migration: better jobs, better education, family reasons or to retire.



Advantages of migration nationally:

- Brings more workers so more taxes are paid.
- Different cultures bring different music and food.



Disadvantages of migration locally:

- More people means we need more hospitals, schools and doctors. This costs money.
- Some people think migrants take jobs from British people.

Keyword	Definition
Boris bikes	Bikes that can be rented by the day in London. Boris Johnson, now the Prime Minister, introduced them when he was the Mayor of London
Brownfield	Land that has been built on before
Congestion	Heavy traffic
Culture	People's way of life, the music they listen to or the food they eat or the activities they enjoy
Economy	The jobs and money in an area
Emigrants	People that move out of a country. Eg: Jack has emigrated to Australia
Greenfield	Land that has not been built on before
Greenhouse gases	Gases that damage the environment and cause global warming
Immigrants	People that move into a country. Eg: Jack has immigrated into the UK
Urban	Cities and built up areas

UK's Landscape Challenges

How can we protect national parks?

- Employ young people to work in the park so they grow up seeing its importance.
- Encourage public transport into the national park.



The UK is at risk from river flooding because:

- The population is increasing so more people have to live nearer rivers.
- More urban areas means more impermeable surfaces.
- More extreme rainfall because of climate change.



The UK government is planning to:

- Reduce the number of buildings near rivers.
- Build flood defences – hard/soft engineering.
- Help people prepare through warnings.



Specific example: Somerset floods, 2013/14.

- Heavy rainfall flooded 600 homes.
- Flood defences failed to protect people.
- Rivers were blocked with silt which meant rivers couldn't hold much water.



UK's Coastal Challenges

- Storm surges cause severe flooding because of the wave height and wind power.
- Storm surges can destroy some coastal defences.



Reducing coastal flooding in the UK:

- Build sea walls to reduce flooding and erosion.
- Use managed retreat in certain areas.

Specific example: 2013, across east England.

- The Thames flood barrier protected London from flooding.
- Flood barriers were quickly built in Norfolk.
- Advice was passed out through social media which meant that 800,000 homes were protected.



UK's Climate Change Challenges

The UK will become:

- Warmer in winter and summer by 3 – 5 degrees.
- 30% wetter in winter, 30% drier in summer.
- Extreme rainfall will be more severe and often.



Climate change will impact the UK:

- More flooding near rivers and the coast.
- More drought and less water in rivers may affect animal habitats and numbers of species.
- More heatwaves could mean more illnesses like heatstroke. This puts pressure on the NHS.



Responding to climate change

Individual people can:

- Walk or cycle to reduce greenhouse emissions.
- Recycle waste to reduce resource consumption.
- Build solar panels and insulate homes to conserve heat.



Governments can:

- Place limits on carbon emissions from businesses.
- Create adverts which encourage recycling.
- Sign agreements like the Paris agreement to work with other governments.



Problems governments face:

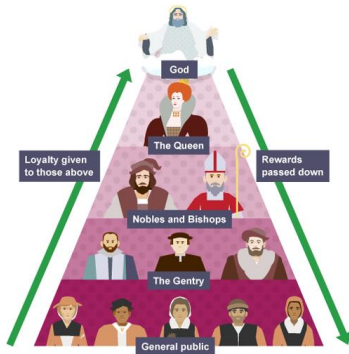
- Encouraging economic growth and development usually means using more resources.
- Reducing climate change can damage economic growth.



Keyword	Definition
Drought	Little or no rainfall for a long time, usually months or years
Economic growth	An increase in the number of jobs in an area and an increase in the number of money spent in an area
Emissions	When gases are released into the atmosphere (air)
Extreme rainfall	Very heavy rain
Flood defences	Things that aim to try and stop rivers from flooding
Greenhouse gases	Gases that damage the environment and cause global warming
Heatwaves	Very hot weather for a few days or possibly weeks
Heatstroke	An illness that makes the body weak. Is caused by being in hot temperatures for too long without drinking enough water
Impermeable surfaces	Building materials that don't allow water to pass through them. Eg concrete, tarmac
Insulate	Keep warm
Managed retreat	Allowing certain parts of the land to become flooded
National parks	Parks that cannot be built on. They are protected by laws
Severe	Very dangerous
Storm surge	This is when the wind 'picks up' the waves and makes them higher. About 6 feet higher than usual
Thames flood barrier	A barrier on the Thames river that protects London from flooding

Patronage

During Elizabethan times power came from the top down by a system of **patronage**. God had chosen the king or, in Elizabeth's case, the queen and as such she had the right to appoint whoever she wished to help her rule the country. She usually chose from the **nobility** and could take their power away if they offended her.



How did Elizabeth control Parliament?

- Parliament could only meet if Elizabeth called it, and she set the agenda.
- Parliament could only talk about what Elizabeth allowed it to discuss.
- Elizabeth mainly used Parliament to grant her taxes - this was her main income.
- Elizabeth could close (prorogue) Parliament at any time.
- Parliament only met 13 times in her 45 year reign for an average of three weeks per year.
- Elizabeth made sure her **Privy Councillors** sat in Parliament to help control proceedings.
- Both Walsingham and Cecil used Parliament to introduce key issues such as marriage, the **succession**, and religion. Elizabeth fought back by stating that these were issues for her to decide just like any other monarch.

Year 10 History - KT1: Elizabeth and Government



How did Elizabeth use her power?

Elizabeth's Secretaries of State

1. William Cecil

- Elizabeth appointed Cecil as the **Secretary of State** in 1558.
- He was her most important **minister** and guided her wisely for 40 years.
- Cecil was a moderate **Protestant** and was concerned about the threat of English **Catholics**.
- Whilst he shared her caution as he did not want to see England embroiled in expensive foreign wars he was very much his own man.
- He was clear on the fact that he was an advisor to the queen and as such he would challenge her by using parliament and her courtiers to encourage her to change her mind about various issues.
- After the execution of Mary, Queen of Scots in 1587 Elizabeth refused to see Cecil. She was angry with him and blamed him

2. Sir Francis Walsingham

- He was in charge of Elizabeth's secret service and advised on **foreign affairs**.
- Walsingham, like Cecil was also worried about the Catholic threat
- Walsingham was a cold and calculating man and whilst Elizabeth admired his straight talking nature she could be angered by him.
- In the 1580s when Walsingham wanted to repress the Catholics she was angry with him and even threw a slipper at him!
- In 1586, he uncovered the plot that led to Mary, Queen of Scots' execution.
- When Walsingham died Cecil took back the role of Secretary of State.

Privy Council

Elizabeth surrounded herself with trusted advisers, a group called the **Privy Council**. Privy councillors could be dismissed by Elizabeth if they displeased her.

Role of the Privy Council



How did Elizabeth control her Privy Council?

- She limited the council to 19 members and of these only eight or nine met regularly
- She appointed councillors with different viewpoints
- She used flattery and played the councillors off against each other
- She used rewards and the threat of removing those rewards in order to maintain control
- She also discussed policies and the business of state with courtiers who were not members of the Privy Council
- In this way her reign differed from that of her predecessors where factions or groups at court had caused trouble for the monarch.

Rebellion of the Earl of Essex

Causes of the rebellion

- Elizabeth promoted Robert Cecil as **Secretary of State** in 1596 as his father, William Cecil was too ill
- Essex was angry she had not chosen him
- Cecil and Essex each began to build up rival factions at court. This was something Elizabeth had sought to avoid for most of her reign.
- Essex was sent to Ireland to defeat a rebellion, but instead made peace with the rebels against Elizabeth's orders. Upon his return from Ireland Essex broke into Elizabeth's bedchamber hoping to explain his actions which alarmed and angered her.
- As punishment he was banned from court and financially ruined.



The Rebellion

- Rather than accept his punishment Essex turned to desperate measures and set out to seize power.
- He gathered his allies such as the Duke of Southampton, another **noble** who was out of favour and heavily in debt.
- Key **Catholics** and **Puritans** also joined him along with former soldiers who were impressed by his military skill.
- Essex wanted to get rid of the influence of Cecil at court and to make Elizabeth declare James VI of Scotland as her successor.
- The rebellion failed as the Privy Council heard of the impending attack and offered to be merciful to those who had initially supported Essex as long as they deserted him.
- Essex was executed for treason on 25 February 1601.

Elizabeth and her people

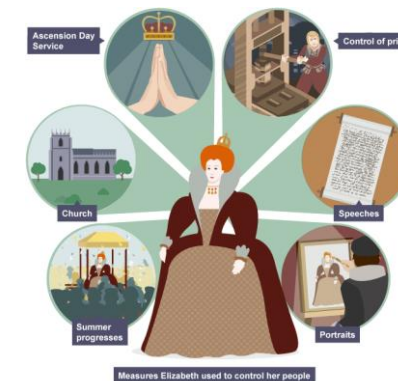
Elizabeth set up two new roles to tackle the problems in England.

Lord Lieutenant - one for every county. A wealthy **noble** who acted as a direct link to the queen and **Privy Council**. He was expected to inform the Privy Council of any potential local unrest. The Lord Lieutenant was also responsible for providing part time soldiers to serve the queen should she need it.

Justices of the Peace (JPs) - 40 in each county. These were unpaid officials selected by the queen to oversee law and order. It was a great honour to be picked. They performed the following duties:

How did Elizabeth control her people?

- Summer progresses allowed Elizabeth to be seen by her subjects and also to keep an eye on her nobles in the provinces. Nobles were expected to provide lavish entertainment for the queen.
- Elizabeth also used the Church to control her people. Church was compulsory and you could be fined for not attending. There was even a prayer for the 'Queen's Majesty' that was included at each service.
- Each year a service of thanksgiving was held on Ascension day. At this service people had to thank God for their wise and **Protestant** queen and they had to pray to keep her free from the threat of the **Catholics**.
- Elizabeth controlled printing and as there were only 60 printing presses in the country it was fairly easy for the Privy Council to censor publications.
- Elizabeth's speeches were published to show how much she loved her people.
- Elizabeth and her ministers also controlled the portraits that were painted of the queen. She was made to look as beautiful and ageless as possible in keeping with the 'Gloriana' myth.



KEY TERMS

Patronage	Favours given in exchange for loyalty
Democracy	A system of government where people vote for the leader
Parliament	Those who run the country alongside the monarch
Nobles	A person of high rank
Gentry	Rich, highly regarded people, below the nobility
Sermon	A religious speech, usually given in Church
Jousting	A medieval sporting contest in which two opponents on horseback, typically knights, fight with lances.
Privy Council	A body of advisors appointed by the monarch
Secretary of State	The head of Elizabeth's government
Rebellion	an act of armed resistance against the monarch/leader
House of Lords	one of the two parts of the UK parliament, whose members are not elected but have a high social position
House of Commons	one of the two parts of parliament in the UK, whose members are each elected to represent a particular official area of the country
Puritan	An extreme Protestant
Monopolies	When someone has exclusive rights to produce something – reduces competition
Pageant	a public entertainment consisting of a procession of people in elaborate, colourful costumes

Year 10 History – KT2: Catholic Threats

Why were there so few Catholics in England by 1603?



The Religious Settlement

- Elizabeth sought a 'middle way' between Catholics and Protestants.
- Elizabethan Religious Settlement of 1559 was deliberately vague and gave little mention of liturgy (the way religion should be practised).
- As long as the people recognised Elizabeth's supremacy (authority) over the Church and at least followed the new prayer book they were safe.
- It held the same structure as the Catholic Church in that bishops retained responsibility for the organisation, administration and supervision of the church and its clergy.

Catholic Plots

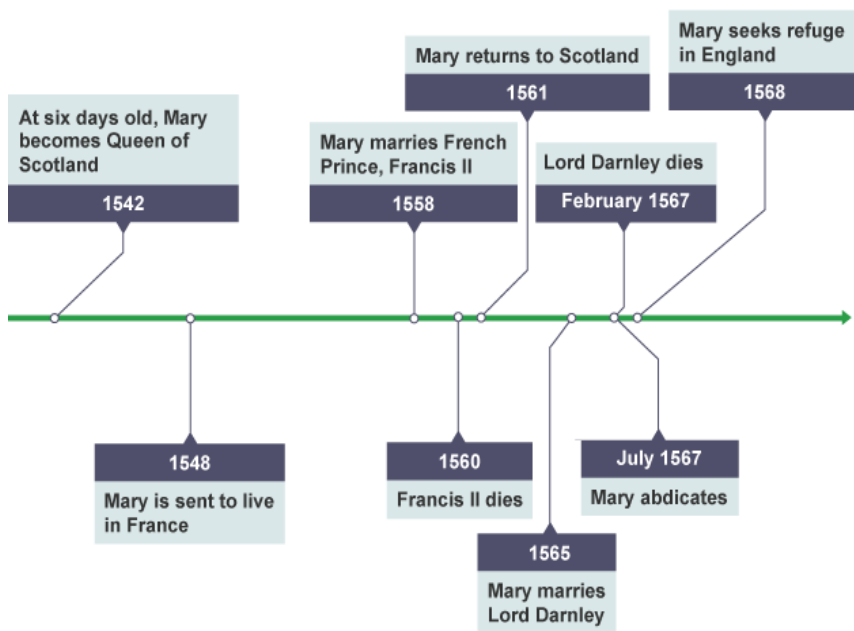
Date	Plot	Elizabeth's action
1583 - The Throckmorton Plot	A young Catholic man, Francis Throckmorton, organised a plan for a French army to invade England and replace Elizabeth with Mary, Queen of Scots, paid for by the Pope and King Philip II of Spain.	Throckmorton was executed and Mary was moved to Tutbury Castle in Staffordshire, where she was held in isolation and allowed no visitors.
1586 - The Babington Plot	Sir Anthony Babington planned to rescue Mary, Queen of Scots from jail and murder Elizabeth. Secret letters between the plotters and Mary were discovered which gave the evidence needed to prove Mary's guilt.	This finally led to the execution of Mary, Babington and six other plotters.

Increased Threat

- From 1568 Mary, Queen of Scots was imprisoned in England. She had been overthrown by the **nobles** of Scotland and had escaped to England. **Catholics** saw Mary as the rightful queen of England.
- In 1570 the Pope produced a **Papal Bull of Excommunication** that said that Elizabeth was excommunicated (thrown out) of the Catholic Church and he ordered Catholics not to obey her. This meant that by the 1580s Elizabeth was under threat from the Catholic Church.
- From the mid 1570s newly trained Catholic priests began arriving in England and from 1580 onwards the Pope sent specially trained priests called Jesuits to aid them.
- In 1571 new **Treason** Acts were passed which made it an offence to deny Elizabeth was the queen of England.
- In 1581 Parliament passed a new law against Catholics. Recusants (those who refused to attend church) had to pay a bigger fine of £20 per month and those who tried to encourage people to become Catholic could be accused of treason.
- In 1584 William of Orange, the leader of the Dutch **Protestants** was murdered by a Catholic. Parliament responded by passing the **Bond of Association**. This stated that if Elizabeth was murdered, Parliament would make sure that the murderers were punished along with anyone who had benefitted from Elizabeth's death.
- In 1585 war broke out between England and Spain. Parliament ordered all Catholic priests to leave the country within 40 days. If they were found in England after that time they would be executed.



Mary Queen of Scots



Why was Mary Queen of Scots a threat?

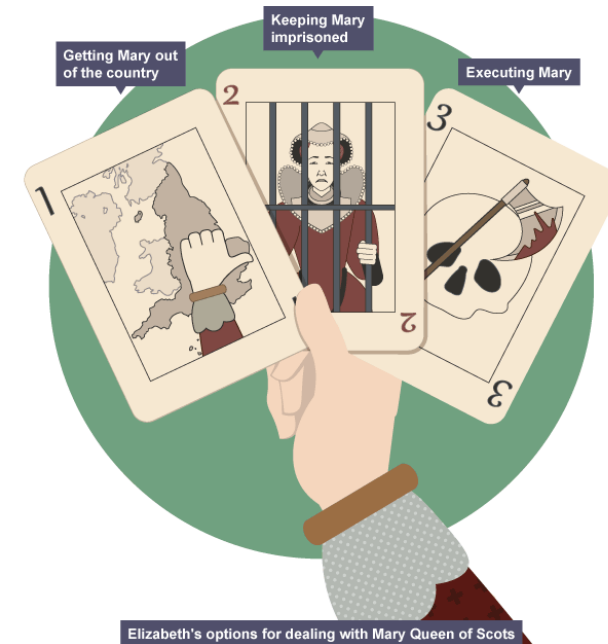
- Mary, Queen of Scots was a threat to Elizabeth's rule because she had two claims to the English throne:
- Many people believed Elizabeth to be **illegitimate** and so felt she had no right to be on the throne. (Her father, Henry VIII, had divorced his first wife. **Catholics** didn't recognise divorce and so viewed his second marriage to Elizabeth's mother as illegal.)
- Elizabeth had converted England's official religion to **Protestantism**, leaving many Catholics disgruntled. Mary was a Catholic and many viewed her as their **figurehead** and a rightful replacement to the throne.

What should Elizabeth do with Mary?

- **Getting Mary out of the country** - sending Mary back to Scotland or France could backfire, allowing her to gather more support to challenge Elizabeth.
- **Keeping Mary imprisoned** - this would reduce the risk of Mary gathering more support back in Scotland or France and allowed Elizabeth to keep tight control. But unlawfully imprisoning Mary could provoke international outcry and attacks anyway.
- **Executing Mary** - whilst this would remove the figurehead for **Catholic** challengers, it could also provoke international attacks and set a precedent for killing a queen.
- In the short term Elizabeth decided to keep Mary as a closely guarded royal 'guest', moving her from castle to castle so she would not be the focus of plots.

Consequences of Mary's death

- As it turned out the consequences were not as serious as Elizabeth had feared:
- **France** - fearing the might of Spain, they wanted to maintain their **alliance** with England.
- **Spain** - were already at war with England due to the action of the **'Sea Dogs'** and events in the Netherlands.
- **Scotland** - King James VI was on the throne of Scotland, he was Elizabeth's heir and so he took no action.
- **English Catholics** - remained loyal to Elizabeth.



Rivalry with Spain

Issue	Explanation
Religious differences	Spain was a Catholic country and England a Protestant country – meaning that the two rulers had conflicting spiritual outlooks.
Marriage rejection	King Philip of Spain had been married to Elizabeth's sister, Mary I. When Mary died he offered to marry Elizabeth but she rejected him.
Piracy	English Sailors like Hawkins and Drake attacked and stole treasure from Spanish ships in the New World. King Philip was furious but Elizabeth encouraged and rewarded adventurers.
The civil war in France	France was the traditional enemy of both England and Spain, meaning that they united together against the country. Now France was in civil war it was preoccupied with its own issues and no longer posed a threat – so the alliance between Spain and England was not necessary anymore.
Spain supported Catholic plots	There was evidence of Spanish support for plots to restore Catholicism to England, particularly involving getting Mary, Queen of Scots on the throne and Elizabeth off.
The Dutch Revolt	Protestants in the Netherlands began a revolt against Spanish rule in 1572. Elizabeth secretly supported the Dutch rebels because she knew the Dutch revolt would keep the Spanish too busy to threaten England.
Elizabeth's army joined the Dutch rebels	Elizabeth sent an army to help the Dutch rebels fight Spain. For the first time English and Spanish armies were fighting each other. England and Spain were now at war.

Spain

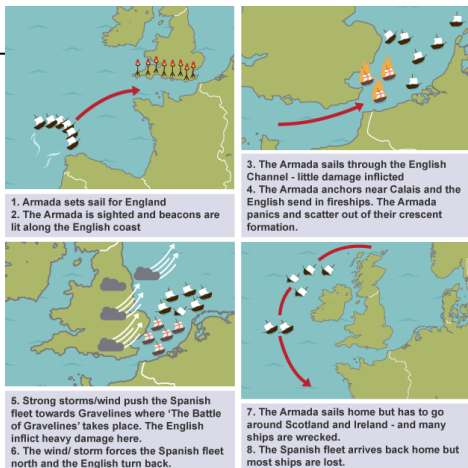


Failure of the Armada

Factor	Explanation
Leaders	The Duke of Medina Sidonia led the Spanish fleet, but he was inexperienced in naval battle and so made some fatal errors in his planning and tactics.
Planning	The strength of the Spanish fleet came from its crescent formation plan – but when the English broke this up with their fireships, the Spanish became vulnerable and exposed to attack.
No reinforcements	The Spanish plan relied on stopping to pick up the Duke of Parma's army to boost their numbers, but the fleet was unable to anchor and so never picked them up.
Tactics	Spanish tactics were to get close enough to English ships to board them, whereas the English tactic was to attack from a safe distance.
Ships	Spanish ships were slower and less equipped for the bad weather than the English ships.
Guns	The English ships had more long-range guns (497 to the Spanish's 172) able to fire at a safe distance. The design of the Spanish gun carriages meant that they could not be re-loaded quickly.
Support	The Spanish overestimated the level of support there would be in England for Spanish control and a return to Roman Catholicism.
Weather	The lack of a secure port where the Spanish could take shelter meant that the Spanish ships were buffeted by the wind. The thinking was that God intervened and the windy weather was a sign that God was on Elizabeth's side.

Spanish Armada Events

- The Armada leaves Lisbon on 28 May 1588. It's delayed by storms and repairs, and finally sets sail for England on 21 July.
- The Armada is sighted by the English from Lizard Point in Cornwall. Warning beacons are lit along the English coastline.
- The Armada continues through the English Channel now chased by English ships, but suffers little damage.
- The Armada anchors near Calais where more troops are meant to join, led by the Duke of Parma, but the English send burning fire ships into the fleet. The Spanish ships panic and are scattered out of formation.
- The Spanish ships are blown towards dangerous sandbanks and the English attack again in the Battle of Gravelines. This time they battle at close range and significant damage is inflicted to the Spanish fleet.
- The Armada is forced north around the east coast of Britain and the English fleet turn back after food and ammunition supplies run low.
- The Armada sets sail for home but are forced around Scotland and Ireland. Many ships are wrecked in storms and thousands of sailors drown.
- The surviving Spanish ships arrive back in Spain, but almost half of their fleet is lost.
- Victory for England.



KEY TERMS

Recusant	Catholics who refused to attend Protestant services
Church Papist	Someone who attended Protestant Church but remained a Catholic in private
Conformer	Someone who dropped their Catholic beliefs and became Protestant
Gentry	Rich landowning men in Tudor England
Mass	The most important Catholic church service
Treason	A crime against the King, Queen or Country
Excommunicate	To ban someone from the Catholic religion
Seminary Priest	Priests from abroad who came to support Catholics
Jesuit Priest	Priests from abroad who came to convert Protestants to Catholics
Priest hole	A place priests hid from the authorities
Traitor	A person who betrays his King, Queen or Country
Convert	To change to something different e.g. religion
Rivalry	Dislike/competition between people
Armada	A large fleet of ships from Spain

The Labouring Poor

Half of the population in Elizabethan England were the labouring poor.

- The houses of the labouring poor were very simple one storey dwellings. They did not have chimneys. There were few windows and they did not have glass in them. A labourer would have very few possessions perhaps a bed a table and a chair.
- Work - most of the labouring poor worked in the countryside on the farms of yeomen and husbandmen. Although farmers needed lots of labour at harvest time for the rest of the year labourers could struggle to find work. They often found it difficult to pay their rent and buy food or fuel.
- Land - some labourers might be lucky enough to have an acre or two of land and they might enjoy common rights (this would allow them to graze their animals on the common land). Two thirds of labourers had only their cottages and gardens. Food - barley and rye bread was the staple diet of the labouring poor. It was supplemented by a soup called pottage made from vegetables grown in the labourer's gardens.
- During good times labourers might have eggs, cheese, fish or bacon but during hard times labourers struggled to put food on the table.



Year 10 History – KT3: Daily Life



What mattered to the Elizabethans?

The Middling Sort

The term 'middling sort' was used by Elizabethans to describe those people who had more than the poor but who had not reached the dizzy heights of the gentry.

- The houses of the yeomen were much bigger than those of the labourers who worked for them. They might have chimneys, glass in the windows and a number of rooms (including two stories) thereby denoting their relative wealth and status.
- Work - in the town the 'middling sort' was made up by the tradesmen and craftsmen who ran their own businesses. In the countryside the 'middling sort' was the **yeoman** and the **husbandmen** who farmed some land of their own. Although they did not have the vast amounts of money of the gentry they lived a more comfortable existence than the labouring poor.
- Food - Whilst yeomen families may have eaten meat it would be simple such as beef, pork and mutton.
- Bread was an important part of their diet but unlike the gentry, who ate white bread regularly, the 'middling sort' would save this for cakes and pastry for guests. 'Yeoman' bread had more bran left in it.
- They would drink beer and mead instead of wine.
- Like the gentry they were able to grow fruit and vegetables in their gardens and orchards but they did not have exotic fruit.

The Gentry

The gentry were landowners and during this period they began to build and extend their homes to reflect their status. They had the following:

- Multiple storied houses with lots of glass in the windows.
- Orchards and kitchen gardens - these would provide the family with fruit and vegetables
- Lavish food - a feast in a gentleman's house would consist of a variety of different types of meat including venison and swan and these would be accompanied by fine wines imported from France and Italy. After the meal there might be a sweet course consisting of sweetmeats and marzipan confections.
- Land - About two percent of the population were gentlemen and they owned over half the land in England at the time. The rents from their estates meant that the gentry did not have to work and they were free to enjoy leisure pursuits such as hunting.
- Political power - they acted as Justices of the Peace and helped the monarch to maintain law and order in the provinces. Some of them were Members of Parliament and helped the queen to govern the country.

The gentry	The 'middling sort'	The labouring poor
Multiple storied housing with lots of glass windows	Two storied housing, maybe a chimney and some glass windows	One story building, no glass but they had a thatch
Lavish food – fine meats like venison and swan, and wine and white bread	Simple meats like pork and beef, beer and mead and bran bread	Pottage soup and bread
They owned most of the land and made their wealth by renting it	Owned a fair bit of the land but not as much as the gentry	Was lucky to have an acre or two of land

Husbands and Wives

- In Elizabethan England all marriages were recorded in the parish register of the church where the marriage took place.
- Men were usually in their late-twenties and women were usually in their mid-twenties when they married.
- Most newly married couples needed to save up before they could get married in order to set up their own home. Those from gentry families tended to marry earlier as money was less of an issue.
- Parish registers also reveal that many babies were baptised a few months after their parents married which suggests that they were conceived prior to their decision to get married.
- There were few **illegitimate** children as single mothers would be brought before the church courts and punished.
- In wealthy families, parents would expect to have a say over who their children married although this did not mean that they arranged marriages.
- In 'middling' families children would often wish to gain the blessing of their parents before they married as parents often gave sizeable gifts of money, land and furniture to their children. In most cases it would seem that children from 'middling' and labouring families were free to marry whom they wished.
- Marriages rarely ended in divorce as this needed an Act of Parliament. Marriages did break down and this could lead to separation.
- More frequently marriages ended due to the death of the husband or wife in which case the surviving spouse would normally remarry

How were women treated?

Despite being ruled by a queen Elizabethan England was a patriarchal society which meant that men were in control. However this did not mean that women were second-class citizens. Many women had some freedoms and certainly those from the 'middling' sort helped run farms and workshops. Although domestic violence did occur it was punished harshly. Wife beating was disapproved of and equally a nagging housewife could be accused of being a scold.



Families

Parents and Children

- The nobility and the gentry could afford to have large families
- High infant mortality especially in the poor.
- In fact, around one quarter of children died before they were ten.
- Most Elizabethan women looked after their children and it was only in the wealthiest families that people used wet nurses (a woman who would breast feed and care for someone else's child) to care for their children.
- Children whose parents had money might be sent to school from the age of seven.
- In poorer families, children would work at home or on the farm from the age of seven. At the age of twelve or thirteen boys would leave home to become apprentices or to work as farm servants.
- Girls often left to become servants at the same age. Most young people lived with another family to learn the skills they would need in adult life.
- Physical punishment was used more readily, particularly in the grammar schools. At home there does not seem to be a great deal of evidence that Elizabethan parents were violent towards their children.

Kinship

- There is little evidence to suggest that people lived with their wider family and most Elizabethans lived in a nuclear family with parents and children.
- There were occasions where wider family members were taken in as a result of them being unable to care for themselves but this was not the norm.
- Wider kin rarely lived in the same village.
- The practice of sending children away to be apprentices often resulted in them marrying and settling down away from home. Thus Elizabethan families were scattered although perhaps not as far as families today.
- Kinship did matter to some, particularly the gentry and sometimes those of the 'middling' sort, for most people neighbours were as important.
- Studies of wills have shown that people were far more concerned about their own immediate family than their wider kin.



Why Poverty Increased

Reason	Explanation
Rising population	The population rose by a million during the Elizabethan period. More people meant there was more demand for goods, and so prices rose.
Inflation	Prices for goods rose, but wages fell as there were more people around to do the work.
Cloth trade collapse	Woollen cloth was England's main export. There was a decline in demand and this led to unemployment.
Wars	Taxes increased to compensate for the price of waging war.
Bad harvests	Harvests were particularly bad in the 1590s leading to even higher demand and more rising prices.
Changes in farming	Many landlords decided to enclose their fields and keep sheep instead of crops which led to unemployment.



Poverty

Why bring in the Poor Law 1601?

- Fears that the 'social order' might be threatened if the growing number of poor people ganged together and started a rebellion
- The risk that **vagabonds** and beggars might turn to crime
- Fears that the poor might spread disease
- Landowners were giving more to the poor

What actions were taken – local level

Unpaid local officials (called Justices of the Peace) were made responsible for poverty related issues. For much of the century the authorities grouped people into three groups:

- **Impotent poor** - people unable to work due to age, disability or other infirmity. Limited relief was provided by the community in which they lived.
- **Able-bodied poor** - these were people who were physically able to work but were often unemployed. The Poor Law provided no relief for these people except employment in the workhouse.
- **Vagabonds** - it was thought vagabonds were lazy, idle and threatened the established social order. Anyone over 18 who became a vagrant having been caught before could be hanged. In 1589 the government went so far as to ban individuals from sheltering people in their own homes.

What actions were taken – national level

They brought in:

- A **compulsory** nationwide **Poor Rate** system
- everyone had to contribute and those who refused would go to jail
- begging was banned and anyone caught was whipped and sent back to their place of birth
- **almshouses** were established for people in genuine need to live in



KEY TERMS

Gable	The triangular upper part of a wall at the end of a ridged roof
Coat of Arms	A special design in the form of a shield that they use as a symbol of their identity.
Orchard	A piece of land with fruit trees
Great Chamber	The second most important room in a Tudor house
Estate	An extensive area of land in the country, usually with a large house, owned by one person, family, or organization.
Merchant	A person involved in trading goods
Husbandmen	A farmer
Yeomen	Someone who owned a small piece of land
Parlour	The sitting room in a Tudor house
Labourer	Someone who does unskilled manual labour
Contraception	Something used to prevent pregnancy
Wet Nurse	A woman employed to breastfeed another woman's child.
Kin	Wider family
Vagrant	A person without a settled home or regular work who wanders from place to place and lives by begging
Impotent Poor	Physically unable to work due to illness or age
Able Bodied Poor	Those were able to work but could not find a job
Vagabond	Those who avoided work
Gaol	Prison

A 'golden age' of culture

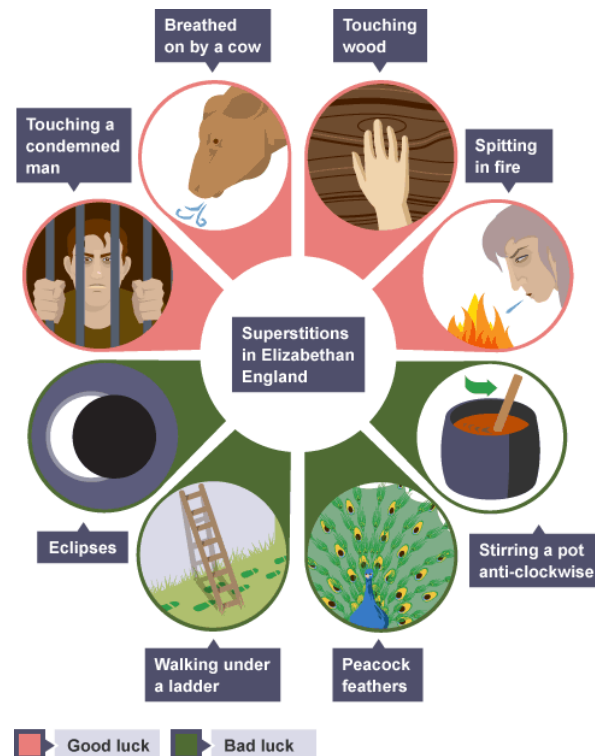
- For the wealthy at court, there were banquets and feasts, **masques** and tournaments (competitions of sword fighting, wrestling or jousting) to enjoy almost every day of the week.
- The rest of society visited fairs and celebrated religious festivals.
- Dancing was very popular - formal dances like the **galliard** at court, and **jigs** among the poor and middling sort.
- Watching animals fight was also popular with rich and poor. Queen Elizabeth herself enjoyed **bear and bull-baiting** (where the bull or bear was pitted against a pack of dogs). Among the poor, **dogfights and cock fighting** were common pastimes, and people often gambled on the outcome.
- **Gambling** at cards, dice games, backgammon or draughts was popular among men of all social groups - it was considered inappropriate for women to gamble (although that didn't stop Elizabeth!)
- Among the nobility, the invention of the printing press and spread of education meant that intellectual pursuits were popular, such as reading the classics, studying music, debating theology and writing poetry
- Hunting and **hawking** were also very popular among the well-to-do, as were physical pastimes such as **bowls**, fencing and archery.
- For the rest of society, inns and taverns were an important part of every social ritual. People could drink, gamble, play cards or **skittles** and watch plays and animal baiting
- The poor and middling sort enjoyed physical games as well, such as wrestling and stick fighting. An early form of football was also played in Elizabethan times. I



Year 10 History – KT4: Merry England

What lay behind changes in popular culture?

Superstitions



Rural past times

- Around 85 per cent of people lived in the countryside and many people never left their villages - and others only went as far as the next town.
- Everyone had to work extremely hard for a living. This meant that they would relish any chance they got for a celebration.

Celebrations were largely tied to the calendar and the religious calendar marked:

- Christmas
 - Easter
 - Shrove Tuesday
 - Lammas Day
 - Saint's days
- The farming calendar was another big influence. Lords of the manor would sometimes hold feasts at harvest time, and there was usually a celebration on Plough Monday (just after Christmas, when the ploughing began). A big event in the year was **May Day**, which was celebrated with dancing, fairs or markets, and the selection of a village girl to be Queen of the May.
- Although there were no theatres, travelling entertainers would visit the villages - especially on holidays - and perform plays, sing songs, perform acrobatics and tell stories.

There would also be 'Mummers' plays', which were simple plays or mimes on popular themes, such as:

- two men competing for the same woman
- folk tales, such as Robin Hood
- religious stories, such as St George and the Dragon

Opposition to Past times

Puritans

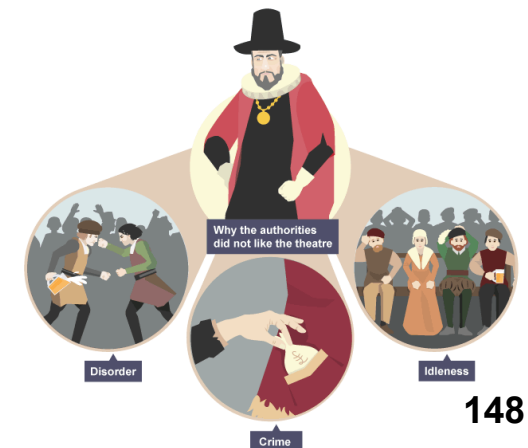
- The main opponents of popular entertainment were the **Puritans**. The Puritans were extreme Protestants who wanted to 'purify' the English church of any Catholic influence.
- They also believed that God intended that society should be a single unit - so any bad behaviour or immorality affected everyone.
- The Puritans wanted people to live devout and godly lives, and put God first. T
- hey opposed anything that distracted people from God - and that, of course, included most forms of fun.
- They wanted people to spend their time praying, listening to sermons and reading the Bible.
- They disapproved of gambling, holidays, dancing, and popular songs ... and most of all, they disapproved of the theatre.
- The theatre attracted huge crowds - sometimes up to 3000 people - and those people were not at work
- Puritans thought the things that playwrights wrote about were unsuitable and disapproved of the rude jokes
- Also, the Puritans worried about the less desirable types who went to the theatres: gamblers, thieves, prostitutes and beggars
- To appease the Puritans, Elizabeth banned theatres within the London city boundary. However that didn't stop several large playhouses such as the Globe, being built just outside London, within easy reach of the public.

Witchcraft

- Dark magic was the domain of witches – people who had supernatural powers because they had made a pact with the Devil.
- Witchcraft was blamed for all sorts of bad fortune
- They believed that witches had 'familiars' - an animal they could turn into so they could spy on people and move around without being seen. The most popular familiars were cats and toads, which is why witches are often depicted with these animals.
- The majority of people who were accused of witchcraft were women - usually poor, single women who had nobody to protect them.
- Many people also believed that women were spiritually 'weaker' than men, and therefore easier for the Devil to win over.
- Illustrations from the time show us what people imagined 'witches Sabbaths' to look like. They usually involve potions bubbling in cauldrons, witches flying on broomsticks or on the backs of goats and sometimes worshipping the Devil.
- Once someone was accused of witchcraft, they were tested, usually by 'ordeal'. One of the common ways was to 'duck' the accused under water. They believed that water was purifying, so if the person floated, it was because the water had rejected them, and they were guilty. If they sank, they were innocent. Of course, this meant that many 'innocent' people drowned!
- The Witchcraft Act of 1563, which made witchcraft a felony. This meant that once a 'witch' was found she would be killed.

Authorities

- Elizabeth too, although she loved the theatre, was not prepared to risk her opponents using it to spread their ideas.
 - As a result the Queen appointed the **Master of the Revels** to **cancel** plays for **blasphemy** or dubious politics.
 - The Lord Mayor of London and his councillors were responsible for law and order and they were worried about the effect of so many people in one place.
- They thought that the crowds and the theatre could cause problems like:
- Disorder - as many people drank at the theatre and fights and quarrels were common
 - Crime - pickpockets and thieves were attracted to large crowds
 - Idleness - they thought people should be at work instead
 - Because the theatres were outside London, the Lord Mayor couldn't deal with them himself - he had to get the **Privy Council** to agree with him, and lots of Privy Councillors liked the theatre!
 - The authorities also worried that the large crowds could spread disease - and here the government agreed with them. The theatres were often closed during outbreaks of the Plague to stop the disease spreading.



Theatre

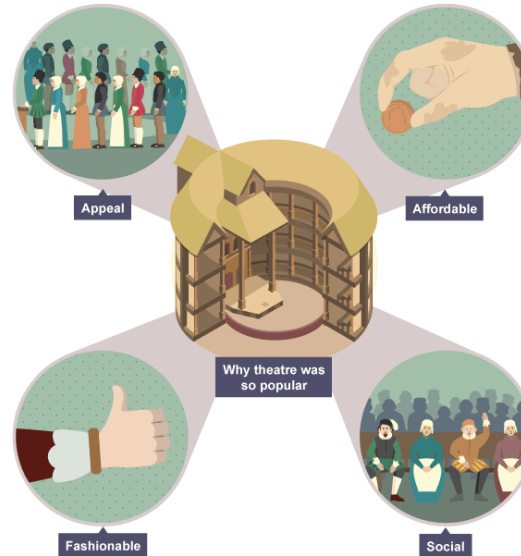
What was the theatre like in Elizabethan England?

Plays were performed:

- at court for the nobility
- in inn yards for the poor
- in purpose-built theatres with tiered seating, which were open to all
- At the theatre, the rich could sit in the best seats, with cushions, and the poor could stand in front of the stage for a penny. The atmosphere in Elizabethan theatres was very different to how the atmosphere is in theatres today:
- The audience would wander about, talk among themselves, shout at and heckle the actors (and throw things if they were really unimpressed).
- There was no curtain, and the audience often surrounded the stage on three sides.
- There were no intervals, so vendors would come round during the play selling food and drink.
- Women were not allowed to be actors. Female parts were played by teenage boys.

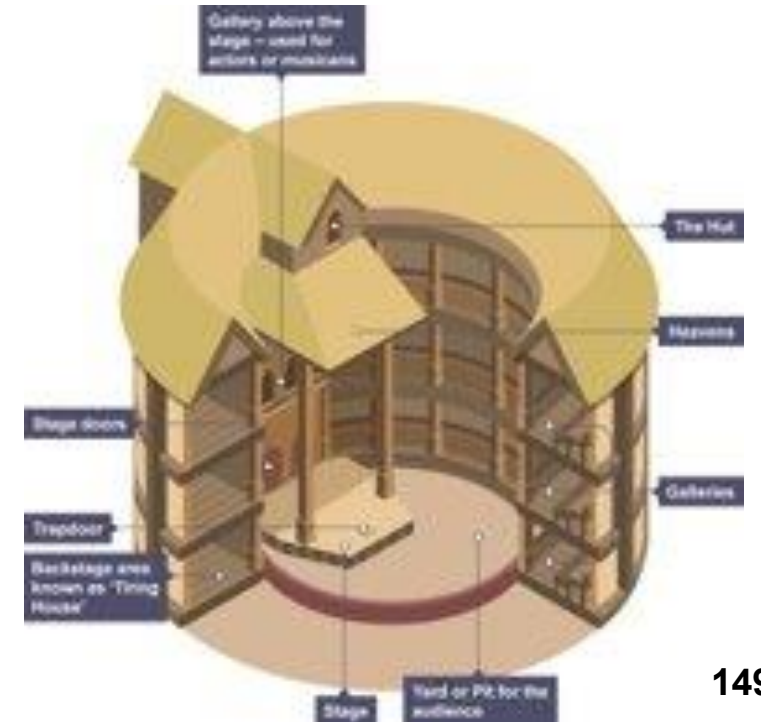
Why were theatres popular?

- Elizabeth encouraged the theatre, which made it fashionable.
- It was an affordable entertainment (costing as little as a penny for a two hour play).
- The theatre was a good place to socialise.
- The plays dealt with topics that appealed to Elizabethan audiences: love and romance, magic, patriotism, exploration and travel - and often had dirty jokes and fight scenes to keep people entertained.



Features of a theatre

No curtain to show the start and end of the play	Plays often had a dramatic start (a shipwreck, an argument) to grab the audience's attention. They finished with music and dancing.
No lighting to show night and day	The words of the play had to tell the audience what time of day it was.
Female roles were played by men	Female characters wore gorgeous costumes, and the other characters talked about how beautiful they were.
There were no intervals, so the play was performed without a break	There were side plots and comic scenes to give the main actors a break and a chance to change their costumes.



KEY TERMS

Golden Age	The period when a specified art or activity is at its peak.
Orpharian	A musical instrument
Popular culture	Types of activities/preferences that are popular at the time
Parish	A small area that usually belongs to a Church
Merry making	Having fun
Mumming play	A type of folk play
Alehouse	A pub
Festivities	Celebrations
Sabbath	Sunday
Familiars	Animals that are supposed to be the pets of witches
Prosecution	Charging someone with a crime
Opposition	Going against something
Miracle Play	A religious play
Jig	A lively dance
Cut-purse/pick pocket	Someone one steals

John Dee

- He was the brain behind Elizabethan exploration
- He was interested in maths, astronomy, astrology, medicine and navigation
- He wanted Britain to rival Spain's advancements and suggested Britain should expand its empire and discover new territory
- He coined the phrase 'British Empire'
- Dee produced maps and books and helped sailors understand navigation to make the mission a success



Year 10 History – KT5: Going Global



What did the Elizabethan adventurers achieve?

Why did exploration occur?

In the 15th century came the first long sea voyages. These were made possible by:

- New navigational instruments like the compass
- Fast, light ships that could be manoeuvred to catch the wind
- The invention of guns



Humphrey Gilbert

- He was sent to try and establish the first colony in North America
- He wanted to find a passage around America to China
- He was also driven by hatred of the Spanish
- He explained to Elizabeth that a base in North America would help attack Spanish ships in the New World
- His first attempt was a disaster and only one ship managed to cross the Atlantic
- He then planned to claim vast amounts of land in America and sell it to Englishmen for a huge profit
- 5 ships set sail to achieve this in 1583, he arrived to find English, Spanish and Portuguese fishermen there who celebrated his 'achievement' – putting a flag into a piece of land
- They shared fish, wine, marmalade and biscuits
- However, the land was barren and cold and Gilbert's men became ill – trying to sail South for supplies failed and they attempted to return home
- The ships sank in violent storms along with Gilbert
- No colony was established



Francis Drake

- Drake was the first Englishman to **circumnavigate** the globe – this means go all the way around the world!
- He had made journeys to the Caribbean several times to plunder Spanish ships
- His plan was to sail around South America to plunder Spanish ships but it did not go to plan!

His Journey:

- In November 1577 he set off and began by plundering Spanish and Portuguese ships in West Africa
- By Spring/Summer of 1578, he arrived in Brazil and entered the Strait of Magellan at the tip of South America, claiming several islands for Elizabeth
- By the winter of 1578, he had travelled north to Chile and Peru, had attacked several native settlements and attacked Spanish ships carrying gold and silver
- In June 1589, he landed on the coast of California and claimed it, calling it New Albion
- By the summer of 1579, Drake realised if he sailed home the same way he would be attacked by Spanish ships waiting for his return. He decided to sail West
- In Moluccas (Spice Islands) he traded linen cloth for cloves, ginger, and pimento
- He then travelled home via the Cape of Good Hope
- He arrived home very rich indeed but most went to his investors and then to the Queen's treasury!
- Drake was knighted aboard his ship 'The Golden Hind'.



The Reconnaissance Mission

In 1584, Elizabeth gave Walter Raleigh a charter, allowing him to form a colony in America. Raleigh and Elizabeth hoped that the colony would:

- provide riches from the New World
- act as a base for disrupting Spanish treasure ships

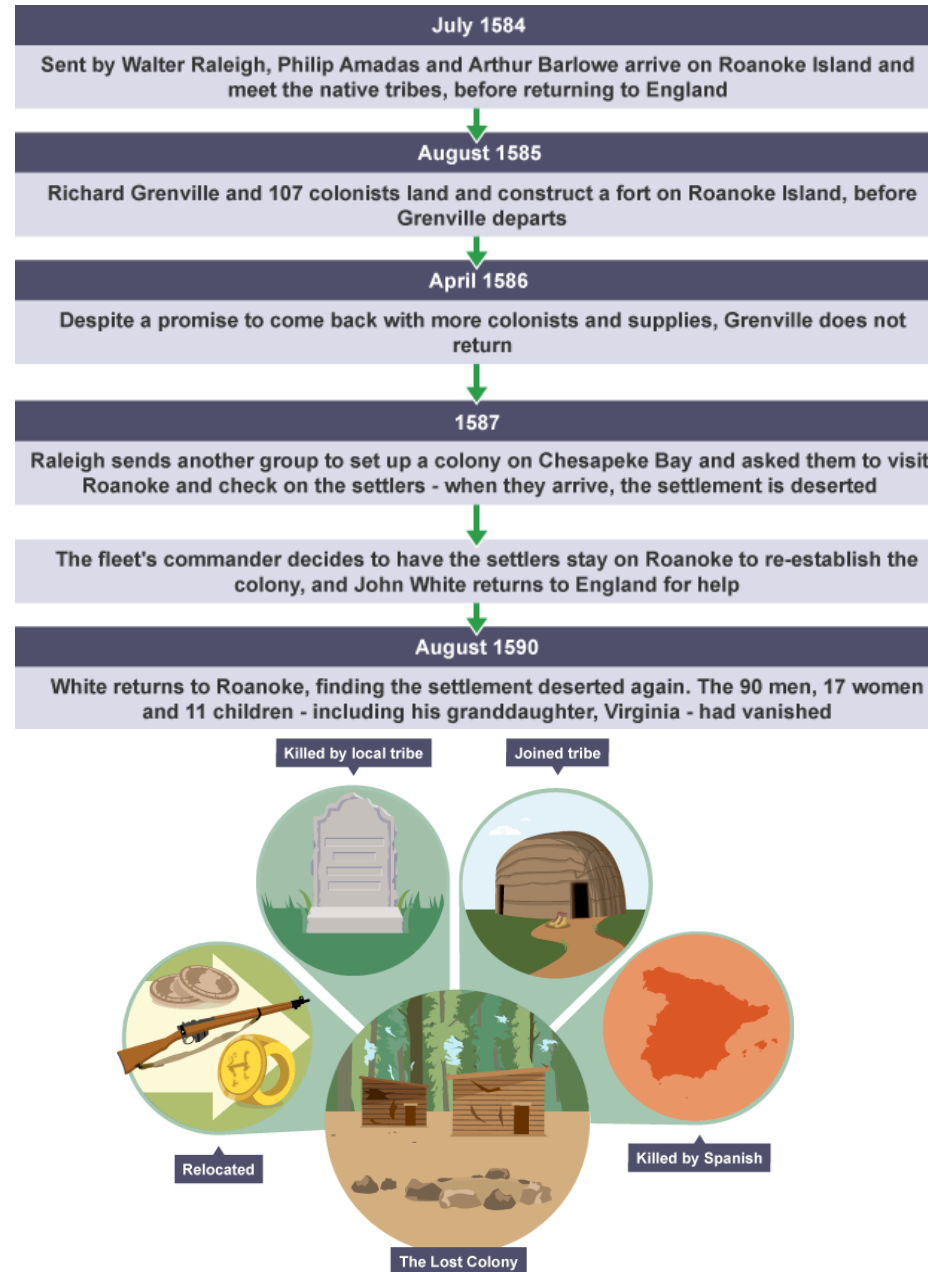
Raleigh sent Philip Amadas and Arthur Barlowe to find a suitable site for a colony.

- They arrived on Roanoke Island in July 1584 and met the native tribes, Barlowe came back to England, bringing two tribesmen, who told Raleigh all about the area.
- Raleigh thought it sounded good and sent a second expedition of five ships, led by Richard Grenville.

What happened to everyone at Roanoke?

- It was some time before help could be sent to Roanoke - the weather was too bad to cross in the winter
- Then there were further delays caused by the Spanish Armada and the war with Spain.
- It was three years before they could try again.
- When White returned in August 1590, he found the settlement deserted.
- The 90 men, 17 women and 11 children - including his granddaughter, Virginia - had vanished.
- There was no sign of a battle.
- The weather was worsening, so White was unable to find out what happened.
- Nobody went back to Roanoke until 1609.

Walter Raleigh



Establishing a Colony

- Bad weather separated the ships, but eventually a group of settlers made their way to Roanoke.
- In August 1585, 107 colonists landed and constructed a fort on the island.
- Grenville promised to come back in April 1586 with more colonists and supplies, but the reinforcements didn't arrive.
- Many of the colonists returned to England and brought back tobacco and potatoes with them, but some of them stayed behind.
- In 1587, Raleigh sent another group of colonists to set up a colony on Chesapeake Bay and asked them to visit Roanoke and check on the settlers there.
- When they arrived, the settlement was deserted. They found a skeleton, but no sign of anyone.
- Instead of going on to Chesapeake, the fleet's commander made the settlers stay on Roanoke to re-establish the colony.
- It soon became clear that the colony's relations with some of the native tribes had not been friendly. Fearing for their lives, they begged the governor, John White, to go back to England and ask for help.
- 115 colonists stayed on the island - including White's grand-daughter, Virginia Dare. She was the first English child to be born in the New World.

The search for the North West Passage was dangerous - and unsuccessful.

- **Martin Frobisher (1535-1594)** tried to reach China by going round North America. He reached the Arctic and was driven back by snow and ice.
- **Humphrey Gilbert (1539-1583)** also believed that there was a route around North America. His ship was hit by storms and he never returned.
- **John Davis (1550-1605)** made three separate voyages looking for a northern route to China. Like Frobisher, he was driven back by the cold weather.



Drake's circumnavigation route Northwest passage routes

Success

- The first person who established trade with the Spice Islands was **James Lancaster**.
- He took the southern route around Africa (capturing Portuguese trading ships along the way) and reached the East Indies, where he bought spices and valuable dyes used in the woollen industry.
- When he came back, the East India Company was set up to attract investors and in 1600, Lancaster took the first of the Company's fleets to modern day Indonesia. He met with local leaders and made alliances and set up trading posts.
- The East India Company grew under later monarchs and became very important and prosperous.

Trade with the East



First Contact with India

- Although the East India Company was set up to trade with South East Asia (the 'East Indies'), it eventually traded more with India and Ceylon (now Sri Lanka).
- One of the first English sailors to visit India was **Ralph Fitch** - a merchant who spent eight years travelling around the Middle East, India and Burma.
- He was one of the first English travellers to visit Mesopotamia and Persia (modern day Iraq and Iran), and he travelled to Aleppo in Syria and Tripoli in Libya with the Levant Company on a ship called the Tyger. From there, he went to India, where he saw 'salt, opium, hinge (asafoetida, a spice), lead, carpets and diverse other commodities' being traded.
- He came back in 1597, and in 1598 he published a book about his travels - and mentioned how rich India was. The English merchants were keen to get access to this valuable market.
- The East India Company didn't start trading out of India until 1608, after Elizabeth's death, but the foundations for the trade with India were laid during her reign.
- The first Indian trading point was set up in Surat, in the Gujarat region.
- Ralph Fitch remained a valued advisor to Lancaster and the Company about Indian matters.



KEY TERMS

Circumnavigate	To go all the way around – e.g. the world
Plunder	To steal
Astrology	The study of the stars and their meanings
Colony	Land taken and ruled by a foreign power
Empire	When several countries are ruled by a foreign power
Navigation	Finding a route - e.g. at sea
Expedition	A journey to investigate/research
Territory	A piece of land
Reconnaissance	Looking around, information gathering
New World	North and South America
Global	Relating to the whole world
Astronomy	The study of the universe and its contents outside of Earth's atmosphere
Commission	An instruction/command given

Key Words

Monotheistic: A religion which believes in one God
Holy: Separate and set apart for a special purpose by God
Omnipotent: All powerful, Almighty
Omnibenevolent: all-loving
Just: Fair
Trinity: One God has 3 parts; God the Father, Son and Holy Spirit
Holy Spirit: God's presence in the world
God the Son: Jesus – enables humans to have a special relationship with God
Creation: God bringing the universe into being
The Word: Jesus – as described in the book of John
Genesis: The first book in the Bible which has the creation story in it
Incarnation: God in human form – Jesus.
Resurrection: coming back from the dead
Blasphemy: saying or doing something which goes against God
Crucifixion: Roman method of execution where a person is nailed to a cross
Ascension: 40 days after the resurrection when Jesus returned to God in heaven
Afterlife: What happens when you die
Day of Judgement: God will judge all souls at the end of time
Heaven: Eternal happiness, being in the presence of God
Hell: Eternal suffering, absence of God
Purgatory: Catholic belief in which souls are cleansed in order to enter heaven
Sin: Any action against God
Original Sin: First sin in the world committed by Adam and Eve which means all humans are born with this in them
Salvation: saving the soul from sin and going to heaven thanks to Jesus' sacrifice
Grace: A quality of God which shows to humans that God loves them, which they don't need to earn
Forgiveness: pardoning someone for their wrong doing
Atonement: restoring the relationship between people and God through the life, death and resurrection of Jesus

God as omnipotent, loving and just

- Christians believe **God is omnipotent: all-powerful. 'Nothing is impossible with God'**
- **God is omnibenevolent: all-loving.** Guidelines are given for us to live the best lives we can. Christians should love each other treating everyone with care and respect. **'God so loved the world he gave his one and only Son...'**
- God has unlimited power and authority, together with complete love, and therefore gives **justice** in a fair way. Christians should try and bring about fairness in the world.



The Problem of Evil and Suffering: The Inconsistent Triad

- Christians believe God is omnipotent (all-powerful) and omnibenevolent (all-loving).
- However, why is there evil and suffering?
- If God was all powerful, he would be able to stop evil and suffering.
- If he was all loving, he would care enough to stop it. So he would stop it.
- But he doesn't! So God cannot exist, or is at least not omnipotent or omnibenevolent.
- A Christian defence: God is transcendent (beyond our understanding) and therefore we can trust God to know best – there is a reason for this inconsistency, even if we can't understand it.



Different Christian Beliefs about Creation

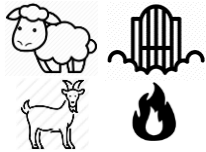
<p>Genesis 1 v 1-3</p>	<ul style="list-style-type: none"> - God created the world in 6 days and rested on day 7. 'In the beginning God created the heavens and the earth'. God created the perfect world in the beginning: 'It was good' - Not all Christians believe this story is literally true, but rather believe it is a story which represents the idea that God created life. - A further quote from Genesis: 'The Spirit of God hovered over the waters' indicates that the Holy Spirit was present at creation. 	<p>Combined, these ideas suggest that all 3 parts of the Trinity were present at creation.</p>
<p>John 1 v 1-3</p>	<ul style="list-style-type: none"> - 'In the beginning was the Word, and the Word was with God, and the Word was God....through him all things were made...' - 'The Word' refers to Jesus and therefore he was present at the beginning of the world and involved in the creation of the world 	

The Oneness of God and the Trinity





<ul style="list-style-type: none"> - The Holy Trinity: God the Father, the Son and the Holy Spirit. - God is three in one. There are not three Gods, but different forms of the same thing. Each part is fully God, but also these parts of the Trinity are not the same. 		
<p>God the Father</p> <ul style="list-style-type: none"> - First person of the Trinity. - Creator - Omnipotent, omnibenevolent, omniscient (all-knowing) and omnipresent (everywhere). 	<p>God the Son</p> <ul style="list-style-type: none"> - Second person of the Trinity. - Jesus, who became God in human flesh (known as the Incarnation). - Performed miracles, healed the sick and showed kindness to outcasts. 	<p>God the Holy Spirit</p> <ul style="list-style-type: none"> - Third person of the Trinity. - God sent the Holy Spirit to influence, guide and sustain all life on earth after Jesus ascended. - The unseen power of God.

Different Christian Beliefs about the Afterlife

- Based on God's judgement Christians believe that people will go to heaven or hell.
- Judgement will happen at death or at the day of judgement (Christians vary on their understanding of this)
- **The Parable of the Sheep and the Goats** shows how people will be judged by God. The sheep represent those who did good actions (therefore going to heaven) and the goats represent those who did bad actions (therefore going to hell)
- Jesus also said, **"I am the way the truth and the life, no-one comes to the Father except through me."**
- So, treating others well and believing in God is important to guarantee a good afterlife.
- Heaven is seen as being with God and eternal happiness where there is no suffering. Hell is seen as eternal torment or suffering and being absent from God, and where the Devil is.
- Some Christians believe that Heaven is a literal, real place you will go. Other Christians believe it is just being with God, in the same way hell may not be actually real but an absence of God.
- The Bible teaches that there will be a resurrection of the body for all people who go to heaven, though the details of this are debated.
- In the book of Revelation it mentions that people who go to hell will burn in a lake of fire.
- Roman Catholics believe in a place called purgatory in which your soul goes to be cleansed as not everyone is ready yet to go to heaven.

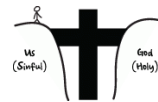


Jesus' Life: Key Events

Event	Key Details	Importance/ Influence on Christians
Incarnation: Jesus is God in human form 	<ul style="list-style-type: none"> - 'Incarnate' mean 'In the flesh' – Jesus was God in the flesh. - Jesus' birth is explained in the Christmas story: the Nativity. - Humble birth (in a manger) shows Jesus was fully human, but he was born through the immaculate conception (Mary was a virgin), so he was fully God - This means Jesus does not have Original Sin because he was not conceived through sexual relations. - 'Before they came together, she was found to be pregnant through the Holy Spirit'. - 'The Word became flesh and made his dwelling among us'. 	<ul style="list-style-type: none"> - Encourages them to celebrate Christmas for its true meaning - Helps them in difficult times as they know their role model was human too - Allows them to have a personal relationship with God through Jesus
Crucifixion: Jesus' death on the cross 	<ul style="list-style-type: none"> - Crucifixion is remembered on Good Friday. - Jesus was arrested (having been betrayed by Judas) and put to death by Pontius Pilate. He was crucified alongside two criminals. - As Jesus was fully human he suffered pain as an ordinary human did. 'Father, into your hands I command my spirit' - On the cross Jesus said 'Father forgive them, for they know not what they do'. 	<ul style="list-style-type: none"> - By accepting Jesus' sacrifice they can be forgiven for sin and go to heaven. - Encourages them to follow Jesus' example and forgive others - Reminds them to be thankful and remember Jesus (especially on Good Friday) - Reminds them that suffering is a part of life and God can understand what it is like for someone to suffer.
Resurrection: Jesus rose from the dead 	<ul style="list-style-type: none"> - Jesus was buried in a tomb and left there until Sunday. Due to it being the Sabbath (on the Saturday), no-one could touch the body until after this. - Mary Magdalene returned to the tomb - it was open and empty. - An angel appeared and said Jesus had risen from the dead. - Evidence of resurrection: he appeared to people including disciples, they saw him eat, Thomas was encouraged to touch Jesus' palms to prove he was not a ghost. 	<ul style="list-style-type: none"> - Shows Jesus was divine and not just a human so it may strengthen faith - Shows the power of good over evil - Encourages them to not fear death
Ascension: Jesus went back up to heaven to be with God 	<ul style="list-style-type: none"> - Happened 40 days after the resurrection - Jesus ascended to heaven. - He gave the disciples the Great Commission: 'Go and make disciples of all nations, baptizing them in the name of the Father, the Son and the Holy Spirit'. - The Holy Spirit was left to guide and comfort people. 	<ul style="list-style-type: none"> - Will encourage them to call on the Holy Spirit for guidance and comfort - Will encourage them to spread the message of Christianity (evangelise)

Sin and Salvation

- Sin: anything that goes against God's laws. Separates humans from God.
- Salvation means to be saved from sin (therefore being able to go to heaven)
- Humans are not perfect – impossible not to sin
- All humans are born with Original Sin – passed down from Adam and Eve.
- This action separated humans from God and brought about death into the world. They were tempted by the serpent (devil) and Christians believe that Christians are tempted in life to do bad things.
- **Salvation through Law:** humans have free will but should use this to make the right choices using God and Jesus' teachings to guide them, e.g. 10 Commandments.
- **Salvation through Grace:** being saved by accepting the sacrifice Jesus made on the cross – this showed God's grace: **'For by grace you have been saved through faith'**
- **Salvation through Spirit:** having the Holy Spirit as a guide to accept God's Grace and follow his Law.











The Role of Christ in Salvation: Atonement

- Salvation is offered through Jesus, **"For the wages of sin is death, but the gift of God is eternal life in Christ Jesus"**.
- Jesus' death makes up for Original Sin. Humans can receive forgiveness for their sins because of Jesus' death and then receive eternal life.
- His sacrifice provides atonement, which means our relationship with God is restored. This removes the effects of sin and allows humans to get back to God. **"He is the atoning sacrifice for our sins and for the sins of the whole world"**.
- Jesus paid the price for the sin of all mankind through his death and Christians believe if you put your trust in him you can receive eternal life with God.
- Links with Salvation through Grace: salvation is a gift people must choose through belief in Jesus atoning for their sins



Exam Terminology

- Influence:** The capacity to have an effect on people's character, behaviour or actions
- Contrasting:** To show a difference
- Contemporary:** Occurring in the present time
- Sacred Writings:** Writing that is believed to contain words of God e.g. The Bible
- Evaluate:** Consideration of different viewpoints before arriving at a final judgement
- Justified Conclusion:** A final decision which is based upon a range of evidence.

Worship and Festivals			
Practice and Key Words	Details/ Contrasting Views		Importance and Quotations
Worship: Act of religious honour or devotion  	Liturgical <ul style="list-style-type: none"> - Takes place in a church and is led by a priest - Formal, set prayers are read out, and the worship follows a set pattern and structure - A more traditional, and formal form of worship - E.g. Eucharist in the Catholic Church 	Non-Liturgical <ul style="list-style-type: none"> - Also takes place in a church but less formal - No set prayers, instead people take turns to preach and read from the Bible - Can be modern and appealing to young people - Service is usually focused around a Bible reading - E.g. Methodist or Baptist services 	<ul style="list-style-type: none"> - Shows gratitude, love and respect to God - Could be a way of asking for forgiveness or asking for help - Brings comfort and strength - Gives time for reflection - 'Sing to the Lord, for he has done glorious things; let this be known to all the world'.
	Informal <ul style="list-style-type: none"> - Spontaneous prayers or sharing of thoughts - Community or house churches might meet to eat together and share their faith - Pentecostal Church – 'charismatic' worship. Led by the Holy Spirit and may involve dancing, clapping, calling out, speaking in tongues. 	Private <ul style="list-style-type: none"> - Spending time with God alone or with close friends/ family - May involve prayer, meditation, studying the Bible. 	
Prayer: Communicating with God 	Informal <ul style="list-style-type: none"> - Prayers that are made up by the individual using his or her own words. 	Set Prayers <ul style="list-style-type: none"> - Prayers which have been written down and said many times by many people - E.g. The Lord's Prayer: The prayer that Jesus taught the disciples to pray, which includes thanks, asking for forgiveness and asking for guidance. "Our father who art in heaven...." 	<ul style="list-style-type: none"> - Set prayers can bring a sense of unity - Prayer brings comfort and builds relationship with God - 'Call on me and come and pray to me, and I will listen to you'.
Sacraments: An outward sign of inward grace. Eucharist/ Holy Communion 	Roman Catholic Church (Mass) <ul style="list-style-type: none"> - Readings from the Bible - Offering of bread and wine brought to the altar - Priest says the words of Jesus at the Last Supper, says the Lord's Prayer and gives a sign of peace - Congregation come to the altar to receive the communion 	Orthodox Church (Divine Liturgy) <ul style="list-style-type: none"> - Hymns, prayers, readings from Bible. - Priest comes through Royal Doors to chant the gospel. - Lord's Prayer said, behind Royal Doors words of Jesus said. - Bread divided into four – three consecrated as body and blood and fourth broken into small pieces. Priest gives bread and wine together on a spoon. 	<ul style="list-style-type: none"> - Jesus started the tradition at The Last Supper (which took place the day before he died) - Christians now remember Jesus' death – reminds them of Jesus' sacrifice, and reminds them to forgive others. - "This is my body which is for you, do this in remembrance of me"
Sacraments: An outward sign of inward grace Baptism 	Infant Baptism <ul style="list-style-type: none"> - Everyone is a descendent of Adam and Eve and therefore carries Original Sin. Baptism washes this away. - It also welcomes them to the church community. - Infant wears white, Godparents are chosen, font holds the water - E.g. Catholic, Orthodox 	Believer's Baptism (Adult Baptism) <ul style="list-style-type: none"> - Some Christians think children are too young to understand the meaning and therefore don't baptise infants. - The person is old enough to understand the meaning behind what they are doing. - This includes a full immersion in a pool to wash away sin and start a new life in Jesus. - This is known as being 'born again' - E.g. Baptist and Pentecostal churches 	<ul style="list-style-type: none"> - Brings a person into the Christian family/ community - Water symbolises the washing away of sins - Jesus was baptised, setting an example for others to follow - Jesus also encouraged baptism in the Great Commission: "Therefore go and make disciples of many nations, baptising them in the name of the father, son and Holy Spirit".
Pilgrimage: A special religious journey to a holy site. 	Lourdes (France) <ul style="list-style-type: none"> - Dedicated to Mary as Bernadette believed to have seen visions of Mary in the 19th Century. - A spring of water was discovered which had healing powers. Now millions of people have been to drink from the spring of water in the hope of being healed. 	Iona (Island off west coast of Scotland) <ul style="list-style-type: none"> - Small community set up by St. Columba, an Irish missionary in the 6th Century - Pilgrimages happen there in dedication to the virgin Mary. - The community in Iona hold daily services in the Church leading a seven mile hike to holy spots – it is a physical and spiritual challenge 	<ul style="list-style-type: none"> - Pilgrimage shows commitment to God and strengthens faith - People may go on pilgrimage for healing - It brings a sense of community
Festivals: Celebrations for religious reasons  	Christmas <ul style="list-style-type: none"> - Remembers the birth of Jesus – his incarnation. - It is celebrated on the 25th December. - Trees and homes are decorated with nativity scenes. Lights remember Jesus is the light of the world. Carol services happen in Churches with readings from the Bible. Children act out nativity plays and midnight mass takes place on Christmas Eve. 	Easter <ul style="list-style-type: none"> - Most important festival which celebrates Jesus' resurrection from the dead leading up from holy week. - Jesus was crucified on Good Friday and rose on Easter Sunday. - Special services take place and processions led by someone carrying a cross. - On Easter Sunday, sunrise services take place with hymns which celebrate the resurrection. Easter Eggs are used as a reminder of new life. Paschal candle is lit. 	<ul style="list-style-type: none"> - Festivals celebrate the most important events of Jesus' life – his birth, death and resurrection. - They are a time for believers to come together and celebrate their faith. - "I bring you glad tidings that today a child is born" - 'Christ is risen from the dead'.

Key Words

Church: The holy people of God, the body of Christ or a building where Christians worship

Agape: compassionate love

Mission: A calling where an individual or group go out and spread the word of God.

The Great Commission: Jesus instruction to his followers to go and spread his message *“Go and make disciples of many nations”*

Missionary: A person sent on a religious mission to promote Christianity in a different country through preaching or charity work

Evangelism: Spreading the Christian message through preaching the Christian gospels

Alpha course: An example of evangelism – trying to tell others about Christianity

Convert: Someone who has decided to become committed to a religion and change his or her religious belief.

Reconciliation: A sacrament in the Catholic faith, also making up after an argument or disagreement

Persecution: hostility or ill-treatment, because of race or religious or political beliefs.

Poverty: When people live without having basic human rights such as having enough food, water or shelter

The Role of the Church in the Local Community		
<p>Food Banks</p>	<ul style="list-style-type: none"> Provide free food (usually non-perishable items) to those in need, usually through donations Some food banks also offer support in seeking employment Example: The Trussell Trust 	<p>The work of food banks and street pastors supports the key Christian message to show love to all. Key words and quotes to support:</p> <p><i>Agape – compassionate love</i> <i>‘Love your neighbour as you love yourself’</i> <i>‘Faith, if not accompanied by action, is dead’</i> <i>‘For I was hungry and you gave me something to eat’ (Parable of the Sheep and the Goats)</i></p>
<p>Street Pastors</p>	<ul style="list-style-type: none"> Volunteers who patrol streets in urban areas Do not actively preach but show their faith through their actions Give out flip flops, lollipops and water on nights out, help people to get home safely, offer reassurance and support 	

The Role of the Worldwide Church: Reconciliation and Persecution		
<p>Working for Reconciliation</p>	<ul style="list-style-type: none"> Jesus came to earth to restore the relationship between humans and God, so Christians believe they have a responsibility to restore the relationship between themselves and others. Lots of examples of arguing between faiths, even within Christianity e.g. Catholics and Protestants. Irish Churches Peace Project set up to reconcile these denominations Coventry Cathedral – bombed during WW2. Cathedral has now become a centre for reconciliation as Christians wanted to respond with forgiveness, not revenge. 	<p><i>‘Therefore, if you are offering your gift at the altar and there remember that your brother or sister has something against you, leave your gift there in front of the altar. First go and be reconciled to them; then come and offer your gift’.</i></p> <p><i>‘Blessed are the persecuted because of righteousness, for theirs is the Kingdom of Heaven’.</i></p> <p><i>‘If one part suffers, every part suffers with it’ (St Paul, likening members of the Church to different parts of the body)</i></p> <p><i>‘Love your neighbour as you love yourself’</i></p> <p>Agape: Compassionate Love</p>
<p>Responding to Persecution</p>	<ul style="list-style-type: none"> Persecution (ill-treatment) happens all over the world – Christians are tortured or even killed for their faith Christians have a responsibility to help those who are persecuted They might pray for them, donate to charity or get involved with charities who work abroad. The Barnabus Fund: send financial support, raise awareness for those persecuted, send spiritual and material support. 	

Church Growth		
<p>Church Growth</p>	<ul style="list-style-type: none"> Estimated to be 2.5 billion Christians in the world Christians are taught to help to grow the church by sharing testimonies (how God has changed their lives), inviting people to meetings, prayer, social events etc. 	<ul style="list-style-type: none"> <i>The Great Commission ‘Go and make disciples of all nations, baptising them in the name of the Father, the Son and the Holy Spirit’ (Jesus’ words before he ascended to heaven).</i> Example: The Alpha Course. Anyone is welcome to join in with a meal and conversation about the ‘Big Questions’ of Christianity.
<p>Mission and Evangelism</p>	<ul style="list-style-type: none"> Evangelism means to spread the message of Christianity through preaching the Gospel (which means ‘Good News’) Some do this through Mission work, which means evangelism overseas The aim is to tell people that Jesus is the saviour of the world, in the hope of converting them to Christianity. 	

The Role of the Worldwide Church: World Poverty		
<p>Responding to World Poverty</p>	<ul style="list-style-type: none"> Jesus emphasised helping the poor so Christians follow his example Jesus told a rich man to sell everything he had and give it to the poor. Christian Aid: They aim to stop poverty, encourage sustainable development and provide emergency relief in areas such as Africa and the Middle East. Their slogan is ‘We believe in life before death’ They provide emergency food, shelter, water, sanitation and run a Christian Aid Week to fundraise every year. 	<ul style="list-style-type: none"> <i>‘If anyone has material possessions and see a brother or sister in need but has no pity on them, how can the love of God be in that person?’</i> <i>Parable of the Sheep and the Goats</i> <i>‘Go, sell everything you have and give to the poor, and you will have treasure in heaven. Then come, follow me.’</i>

Exam Terminology

Influence: The capacity to have an effect on people's character, behaviour or actions

Contrasting: To show a difference

Contemporary: Occurring in the present time

Sacred Writings: Writing that is believed to contain words of God e.g. The Bible

Evaluate: Consideration of different viewpoints before arriving at a final judgement

Justified Conclusion: A final decision which is based upon a range of evidence.

Year 10 Child Development KO

KEY WORDS for FACTORS

Physical development	Growth and other physical changes that happen to our body throughout life
Intellectual development	The development of language, memory and thinking skills
Emotional development	The ability to cope with our feelings about ourselves and others
Social development	The ability to form friendships and relationships and to learn to be independent
Cognition/ Cognitive	Acquiring knowledge and understanding through thoughts, <u>experiences</u> and senses.
Communication	Exchanging information through speaking and writing.
Language	The method of human communication
Genes	Inherited characteristics transferred from parents to children
Abnormalities	An abnormal (something unusual or not normal) feature or characteristic
Chromosomes	A threadlike structure inside most living cells that carry genetic information
Foetus	An unborn human.
Spina bifida	A defect in the spine, which causes a gap in the backbone. This causes paralysis of lower limbs and sometimes-learning difficulties.
Substances	An intoxicating and stimulating chemical or drug that causes harm.
Premature	A baby born before the full term of pregnancy.
Mental health	Psychological and emotional well being
Deprivation	A lack or denial of something that is necessary- <u>e.g.</u> food.
Housing need	Considers the households who do not have access to accommodation that meets the normal requirement.
Abuse	Treated cruelly or with violence regularly or repeatedly.
Neglect	Failure to care for someone.
Exploitation	Treating another unfairly to benefit yourself
Mutilation	Inflict serious damage on.
Prescription drugs	Medicine that is only given with a doctor's prescription (recommendation)
Illegal drugs	A drug that is forbidden by the law due to the harm it causes.
Socio economic	Social and economic factors.
Discrimination	Unjust or prejudice treatment of different groups of people based on their age, <u>sex</u> and race.
Social exclusion	Removal from the social system and its rights and privileges due to poverty or belonging to a social group.
Poverty	The state of being extremely poor.

FACTORS AFFECTING GROWTH AND DEVELOPMENT

PHYSICAL FACTORS

BEFORE BIRTH: An effect on the foetus.

Prenatal: based on genetics that are passed on through parents. Genetic abnormalities can be caused by:

- Maternal nutrition and exercise
- Paternal drug or substance abuse
- Premature/low birth weight
- Mothers mental health



AFTER BIRTH

Health status: chronic or life limiting illness

Diet and dietary deficiency- e.g. not enough calcium

Amount of exercise: not encouraged to eat healthy food, risk of diabetes.

ENVIRONMENTAL FACTORS

Housing:

Living in deprivation or housing needs.

Housing needs- When the local council look at the amount of homeless households, those living in temporary accommodation, and households not big enough for their family.

Home environment:

Living with parental conflict, experiences of abuse and neglect



Exposure to harmful substance:

Drugs, alcohol, smoking, and the effects of this on a child.

SOCIOECONOMIC FACTORS

Discrimination against the child:

Based on their race, social or cultural grounds. For example, what religion they follow, or the groups of individuals they associate with.

Income and poverty:

Unemployed or workless families

Whether they had access to early education services, preschool, nursery.



Poor relationships with significant adults:

Whether they receive warmth and affection from family.

How they respond to significant adults offering support, attention.

Key Words



Impact– the effect or influence on something
Development– an acquisition of skills and/or knowledge
Fine motor skills – small precise movements e.g. holding a pencil
Gross motor skills- Using large muscles, balance and coordination
Socioeconomic – the combination of social and economic (money) factors
Environment - a person's immediate surroundings

COMPONENT 1- ASSIGNMENT CRITERIA LAB

P3→ Explain the ways that different factors have affected growth and development in selected case studies

P4→ Explain the impact of physical, environmental and social factors on growth and development in selected case studies

M2→ Compare the impact of physical, environmental and social factors on growth and development in selected case studies

D2→ Assess the impact of physical, environmental and social factors on growth and development in selected case studies

Factors that affect growth and development - PHYSICAL



PRENATAL:
 Genetics and genetic abnormalities. E.g. Downs syndrome cause by a chromosomal abnormality
 Substance Abuse
 Maternal nutrition/Exercise
 Premature/low birth weight
 Mother's mental health



KEY QUESTIONS FOR ALL FACTORS:
 1- What is the factor → Define and Explain
 2- How does the factor affect development → Look at positive/negative impact on all areas of development

ENVIRONMENTAL:
 Housing – areas of deprivation or experiencing housing needs
 Home environment – parental conflict, abuse and neglect
 Effects of exposure to drugs, alcohol and smoking



SOCIOECONOMIC (Social and Economic)
 -Experiences of discrimination (social, racial or cultural)
 -Income and poverty (unemployed and workless families, access to good early education experiences)
 -Poor relationships with significant adults – level of warmth, affection and attention received

Assignment tips:
 You need to be able to define and explain each factor.
 You also need to be able to explain how the factor can affect each area of development!

KEY WORDS for LIFE EVENTS

Life event	A change in an individual's life, which can cause disruption or positive change to their lifestyle and everyday activities	
Expected	Something that is likely to happen	
Unexpected	Not thought it is likely to happen	
Physical events	Making changes to your physical health, <u>body</u> or mobility.	
Relationship changes	A significant change in relationship status such as engagement, marriage, divorce, <u>separation</u> or death.	
Life circumstances	Impacts on <u>day to day</u> life and the choices you make.	
Reasoning	The action of thinking about something in a logical and sensible way.	
Adapt	To adjust to new conditions or circumstances	
Professional	Describes a member of a profession who is trained and skilled in their area of work	
Transition	The process of changing from one state or condition to another.	
Disposition	An individual's attitude or qualities	
Income	Money received on a regular basis from work.	
Long term illness	An illness that cannot be cured by medicine or treatment.	
Restriction	A limitation of someone or something.	
Responsibility	Being accountable, having control over something or being to blame.	
Chronic illness	Another word for a long term illness.	
Lifestyle	The way in which a person lives	
Grief	Intense sorrow, caused by someone's death	
Mutual understanding	A shared feeling or action, in which both people involved have sympathy for.	

Physical life event

Ill health
Accident and Injury

Relationship change

Bereavement
New relationships
Marriage
Divorce
Parenthood

Life circumstance

Moving house
Starting or moving school
Exclusion from education
Redundancy
Retirement

TYPES OF SUPPORT

Informal support		Informal support is given by anyone who you know outside of a professional capacity . This could be family and friends or those you know well. This will involve the supporter offering security and practical help , through emotional support and information and advice .
Formal support		Formal support is offered by statutory care services provided by the government. It could also be from private care services and charitable organizations .
Emotional support		This involves showing empathy , compassion and genuine care for others. This can be via informal, formal or voluntary support.
Practical help		This involves helping an individual practically by helping them with finances, childcare or transport issues such as finding alternative transport services.
Information and advice		Involves providing the individual with information to improve their life event or circumstance. This will help them to understand where to go for <u>help</u> ? What services are available? How <u>that will</u> benefit them?
Voluntary support		Working for free and offering support, working alongside those providing informal and formal support. This could involve organisations such as The Princes Trust and Relate.
Occupational therapist		Helping ill and disabled people to continue with daily activities and tasks at ease. This will include shopping, making meals and walking upstairs.
Counsellor		A person trained to give guidance on personal or psychological problems.
Accident and injury		Something that happens unexpectedly at an abrupt state. This means the individual will have to adjust quickly to their new life circumstance.
Social worker		Assists individuals handle everyday life problems who have experienced neglect , abuse , mental health and domestic violence .

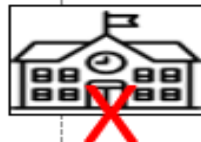
New relationship:

New relationships develop qualities such as trust, patience and empathy. Having a new relationship will teach individuals about their own qualities, and how equal compromise is important. Having a relationship can take time to adjust to, especially if you have been used to independence. Mutual understanding is highly important when forming new relationships with others.

This can involve intimate relationships and friendships.

**Exclusion from education:**

Removing a child from education, could eliminate the issues that caused the exclusion, relieving stress and anxiety. However, moving to a new school or educational provision can cause apprehension about new routines and lack of interaction and socialisation. Missing out on valuable learning, can have a negative impact on intellectual development.

**Engagement:**

Engagement shows commitment to another individual. On acceptance, mutual understanding between both partners is important as they are planning to commit to each other for their remaining life. Engagement will be exciting for both, as planning for a wedding, house and family can be discussed.

Marriage/Civil partnership:

Marriage/Civil partnership is a joining of two people together. This is a very happy time, as both individuals can forge a new life together, make plans and goals they want to achieve. This could involve starting a family.

Marriage/Civil partnership involves trust, honesty, mutual understanding, respect and empathy.

Couples will need to adapt to living together, changing their lifestyle to suit both partners equally, provides security and safety. It will also involve sexual intimacy.

**Divorce/Separation**

According to research, divorce is the second life event after death that has the highest emotional impact on an individual. By having strong family ties, support and stability can be offered during the uneasy time of divorce. However, a break down in relationship causes insecurity, which can lead to low self-esteem. With a loss of wider family networks and friendships, social development can be affected.

A positive outcome of divorce, if both people were unhappy, a fresh start could be needed for them to take a new direction in life.

Redundancy

Although this can be devastating, it can be an opportunity for a career change. Losing a job, can have an impact of lifestyle and diet, with a loss of earnings food options and socialising may be limited.

**Moving house:**

Moving house is an exciting time, it can involve a couple, friends or just the individual. There are opportunities to meet new people and join a new community. However, there can be apprehension moving away from family and friends and starting in a new community of unknown people. There are also pressures from up keeping mortgage fees and household bills.

**Imprisonment:**

Being imprisoned offers reflection, for the individual to solve issues to change their life. There are options for learning and developing new skills through voluntary roles within the prison. However, a loss of independence and socialisation, will have a negative impact on emotional and social development.

**Parenthood:**

Parenthood is an exciting time. You are bringing a new life into the world, which involves responsibility, and can cause anxiety especially if there is a single parent. There will be less time for themselves, and more time focused on looking after their child. A change of lifestyle and routine, can cause lack of sleep, adding pressure to the relationship. However, having a child brings positive emotions, excitement and content.

**Bereavement:**

With an expected death, this can be easier to come to terms with, as emotionally the people around have prepared themselves for death. This doesn't make it easier to get over, as death is a gradual process of coming to terms with. If it is unexpected, this will take longer to come to terms with. It is not about getting over the death, but finding a way to cope with the fact it has happened.



Knowledge Organiser – Component 1

Examine equipment and technology required for participants to use when taking part in sport and physical activity / Prepare participants to take part in physical activity

TOPIC

A

- Learning Aim B & C:

DIFFERENT TYPES OF SPORTS CLOTHING AND EQUIPMENT FOR SPORTS PARTICIPATION

- ✓ Clothing
- ✓ Footwear
- ✓ Sports related equipment
- ✓ Protection and safety equipment
- ✓ Equipment for people with disabilities
- ✓ Facilities
- ✓ Officiating equipment
- ✓ Performance analysis



DIFFERENT TYPES OF TECHNOLOGY AND BENEFITS TO IMPROVE PARTICIPATION AND PERFORMANCE

- ✓ Clothing to increase performance and experience
- ✓ Footwear
- ✓ Sports specific equipment
- ✓ Protection and safety equipment
- ✓ Equipment for people with disabilities
- ✓ Facilities
- ✓ Officiating
- ✓ Performance analysis

The limitations of using technology in sport and physical activity

- Time
- Access to technology
- Cost of technology
- Accuracy of data provided by equipment
- Useability

PLANNING A WARM UP

- ✓ Types of activity
- ✓ Response of the Cardiovascular system to the pulse raiser
- ✓ Response of the musculoskeletal system
- ✓ Mobiliser activities and the response of the cardiorespiratory and musculoskeletal system
- ✓ Stretching activities and the response of the cardiorespiratory and musculoskeletal system



ADAPTING A WARM UP

- ✓ Adapting warm ups for different categories of participants
- ✓ Adapting warm ups to specific activity or sport
- ✓ Delivery of warm ups to prepare participants for physical activity (organisation & demonstration and supporting participants that are taking part)



Explore types and provision of sport and physical activity for different types of participants

TOPIC **B**

• Learning Aim A:

- ✓ Team & individual sport
- ✓ The benefits of taking part in sport
- ✓ Outdoor adventurous activities and its benefits
- ✓ Benefits of taking part in physical activities
- ✓ The provision of sport (public, private and voluntary sectors)
- ✓ Advantages and disadvantages of the sectors



TYPES & NEEDS OF SPORT & PHYSICAL ACTIVITY PARTICIPANTS

- Types of participants
- Age groups of participants (primary school/ adolescents/adults/older adults)
- Participants with disabilities
- Participants with long term health conditions
- Physical activity needs of participants

BARRIERS TO PARTICIPATION IN SPORT

- ✓ Barriers to participation
- ✓ Cost of clothing, equipment, transport
- ✓ Access to sport and physical activity
- ✓ Time constraints (family, school, work)
- ✓ Personal barriers
- ✓ Cultural barriers

METHODS TO ADDRESS BARRIERS TO PARTICIPATION IN SPORT

- Cost (discounted pricing, hiring equipment, free parking)
- Access (transport discounts, free parking, taster days, staff training, ramps, assistive technology)
- Time (creche facilities, extended opening time)
- Personal barriers (private changing facilities, parents and child sessions, campaigns to increase participation)
- Cultural barriers (women only sessions, diverse staff body, staff training in cultural awareness)



- Learning Aim B:

Knowledge Organiser - Component 1

WHAT IS SALTAPS?

STOP PLAY

ASK

LOOK

TOUCH

ACTIVE MOVEMENT

PASSIVE MOVEMENT.

STRENGTH TEST

FOR BASIC INJURIES SALTAPS CAN BE COMPLETED HOWEVER NOT FOR COMPLEX INJURIES SUCH AS A FRACTURE OR DISCLOCATION THIS MAY CAUSE FURTHER INJURY.

BASIC INJURY	COMPLEX INJURY
SPRAIN	DISLOCATION
STRAIN	LIGAMENT TEAR
BRUISE	FRACTURE
	TENDONITIS
	SHIN SPLINTS

PSYCHOLOGICAL REHAB?

- ✓ GOAL SETTING
- ✓ RELAXATION TECHNIQUES

WHAT IS PRICE?

PROTECT

REST

ICE

COMPRESSION

ELEVATION

BASIC REHABILITATION METHODS:

- ✓ ICE BATHS
- ✓ HOT AND COLD TREATMENT
- ✓ BASIC STRAPPING
- ✓ FLEXIBILITY EXERCISES AND YOGA/PILATES



- Learning Aim C



ADVANCES IN PROTECTION

- CRICKET HELMETS
- MOUTH GUARDS
- LANDING MATS

ADVANCES IN FOOTWEAR

- STUDS
- INSOLES
- BREATHABLE AND WATERPROOF MATERIALS

ADVANCES IN EQUIPMENT

- TENNIS RACKETS
- FOOTBALLS
- GOALPOSTS
- STRENGTHENING EQUIPMENT

ADVANCES IN TECHNOLOGY

- HAWK-EYE
- GOAL-LINE TECHNOLOGY
- MATCH ANALYSIS
- PARTICIPANT PLAYER ANALYSIS
- ACTION CAMERA
- GPS
- SMATCH WATCHES
- APPS

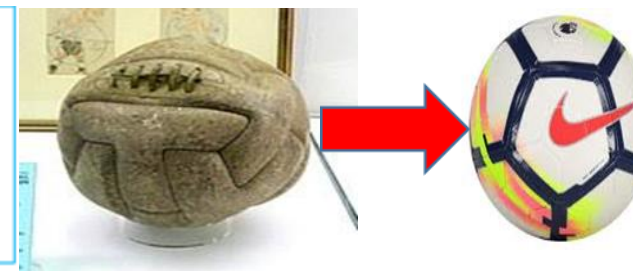
ADVANCES IN FACILITIES

- ✓ CLIMATE CONTROL
- ✓ SPRUNG FLOORS
- ✓ WOODEN FLOORS
- ✓ RUBBER FLOORING
- ✓ OUTDOOR FLOORING



ADVANCES IN CLOTHING

- AERODYNAMIC CLOTHING
- COMPRESSION CLOTHING
- MOISTURE CLOTHING



- Learning Aim C

**Knowledge Organiser –
Component 1**



BENEFITS OF TECHNOLOGY FOR THE PERFORMER.

- ✓ MARGINAL GAINS IN BODY SYSTEMS.
- ✓ CLOTHING
- ✓ GPS
- ✓ USE OF PROSTHETICS
- ✓ FOOTWEAR

LIMITATIONS OF TECHNOLOGY FOR THE COACH/MANAGER/OFFICIALS.

- ✓ TIME CONSUMING TECHNOLOGY
- ✓ KEEPING UP WITH DEVELOPMENTS IN TECHNOLOGY
- ✓ TECHNOLOGY BREAKDOWNS AND REPAIR COSTS.
- ✓ COST OF ADVANCED TECHNOLOGY
- ✓ BREAKS IN PLAY
- ✓ SOME TECHNOLOGY IS ONLY AVAILABLE FOR CERTAIN LEVELS.

BENEFITS OF TECHNOLOGY FOR THE COACH/MANAGER/OFFICIALS.

- ✓ VIDEO ANALYSIS
- ✓ GPS TECHNOLOGY
- ✓ USE OF APPS
- ✓ MOISTURE CONTROL CLOTHING
- ✓ USE OF SMARTWATCHES

LIMITATIONS OF TECHNOLOGY FOR THE PERFORMER

- DATA FROM TECHNOLOGY
- DATA AND INJURY ASSESSMENT.

