Year 9 Cycle 3

Knowledge Organisers

Contents

LO: How do I use a knowledge organiser so that I don't forget what I've learnt?

SUBHEADINGS

1. Look at the subheading.
2. Write down everything you know about that topic without looking at the KO.
3. Check what you've missed; add this to your notes in a different colour.
4. Do something else (e.g. revise something else).
5. Return to this and repeat from the beginning.

'Remains' – Knowledge Organiser

What happens in the poem? The speaker and two other soldiers are sent to tackle some looters who are robbing a bank. They open fire on a looter who is running away. The looter is seriously wounded He is carried away in the back of a lorry. The soldier has to walk past the blood stain left on the ground week after week. He returns home and is haunted by the memory of what he has done, reliving it again and again. He drinks and takes drugs in an attempt to forget what happened. However, he is unable to forget the looter and what he did. The memory remains stuck in his mind.

What is the context of the poem?

- Simon Armitage wrote 'Remains' (and other poems) for a Channel 4 programme called 'The Not Dead'.
- He has never been to war himself and has never been a soldier.
- To write the poems, he interviewed a number of soldiers who have survived war (in Iraq, Afghanistan, the Falklands etc.) i.e. the 'not dead'.
- The poems show the suffering soldiers experience long after wars have finished.
- 'Remains' is heavily based on the experience of Guardsman Tromans who fought in the Iraq war.
- Tromans shot a looter in Iraq and suffers from PTSD.

What is the significance of the title? The poem is about PTSD – in other words, how the traumatic experience of war REMAINS with the soldier. It could also refer to the human REMAINS – the image of the looter – that the soldier obsesses over so much as part of his PTSD.

What is a central idea in this poem? As is implied by the title, the poem explores the trauma experienced by soldiers and the terrible impact of PTSD on survivors long after the battle has ended.

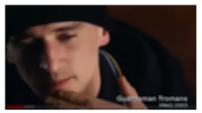
What other ideas are explored in the poem?

- War can cause suffering beyond the battlefield.
- War is damaging.
- Guilt is powerful and can overwhelm us.
- War can result in us dehumanising the enemy.
- War can cause us to act in ways we later regret.
- Memory can have a powerful effect on us.

Key Vocabulary	Definition	Example
Traumatic	Causing severe and lasting emotional shock or pain.	Being involved in war is deeply disturbing and a highly _____ experience.
PTSD (post-traumatic stress disorder)	This is an anxiety **disorder** caused by very stressful, frightening or distressing events. Someone with this often relives the **traumatic** event through nightmares and flashbacks, and may experience feelings of isolation, irritability and guilt.	The soldier in 'Remains' is suffering from _____.
Guilt	A feeling of worry or unhappiness that you have because you have done something wrong.	The soldier struggles to come to terms with the _____ he feels over shooting the looter.
Haunt	To revisit again and again.	The memory of the shooting _____ the soldier.
Dehumanisation	To treat people as less than human.	It can be argued that the soldiers in 'Remains' _____ the looter by treating him with so little respect.
Dramatic monologue	A poem made up of a single *character* speaking (i.e. the poet is very clearly writing as someone else).	'Remains' is a _____ because Armitage is writing as someone else and there is only one speaker in the poem.

Writer's Craft:	Example
Why is the poem written as a dramatic monologue?	To explore a traumatised soldier's thoughts and feelings; because the poem was produced following an interview with a soldier.
Why does Armitage use colloquial language?	To create a convincing voice – an ordinary person/soldier; to contribute to the almost matter-of-fact tone in the first half of the poem.
What does the first/second half focus on? What is the turning point?	First half: the shooting; second half: the emotional impact on the soldier. Turning point = 'End of story, except not really.'
Why is the shooting described with graphic imagery?	To convey the brutality; to show what has traumatised the soldier; because it's so vivid in the soldier's mind.
Why is the blood on the street described as a 'blood shadow'?	Shadow = dark imagery – connotations of death and misery; the shooting has cast a shadow over his life; a shadow follows you around
What does the imagery 'dug in behind enemy lines' suggest?	To the looter, the soldier is the enemy; the soldier's mind is enemy territory. The looter is in the soldier's mind, so this is 'behind enemy lines'. 'Dug in' means well defended and prepared for attack – this suggests that the memory of the looter is difficult to remove; 'dug in' is a military term, suggesting that the war/conflict is still going on for the soldier.
What impression does the final stanza leave us with and what is meant by 'bloody hands'?	It leaves us with the impression that the pain will be ongoing – there seems little hope of an end as the looter is still 'here and now'. 'Bloody' can suggest frustration (swearing), but 'to have blood on your hands' also means to be responsible for an act of violence against someone i.e. to be guilty of something.



VOCABULARY

1. Cover the vocabulary and definition columns. Try to work out what the missing word is in the example. Check. Move to the next word. Repeat until you can do this with all the words you've studied so far.
2. Try the same as above, but this time by looking at just the definition column.
3. Try the same as above, but this time just look at the vocabulary and try to explain what the definition is.

BIG IDEAS

1. Look at the list of big ideas.
2. For each idea, make notes.

MINDMAP

1. Create a mindmap of what you know about the topic *from memory*.
2. Check your mindmap against the KO.
3. Add 5 things that you've missed using a different colour pen.
4. Do something else (e.g. revise something else).
5. Repeat.

PICTURES

1. Look at just the pictures.
2. Explain how each of these pictures is relevant to the topic.

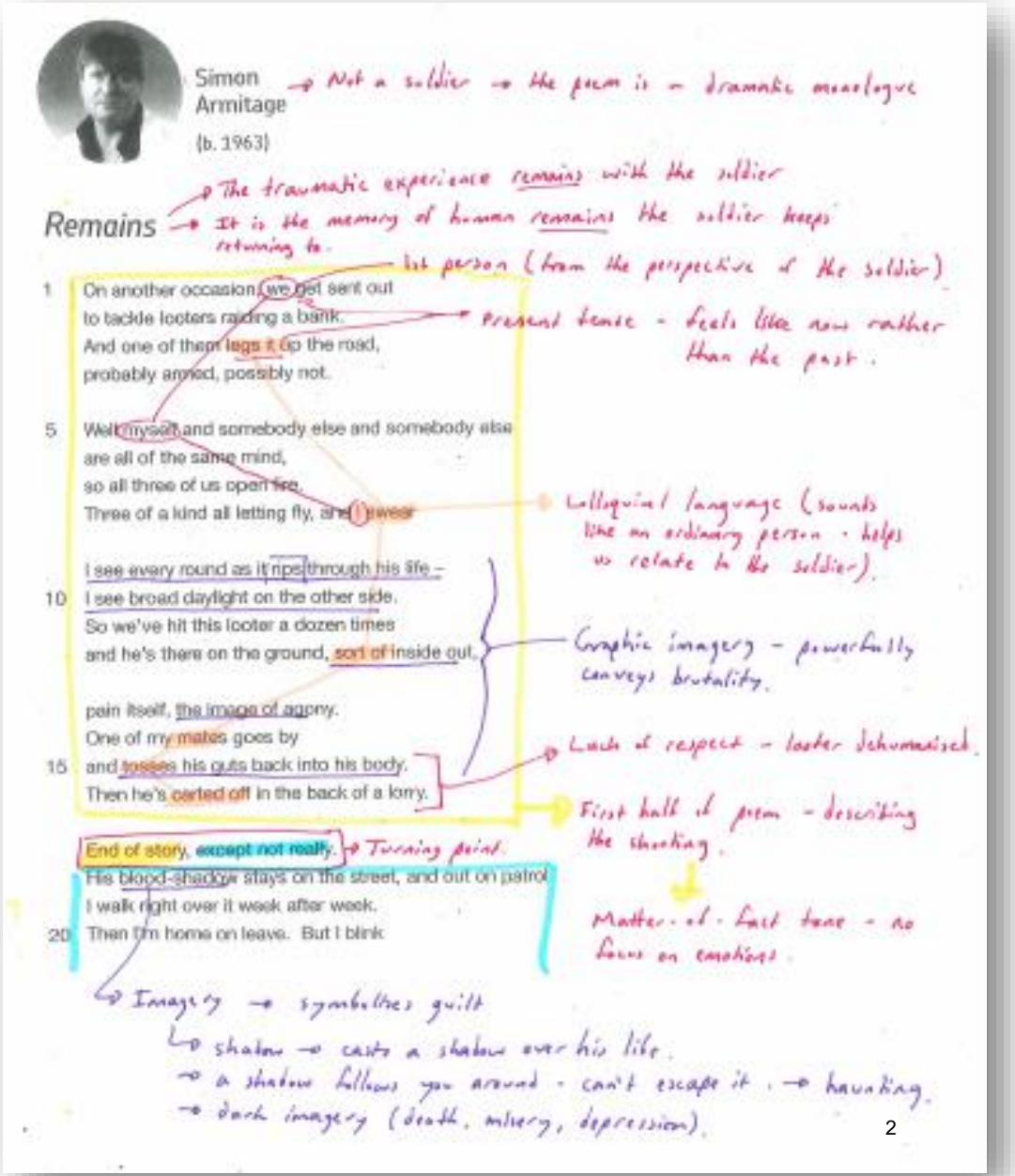
OTHER QUESTIONS

1. Cover the explanation.
2. Answer the questions.
3. Check your answers; add anything you missed; correct anything you got wrong.
4. Do something else (e.g. revise something else).
5. Return to this and repeat from the beginning.

LO: How do I revise (poetry) so that I don't forget what I've learnt?

You also have access to an annotated copy of the poem. This can help us to revise too:

1. Take a blank copy of the poem.
2. Annotate it with everything you can remember about the poem.
3. When you've finished, check it against the annotated version.
4. Add anything you missed using a different colour pen.
5. Do something else.
6. Repeat with another blank copy of the poem.



Design & Technology *knowledge organiser* Year 9

Year	Curriculum Overview	KS3 Curriculum Criteria covered	Assessment
YEAR 9 8-10 week rotation	You will design and make a trophy representing an achievement or an award. You will use a variety of woods, metals and plastics in a range of stock forms. You will learn about mechanisms and types of motion, mechanical advantage and levers. You will select materials for their properties. You will make and use templates. You will use more complex manufacturing processes such as vacuum forming, laser cutting and mould making.	**Design:** • identify and solve their own design problems and understand how to **Make:** resolve design problems given to them such as joining mixed media and integrating a moving part **Evaluate:** analyse the work of past and present professionals and others to develop and broaden their understanding **Technical knowledge** • understand and use the properties of materials and the performance of structural elements to achieve functioning solutions • understand how more advanced mechanical systems used in their products enable changes in movement and force	**Design:** You will use modelmaking and sketching to create a working prototype integrating a mechanism or movement. **Evaluate:** You will have conducted a series of detailed product analysis for CW and HW **Make:** The trophy will include a range of manufacturing processes and will demonstrate high levels of technical skills and materials knowledge **Technical knowledge and language:** You will use technical language and demonstrate knowledge of tools and processes during CW and HW tasks

Use www.technologystudent.com to research the meaning of core Key terms: Renewable and non-renewable energy sources, sustainable design, AI, Automation and Robotics, Scales of Production, Properties of materials, CAD/CAM, the iterative design process,

Know the meanings of these keywords

Spherical	Oscillating motion
Angular	Reciprocating motion
Geometric	Wood joints
Cylindrical	Riveting
Symmetrical	Metalworking
Mixed media	Vacuum forming
Properties of materials	Strip heater
Rotary motion	Decoration

Types of movement and motion

Symbol	Keyword	Definition
	Linear Motion	Moves in a straight line
	Rotary Motion	Moves in a circle
	Intermittent Motion	Stops and starts
	Reciprocating Motion	Moves back and forth, or up and down
	Oscillating Motion	Swings back and forth, or up and down
	Irregular Motion	Does not happen when expected

Product Analysis – Identifying key features of trophy or award designs

We are going to look at different trophies to identify their strengths and weaknesses, assess them and award a mark for each section.

1. What is the trophy for. Is it clear or do you have to guess?
2. Describe the main features of the trophy. Include the weight and size where possible
3. List the materials the trophy is made from, describe how do you think the parts have been made?
4. What does the trophy represent – what was the designer trying to achieve with the design?
5. As a new trophy designer, how would you rate this trophy?

FIFA TV https://www.youtube.com/watch?v=Ou7jJJfT1bQ

Drama: Melodrama Knowledge Organiser

Melodrama is a style of drama in which is characterised by its sensationalism. The characters are stereotypical and their reactions are exaggerated and highly emotional. The storylines are extremely eventful, often with 'life and death' situations, intending to entertain and shock the audience. Good always triumphs over evil in melodrama, with the baddies getting their come-uppance .

Stock Characters are a form of stereotype, which we expect to see in a particular style of drama (their appearance, behaviour and speech is predictable). In Melodrama we expect to see the **Villain (and sidekick),** the **Maiden/Damsel in Distress** and of course the **Hero.**

Music and Sound - The use of music and sound effects are essential in Melodrama. The word melodrama comes from the words **Melody and Drama.**

- **Leitmotif** — In melodramas the tock characters had their own piece of music called a leitmotif. These were often played as a character entered.
- **Music** — Music was used to make the action on stage even more sensational (exciting). Fast music might increase the tension in a chase sequence whereas slow music, creepy music might add tension to a dangerous situation.
- **Sound Effects/SFX** - Sound effects could be used in melodrama to add atmosphere – a stormy night, driving rain, howling wind, an advancing steam train.

Costume - With the characters being stereotypical, costume design in melodrama would usually reinforce these stereotypes. Colour might be used symbolically (red for danger, black for a villain, white for purity etc) and accessories might be added for dramatic effect, e.g. a cloak to swish menacingly.

Set (Scenery) in melodrama should create an atmosphere. There may be shadowy corners in which a villain could lurk. You may need several doorways for dramatic entrances/exits and thrilling chase sequences. Levels could also suggest status, such as high platforms for the powerful characters. The **lighting** could help create shadowy corners, or sudden flashes could add dramatic effect to surprise entrances. Colour could be used symbolically such as red for danger and white for purity.

Structure - The structure of a play is the'shape' of the action. Typically in melodrama, we begin with **exposition** (who's who and what's going on), build **tension** towards the **climax**, draw the plot together through the **denouement** and end with **resolution**.

Performance Skills in melodrama can be described as over the top. **Very clear and loud vocal delivery** is needed, **facing out to the audience**, combined with **large gestures** and **exaggerated facial expressions**.

Drama: Pantomime Knowledge Organiser

Pantomime derives from the Greek word 'Pantomimos', which is defined as a performer acting all the roles in a story, or an 'imitator of all.

When did pantomime begin?
The panto we know and love today – with its slapstick humour and audience participation – has its roots in Italian street theatre of the commedia dell'arte in the 16th Century. Small companies travelled through markets and fairgrounds performing and improvising comic stories featuring the same stock characters.

Where Does British Pantomime Originate From?
In the Middle Ages, at Christmas gatherings a traditional English folk play called 'Mummers Play' was popular. It contained many of the archetypal elements of a pantomime such as stage fights, risqué humour, memorable creatures, gender role reversal, and the obligatory good defeating evil.

By the 1800s, children were regularly going to the theatre around the Christmas and New Year holidays (and often at Easter) to watch the craziness of the chase scene – the most exciting part of the 'panto' of the time, because it was fast-paced and included spectacular magic tricks as well as slapstick comedy, dancing and acrobatics.

Why are Pantomimes at Christmas?
One of the reasons pantomime is so popular is due its universal appeal; traditionally a show for children, adults find themselves returning to the panto for nostalgic escapism, as well as to take their own children, or to enjoy with family members and friends.

This is also part of the reason why they have become so popular at Christmas, seen as a Christmas tradition to enjoy each year and reunite with friends and family to celebrate the festive season.

As pantomimes are generally enjoyed by children, it was back in the 1800s where it became popular for children to experience a panto at Christmas. Seen as a treat to particularly enjoy at Christmas, at the time pantomimes involved more acrobatic performances, and dramatic dancing, rather than the more established structure of pantomimes today.

Additionally, in the Tudor period, a popular festival called The Feast of Fools, was celebrated. The feast included eating, drinking and role reversal, which is seen as one reason why Pantomimes are now traditionally performed at Christmas.

Traditional Elements of Pantomime

Principal Boy, Primcipal Girl, The Villain, Good/Bad Fairy, Comedy Characters, Panto Animal, Slapstick Scene, Audience Singalong

Traditional Pantomimes

Dick Whittington, Sleeping Beauty, Cinderella, Jack and the Beanstalk, Aladdin, Peter Pan,

Homework 1 https://forms.office.com/e/tLFBcFh2p8

Nutrition recall

Balanced diet definition: Eating a wide variety of foods in the right proportions, and the right amount of food and drink to achieve and maintain a healthy body weight.

8 tips for a healthy diet

1. Base your meals on higher fibre starchy carbohydrates.
2. Eat lots of fruit and veg.
3. Eat more fish, including a portion of oily fish.
4. Cut down on saturated fat and sugar.
5. Eat less salt: no more than 6g a day for adults.
6. Get active and be a healthy weight.
7. Do not get thirsty.
8. Do not skip breakfast.

VITAMINS AND THEIR FUNCTIONS

	Function (what does it do?)	Source (foods found in)
A	• Healthy skin • Helps us see in the dark	• Animals – liver and milk • Plants – carrots and red peppers
B	• Releases energy from food	• Bread, fish, broccoli, liver, milk, peas, rice
C	• Keeps connective tissue healthy • Helps absorb iron	• Oranges, blackcurrants, broccoli, red and green peppers
D	• Helps the body absorb calcium	• Butter, eggs, milk, oily fish

MINERALS AND THEIR FUNCTIONS

	Function (what does it do?)	Source (foods found in)
Calcium	Build strong bones and teeth	Yoghurt, cheese, milk, tofu
Sodium (salt)	Keeps the correct water balance in the body	Cheese, ready meals, salted nuts, bacon
Iron	Keeps red blood cells healthy	Dark green vegetables, beans, fish, egg yolk, red meat

Questions:

1. What should we cut down on eating too much of?
2. Which vitamin helps the body absorb calcium?
3. Which vitamin helps the body absorb iron?

Homework 2 https://forms.office.com/e/TfRLhqkKWw

Diet, nutrition & Health

Over vs under-nutrition

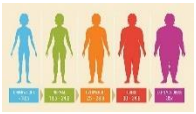
Over-nutrition – eating too much food, or too much of a certain food.
Under-nutrition - eating too little food or too little of a particular nutrient

Definitions:

- Obesity, or being obese, means being very overweight.
- Cardiovascular disease covers a group of diseases, including diseases of the heart and blood vessels.
- CHD (coronary heart disease) occurs when blood vessels to the heart become blocked with fatty deposits.
- Type 2 diabetes is the most common type of diabetes in the UK. It causes the sugar in the blood to get too high.

The main health problems linked to obesity?

- Type 2 diabetes
- Coronary heart disease
- Stroke
- Cancers
- Arthritis
- Depression



The main the risk factors are for CHD

- High blood pressure
- Smoking
- High cholesterol
- Diabetes
- Not exercising enough
- Being overweight or obese
- DNA
- Ethnic background

The signs of type 2 diabetes

- Feeling tired all the time
- Feeling thirsty
- Passing more urine than normal

Normal

Blocked

Questions:

1. What are the main health problems associated with obesity?
2. What is coronary heart disease? Explain
3. What is the difference between type 1 and 2 diabetes?
4. How can you treat type 2 diabetes?

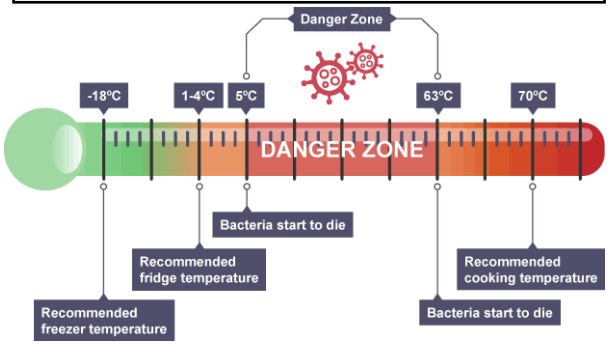
Homework 3 https://forms.office.com/e/ChZMtFxpu0

Food Poisoning bacteria, symptoms and causes

Food safety advice when handling food:

How do bacteria grow?

Bacteria double every 10-20 minutes in the right conditions (asexual) e.g. 1 becomes 2, then 4, then 8 …… through binary fission



Definitions:

- Food poisoning is an illness caused by eating contaminated food. It's not usually serious and most people get better within a few days without treatment. In most cases, food is contaminated by bacteria.
- High-risk foods: ready-to-eat foods high in moisture and protein

Food poisoning bacteria and symptoms

Name of bacteria	Foods it can come from
Salmonella	Undercooked poultry Eggs Unpasteurised milk
Listeria	Soft cheeses, pate
Campylobacter	Poultry, milk and milk products
E-coli	Undercooked meat – especially burge Unwashed contaminated fruit

Symptoms of food poisoning:

- Vomiting
- Diarrhoea
- Nausea
- Stomach pains
- Dehydration

Questions:

1. What are the 5 main things that bacteria need to grow?
2. What are the main symptoms of food poisoning?
3. How could you control or stop bacterial growth?

Homework 4 https://forms.office.com/e/6M8QazRs50

Seasonality and food waste

Some foods are seasonal. This means that they are only available and grown at certain times of the year.

How is food wasted?

There are 2 main reasons we waste food at home:

1. We make too much
2. We don't use food before it goes off

Using leftovers

You could use leftover food to make another dish such as:

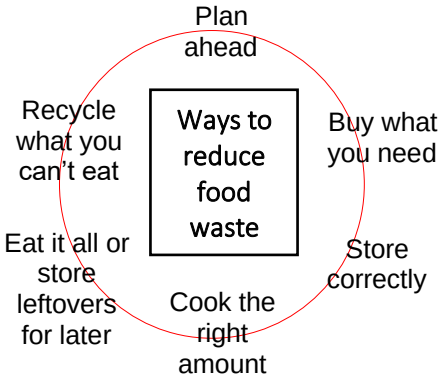
- Rice and pasta in salads
- Bread for breadcrumbs. Used to coat fishcakes, chicken goujons
- Potatoes used for bubble and squeak or frittata
- Chicken used in chicken curry or pie

Advantages of seasonal foods

- More likely to be grown in the UK
- Reduced food miles and carbon footprint
- Supports local businesses
- Can be fresher than buying out of season
- More available which makes them cheaper

Disadvantages of seasonal foods

- They can be used a lot during some seasons which means people could become bored of them
- There can be too much of some foods that will be wasted if they are not eaten



Questions:

1. What does 'seasonal' mean?
2. Give 2 advantages and 2 disadvantages of seasonal foods
3. What are the 4 seasons in the UK?
4. Create a meal that could be made using leftovers from a roast chicken dinner.

Y9 French LC3 Sentence Builder 1 : School rules : Quelles sont les règles ? Tu es d'accord ?

Noun	verb	verb phrase	opinion	adjective	connective	reason
Au collège en Angleterre (at school in England)	je dois (I have to) on doit (one has to) il faut (it's necessary to)	écouter le professeur (listen to the teacher) être gentil(le) (be kind) travailler en classe (work in lessons) être à l'heure (be on time) porter l'uniforme (wear a uniform) faire mes devoirs (do my homework)	je trouve ça (I find that)	juste (fair) normal (normal) facile (easy)	car (because)	il faut protéger les jeunes (it's necessary to protect young people) il faut respecter les autres (it's necessary to respect others) je veux apprendre (I want to learn) je veux des bonnes notes (I want good marks/grades)
	_____	_____		_____		_____
	je ne dois pas (I must not) on ne doit pas (one must not) il est interdit de/d' (it is forbidden to)	utiliser un portable (use a mobile phone) porter des bijoux (wear jewellery) crier dans les couloirs (shout in the corridors) harceler d'autres élèves (bully other students) tricher dans un contrôle (cheat in a test)		injuste (unfair) frustrant (frustrating) ridicule (ridiculous) énervant (annoying)		on n'est pas des bébés (we are not babies) mon prof a téléphoné à mes parents (my teacher phoned my parents) j'ai eu une heure de retenue (I had an hour of detention) c'est trop strict (it's too strict)

Y9 French LC3 SB2 – What do you like to wear? Qu'est-ce que tu aimes porter ?

Noun	verb	noun	adjective	opinion phrase	verb	adjective
Au collège À l'école (At school)	je porte (I wear) on porte (we wear) je dois porter (I have to wear) on doit porter (one has to wear)	une chemise (a shirt) une veste (a jacket) une jupe (a skirt) une cravate (a tie)  un pantalon (trousers) un pull (a jumper) un manteau (a coat) un jean (jeans) un chapeau (hat) un haut (a top)	noire (black) bleue (blue) verte (green) grise (grey) blanche (white) rouge (red) jaune (yellow) noir (black) bleu (blue) vert (green) gris (grey) blanc(white)	selon moi l'uniforme (in my opinion the uniform) je trouve que l'uniforme (I find that the uniform) car j'aime (because I like) car je préfère (because I prefer)	est (is)	très pratique (very practical) trop cher (too expensive) un peu moche (a bit ugly) assez confortable (quite comfortable) sportif (sporty) relaxe (relaxed) courant (up to date)
Hier (yesterday) Le weekend dernier (last weekend)	j'ai porté (I wore)				le style (the style) _____ les vêtements (clothes)	_____ confortables (comfortable) intéressants (interesting) pratiques (practical) aux couleurs vives (colourful)

Y9 French LC3 Sentence builder 3 : Languages & travel – Tu apprends une langue ?

Time marker	verb	noun	opinion	reason	future tense	noun	clause
 Au collège (at school) En ce moment (At the moment) Actuellement (Currently)	j'apprends (I'm learning)	le français (French) l'allemand German) l'espagnol (Spanish) le grec (Greek) l'italien (Italian) le chinois (Chinese) l'arabe (Arabic)	je pense que c'est important (I think it's important)	car dans le futur (because in the future) car après avoir fini mes études (because after having finished my studies)	je vais faire une année sabbatique (I'm going to do a gap year) je vais avoir une carrière (I'm going to have a career) je vais étudier (I'm going to study) je vais voyager (I'm going to travel) je vais faire du bénévolat (I'm going to do volunteering) je vais faire une formation (I'm going to do some training) je vais faire un échange scolaire (I'm going to do a school exchange) je vais habiter (I'm going to live) je vais enseigner l'anglais (I'm going to teach English je vais aider les gens (I'm going to help people) je vais soutenir un projet (I'm going to support a project)	en Asie (In Asia) en Europe (in Europe) en Afrique (in Africa) à l'étranger (abroad) au Canada (in Canada) en Amérique du Sud (In South America) en Grèce en France en Italie en Espagne en Allemagne (Greece France Italy Spain Germany)	seule(e) (alone) avec ma copine (with my friend) avec mon copain (with my friend) avec ma famille (with my family)
Un jour (one day A l'avenir (in the future)	je voudrais apprendre (I would like to learn)						

Y9 French LC3 SB4 – My future trip - ordering and booking – Je peux vous aider?

Future time marker	future tense	connective	noun	connective	future verb phrase
L'année prochaine (Next year) L'été prochain (Next summer)	je vais aller en France (I'm going to go to France) je vais aller au Canada (I'm going to go to Canada)	avec (with	ma famille (my family) mes amis (my friends) mon école (my school)	pour (to/for) _____ je vais (I'm going to	améliorer mon français (improve my French) _____ rester dans un hôtel (stay in a hotel) manger dans un restaurant (eat in a restaurant)

Greeting/question	conditional	noun	question	noun	please	price
 Bonjour, je peux vous aider ? (Hello, can I help you?) 	Je voudrais (I would like)	l'entrée (the starter) le plat du jour (dish of the day) la viande (the meat) le poulet (the chicken) le poisson (the fish) les legumes (the vegetables) la salade (the salad)	et comme boisson? (and as drink?) et comme dessert? (and as dessert?)	un coca (a coca cola) de l'eau (water) du thé (tea) du café (coffee) la mousse (the mousse) la tarte (the tart) les fruits (the fruit) la glace (the ice cream) le gâteau (the cake)	s'il vous plaît.	ça fait ___ euros, merci et au revoir. that's __ euros, thanks and goodbye.
	Je voudrais une chambre (I would like a room)	avec un grand lit (with a double bed) avec un lit simple (with a single bed) pour une personne (for one person) pour deux personnes (for two people) avec une vue sur la mer (with a sea view) avec une salle de bains (with a bathroom)	Pour combien de nuits? (For how many nights ?)	pour __ nuits s'il vous plaît. (for __ nights please.)		

GCSE Geography Knowledge Organiser

Lesson content
(If you cannot access the QR code, ask your teacher to share the folder with your school email)
Quizlet
https://quizlet.com/notes/450ff17b-20cc-4ba6-8ae7-dcf8dd5704a7?i=24ilg4&x=13qt

Year	9	Cycle	3	Topic	The Living World (Ecosystems, Rainforests & Hot Deserts)

Subject vocabulary

Ready to test your knowledge? Scan this QR code to access Quizlet

Ecosystem	An ecosystem is a community of interacting living (biotic) and non- living (abiotic) organisms and their environment.
Food web	Numerous food chains joined together, showing multiple reliances (interdependence)
Food chain	A series of simple links showing the transfer of energy in an ecosystem (who eats who!)
Biome	A large geographical area characterised by a particular climate and vegetation
Biodiversity	The variety of living organisms within a given space/ habitat
Litter	This is the surface layer of vegetation, which over time breaks down to become humus.
Biomass	The total mass of living organisms per unit area.
Eutrophication	Excessive nutrients in a lake or other body of water, due to run-off from the land, which causes a dense growth of plant life and reduces the oxygen level in the water.
Trophic cascade	A side-effect when a trophic level (species) of the ecosystem is reduced or removed. This results in lack of balance in an ecosystem, having a ripple effect through food webs.
Insolation	The amount of solar radiation (sun's energy) received on a given surface in a given time
Deforestation	The removal of trees for an alternative land use
Evapotranspiration	Evaporation and transpiration combined. Evaporation, when water (liquid) turns to water vapour (gas). Transpiration, water vapor coming from vegetation (pores under leaves)
Leaching	(usually precipitation) washing nutrients out of the soil. This happens a lot in rainforests
Resource	Something which human society attaches value to due to its usefulness
Famine	Widespread scarcity (lack of) food
Epiphyte	A plant in the rainforest that gets its nutrients and water from the air (it doesn't need soil- so often grows high up in the under canopy to reach sunlight)
Buttress roots	Large, wide shallow root system common to trees in rainforest regions. Adapted to stabilise the tree, and with thin source of organic matter/ nutrients on the forest floor, being shallow optimises the uptake of nutrients
Hydroelectric power (HEP)	Renewable source of electricity (doesn't run out). Usually installed in dams, whereby turbines are moved by the flow of water to generate electricity
Indigenous	Originating or occurring naturally in a particular place; native
High pressure	When air is descending, this creates clear skies and stable weather
Low pressure	Associated with air rising, condensing and forming clouds. thunderstorms are common.
Carbon sink	Something that stores carbon
Diurnal	Daily; of each day
Succulent	A plant that stores water (cactus for example)
Tap roots	Deep roots, able to tap into underground sources of water (and aquifers)
Desertification	When fertile land turns infertile, due to a mix of human and physical causes
Salinisation	When evaporation of water at the surface of the soil draws salts from underground rocks and soils, causing salts to crystallize and interfere with root and plant growth.
Hydroelectric power (HEP)	Renewable source of electricity (doesn't run out). Usually installed in dams, whereby turbines are moved by the flow of water to generate electricity.
Overgrazing	Excessive grazing (cattle eating) which causes damage
Agriculture	The practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products
Irrigation	The supply of water to land or crops to help growth, typically by means of channels

Ecosystems

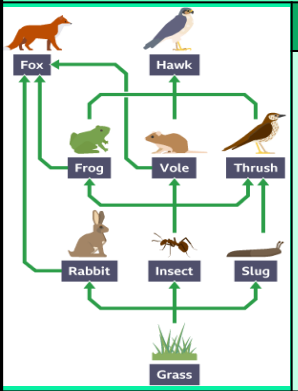
An ecosystem is a system in which organisms interact with each other and with their environment.

Abiotic	These are **non-living**, such as air, water, heat and rock.
Biotic	These are **living**, such as plants, insects, and animals.
Flora	**Plant life** occurring in a particular region or time.
Fauna	**Animal life** of any particular region or time.

Food webs and chains

Simple food chains are useful in explaining the basic principles behind ecosystems, the transfer of energy (who eats who!). They show only one species at a particular trophic level.

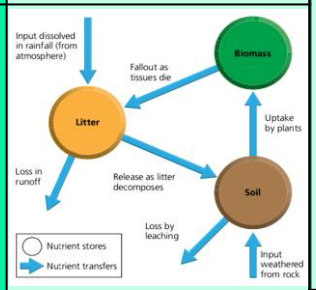
Food webs however consists of a network of many food chains interconnected together. This shows interdependence.



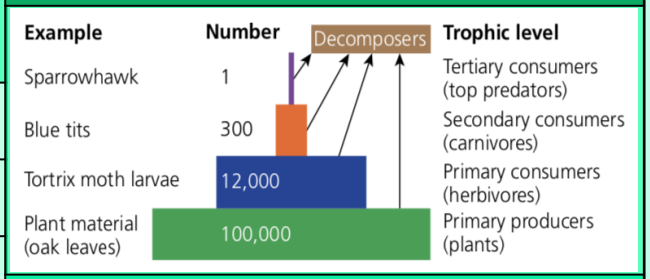
Nutrient cycles

Plants take in nutrients to build into new organic matter. Nutrients are taken up when animals eat plants and then returned to the soil when animals die and the body is broken down by decomposers.

The decomposers are the organisms that break down organic matter. They include a mixture of: worms, bacteria & fungi. They help to return nutrients to the soil.



This diagram shows the weight of biomass getting smaller at each level.



Many parts of plants are simply not eaten by animals, and carnivores do not eat all of their prey (such as the bones). Also, much of what the animals do eat is excrete.

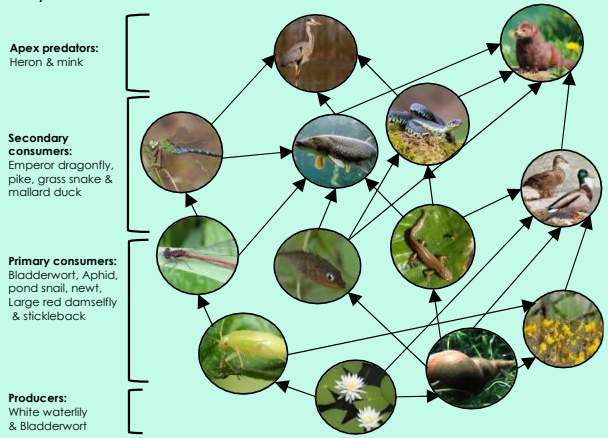
An example of a small-scale ecosystem: Stover country park

Stover Country Park is owned and managed by Devon County Council as a Site of Special Scientific Interest (SSSI) , Country Park, Local Nature Reserve and a listed historic park and garden covering 46.15 hectares, consisting of a mosaic of 6 habitats.

Lakes and ponds

Undoubtedly the main feature of the Park, the 10 acre (4ha) lake and marsh, is particularly important for dragonflies, so much so that in 1984 it was designated a Site of Special Scientific Interest, and a Local Nature Reserve in 2002.

The lake provides a sanctuary for an abundance of wildfowl, and in winter flocks of snipe use the marsh as a daytime roost.



Deciduous woodland

Stover's producers, consumers and decomposers are all interdependent. This is most clearly shown by the annual life cycle of the trees.

Most of the trees are deciduous, meaning that they lose their leaves in winter. This is an adaptation to the UK's seasonal climate. Winters are darker and cooler than summers (the mean monthly temperature is 18 °C in July but just 5 °C in January). As a result, the trees grow broad green leaves in spring. This allows them to maximise photosynthesis during the summer. They shed their leaves in the autumn, and so conserve their energy during winter.

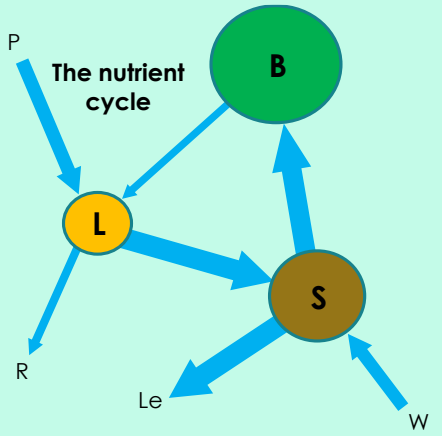
By mid-autumn, the forest floor is covered with a thick layer of leaves. Remarkably, by spring, the leaf litter has all but disappeared: the decomposers work is now complete. Nutrients stored in the leaves are converted to humus in the soil, ready to support the new season's plant growth. This will ultimately include the fruits and berries that, in turn, support many primary consumers.

Nutrient cycling at Stover

Nutrient cycling demonstrates clearly the interdependence of plants, animals and soil. People and ecosystem components are interdependent too. Today, visitors pick berries and flowers. In turn, this helps spread the seeds, which stick to their clothing.

The biomass store is large because of the great height of the trees, and the dense undergrowth beneath them.

The soil store is large too because there is always plenty of humus.



The high flow rates between the litter, soil and biomass stores reflect the vigorous cycle of new growth that takes place each year. The park also loses a lot of nutrients each year, via leaching, during episodes of heavy rainfall.

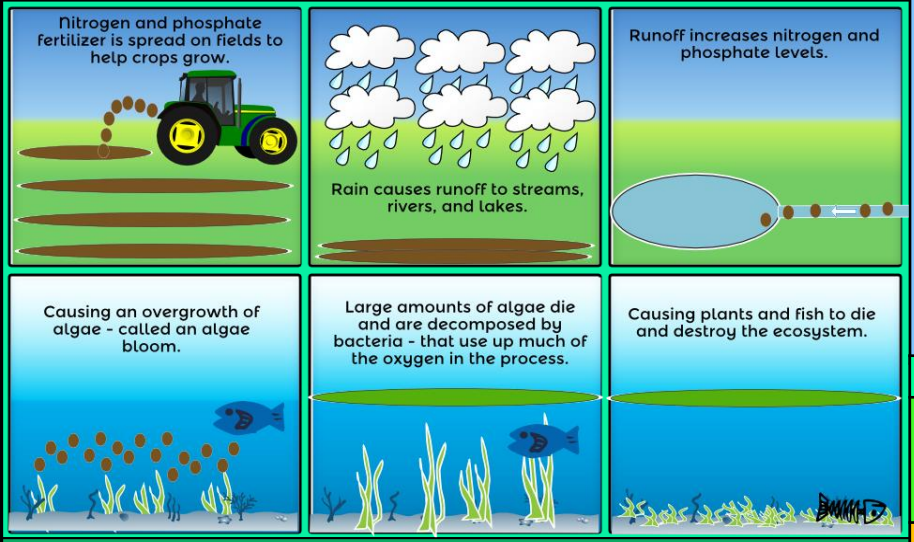
Changes affecting ecosystem balance

Ecosystems are very sensitive to change. The living (biotic) and non-living components (abiotic) of the ecosystem can be altered by either natural factors or human management.

Changes to the ecosystem caused by **natural** factors include: drought, flood, fire and disease

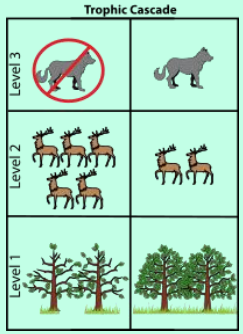
Changes to the ecosystem caused by **human** factors include: deforestation, fires and eutrophication

Eutrophication:



How can management restore the balance?

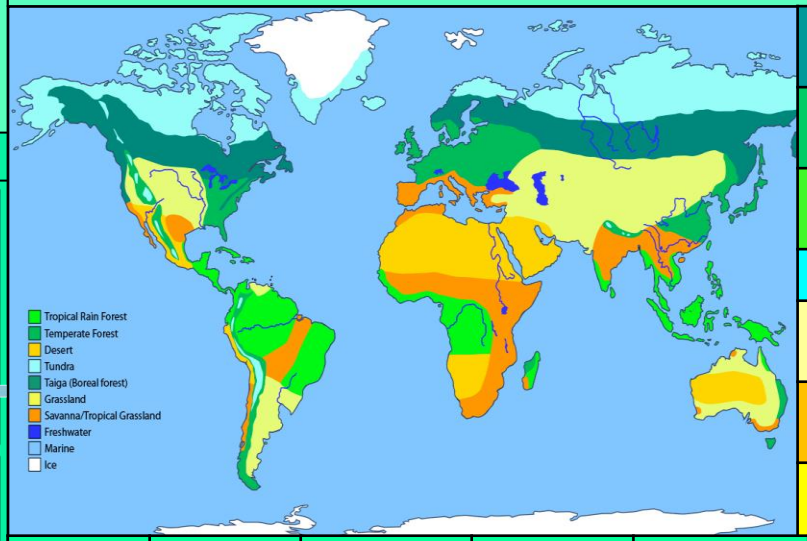
Many scientists believe that 'ecosystem restoration' is the best way to restore ecosystem balance. Grey wolves were recently introduced into **Yellowstone National Park** which resulted in numerous impacts. The wolves have restored balance to the ecosystem and landscape.



- Reintroduction of the grey wolf. There are 16 packs of around 10 animals. Each pack kills one elk per day.
- Elk population falls from 20,000 to 10,000 in 8 years
- Reduction in grazing pressure on vegetation. Aspen and cotton wood start to regenerate. There is more tree cover.
- Competition from wolves results in a decrease in coyotes.
- Reduction in predation from coyotes leads to an increase in voles, mice and other rodents.
- Increase in banks side trees stabilises river banks- there is less erosion. Trees provide habitats for many creatures.

Biomes

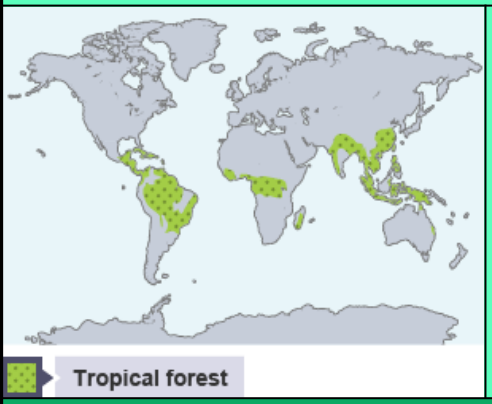
A biome is a large geographical area of distinctive plant and animal groups, which are adapted to that particular environment. The climate and geography of a region determines what type of biome can exist in that region.



Biome	Location	Temperature	Rainfall	Flora	Fauna
Tropical rainforest	Centred along the Equator.	Hot all year (25-30°C)	Very high (over 2000mm/year)	Tall trees forming a canopy; variety of species.	Greatest range of different animal species. Most live in canopy layer
Tropical grassland	Between latitudes 5°-30° north & south of Equator.	Warm all year (20-30°C)	Wet + dry season (500-1500mm/year)	Grasslands with widely spaced trees.	Large hoofed herbivores and carnivores dominate.
Hot desert	Found along the tropics of Cancer and Capricorn.	Hot by day (over 30°C) Cold by night	Very low (below 300mm/year)	Lack of plants and few species; adapted to drought.	Many animals are small and nocturnal: except for the camel.
Deciduous forest	Between latitudes 40°-60° north of Equator.	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500m /year)	Mainly deciduous trees; a variety of species.	Animals adapt to colder and warmer climates. Some migrate.
Coniferous forest	50° to 60°N latitudes	Winter ranges from -40°C) to 20°C. Summer usually around 10°C	Cool + moist.Varies from 300 to 900 mm/ year	Evergreen trees that bear cones	Moose, grizzly bears, timber wolves, red squirrels
Tundra	Far Latitudes of 65° north and south of Equator	Cold winter + cool summers (below 10°C)	Low rainfall (below 500mm/ year)	Small plants grow close to the ground and only in summer.	Low number of species. Most animals found along coast.

Tropical rainforests

Tropical rainforest cover about 7 per cent of the Earth's surface yet they are home to over half of the world's plant and animals.



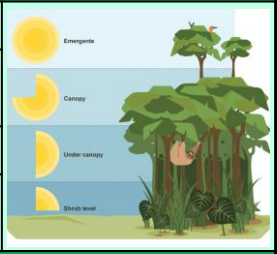
They are centred along the Equator between the Tropic of Cancer and Capricorn. Rainforests can be found in South America, central Africa and South-East Asia.

Characteristics

Climate	Due to the presence of clouds, temperatures rarely rise above 32°C. **Temperature approximately 27°C.** Most afternoons have heavy showers. **>2,000 mm of precipitation annually**
Soil	Rainforest soils (**latosols**)are red in colour and rich in iron. They have a thick layer of leaf litter but only a thin fertile layer because the leaves rot quickly in the humid conditions. Nutrients are quickly washed out of the soil because of the heavy rainfall (this is called **LEACHING**)The **soils** in the rainforest are therefore **NOT very fertile**!
Water	The roots of trees, plants and shrubs take up water from the soil. The rain is intercepted by trees as it falls. As the temperature in the rainforest increases during the day, it causes the **water to evaporate into the atmosphere.** This water vapour cools, condenses and forms clouds to make the **next day's rain.** This is known as **convectional rainfall**. The whole process is repeated daily and the cycle continues. The TRF uses the circulating water as a **sort of cooling system.**

Biodiversity

Emergent	Highest layer with trees reaching **50 metres.**
Canopy	Most life is found here as It receives **70% of the sunlight** and **80% of the life.**
Under Canopy	Consists of trees that reach **20 metres high.**
Shrub Layer	Lowest layer with **small trees** that have adapted to living in the **shade.**



Plant adaptations

Lianas	Woody vines. Climbs trees to reach sunlight at canopy.
Buttress roots	Large roots above the surface of the soil, shallow root system but large surface area to support large trees.
Epiphytes	Air plants; get their water and nutrients from the air.
Drip tips	Allows heavy rain to run off leaves easily.

Animal adaptations

Sloth	Move slowly to conserve energy in humid conditions. Algae may grow on fur to act as camouflage. Large claws to cling to trees. The sloth goes to the toilet on the forest floor-but this is dangerous with predators around; they have a very large bladder, this permits them to store large amounts of waste- restricting their time on the ground.
Tree frog	Red-eyed tree frogs have cup-like footpads that enable them to spend their days clinging to leaves in the rainforest canopy. When the frog closes its eyes, its green eyelids help it to blend in with the leafy environment. When sleeping they will also tuck their bright feet under their body to camouflage against predators.
Flying squirrel	Flying squirrels have a flap of skin between their front and back legs, called a patagium, which allows them to glide from tree to tree. Gliding helps them conserve energy in the humid, warm climate. They are a nocturnal animal to try to avoid daytime predators. They also have very large eyes that help them see in the dark.
Toucan	They have adapted fruit eaters as their long and light beaks make it easy to reach fruit on the trees from those branches also where standing is not possible. They can adjust blood circulation to the beak to control their temperature by means of managed warmth loss, so they don't overheat in its tropical habitat.

Many tribes (indigenous populations) have developed sustainable ways of survival. The rainforest provides inhabitants with; Food through hunting and gathering. Natural medicines from forest plants. Homes and boats from forest wood. They use slash and burn agriculture and shifting cultivation to allow the rainforest to recover from human use.

Issues related to biodiversity

Keystone species (a species that are important of other species) are extremely important in the rainforest ecosystem. Humans are threatening these vital components. Decline in species could cause tribes being unable to survive. Plants & animals may become extinct. Key medical plants may become extinct.

Case study: The Brazilian Rainforest

Brazil is located in South America. It is the fifth largest country in the world and contains the largest area of tropical rainforest. The tropical rainforest of Brazil, as in other countries, is being exploited in two ways:

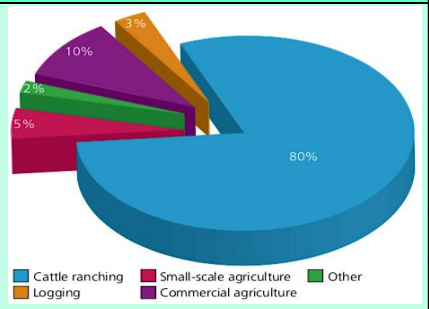
- By using its resources, such as timber, water and minerals
- By clearing the forest to make way for other activities , such as growing crops and rearing livestock

Causes of deforestation in Brazil

You may be surprised that the figure for logging is so small. Logging is the first step in the conversion of forest land to other uses So it is the eventual use the cleared land is put to that is recorded in the pie chart.

Large areas of the Amazon rainforest have been cleared to make way for livestock rearing The rearing of cattle is believed to account for 80% of the tropical rainforest destruction in Brazil.

However, the land cannot be used for long. The quality of the pasture quickly declines. The cattle farmers then have to move on and destroy more rainforest to create new cattle pastures.



Logging

- Most widely reported cause of destructions to biodiversity.
- Timber is harvested to create **commercial items** such as furniture and paper.
- **Violent confrontation** between indigenous tribes and logging companies.

Agriculture

- Large scale **'slash and burn'** of land for ranches and palm oil.
- Increases **carbon emission**.
- **River saltation** and **soil erosion** increasing due to the large areas of **exposed land.**
- Increase in **palm oil** is making the **soil infertile**.

Mineral Extraction

- **Precious metals** are found in the rainforest.
- Areas **mined** can experience **soil and water contamination**.
- **Indigenous people** are becoming **displaced** from their land due to roads being built to transport products.

Tourism

- **Mass tourism** is resulting in the building of hotels in extremely **vulnerable areas**.
- Lead to **negative relationship** between the government and indigenous tribes
- Tourism has **exposed animals** to human **diseases.**

Energy Development

- The **high rainfall** creates ideal conditions for **hydro-electric power (HEP).**

Road Building

- **Roads** are needed to bring supplies and **provide access** to new mining areas, settlements and energy projects.
- Logging companies use an **extensive network of roads** for heavy machinery

Impacts of deforestation

Global impacts

Global warming	The tree canopy absorbs carbon dioxide in the atmosphere. This stops, of course, as soon as the trees are felled and more carbon dioxide remains in the air. Also, fire is often used in clearing rainforests, which means that the carbon stored in the wood returns to the atmosphere. In these ways, deforestation is a main contributor to the greenhouse effect, which is a cause of the global warming.
Loss of biodiversity	Clearing tropical rainforests means that: the biodiversity will be reduced, and individual species will become endangered and then possibly extinct. It has been estimated that 137 plant, animal and insect species are being lost every single day due to rainforest deforestation. That amounts to 50,000 species a year. As the rainforest species disappear, so do many possible cures for life-threatening diseases.

National impacts

Economic development	Brazil has transitioned from an LIC to a NEE, as a result of exploiting the rainforest. This has lifted many people out of poverty. + Mining, farming and logging creates employment and tax income for government. + Products such as palm oil provide valuable income for countries. - The loss of biodiversity will reduce tourism.

Local impacts

Soil erosion	As soon as any part of the forest cover is cleared, the thin topsoil is quickly removed by heavy rainfall. Bare slopes are particularly prone to soil erosion. Once the topsoil has been removed, there is little hope of anything growing again. Grazing and plantations do little or nothing to keep the soil fertile. The decline in soil fertility leads to pastures and plantations being abandoned.
River pollution	Gold mining uses mercury to separate the gold from the ground is allowed to enter the rivers. Fish are poisoned, as well as people & animals. Rivers are also being polluted by soil erosion.
Decline of indigenous tribes	Not all Brazilians are benefitting from this exploitation of the rainforest resources. Most obviously, indigenous tribes have a traditional way of life that is closely geared to the resources of the natural forest. There are now only around 240 tribes left, compared with over 330 in 1900. Many indigenous people have been forced out of the rainforest by: the construction of roads, logging, the creation of ranches, plantations, reservoirs and mines.
Conflicts	Disputes between indigenous people and loggers and other developers of the rainforest often end in open conflict. People have conflicting views about the rainforest, for example, between conservationists and developers.
Local climate change	Deforestation disrupts the water cycle. With the felling of trees, evapotranspiration is reduced, and so too the return of moisture to the atmosphere. The local climate becomes drier.

Value of the rainforest

The resources and opportunities offered by the tropical rainforest or any other biome or ecosystem are more widely known as goods and services. Goods are things that can be obtained directly from the rainforest. Services are benefits that the rainforest can offer people and the environment

Goods	• Native food crops (fruit & nuts) • Wild meat and fish • Building materials (timber) • Energy from HEP (hydro-electric power) • Water • Medicines
Services	• Air purification (absorbing C02) • Water and nutrient cycling • Protection against soil erosion • Wildlife habitats • Biodiversity • Employment opportunities • Carbon sinks

Sustainability in the rainforest

Uncontrolled and unchecked exploitation can cause irreversible damage such as loss of biodiversity, soil erosion and climate change.

Conservation	means that natural resources such as timber can still be used, but must be used sustainably.
Protection	means that the environment should be untouched and humans should not interfere, so ecosystems can find their own balance.

Sustainable strategies in the rainforest

Selective logging	This involves only felling trees when they are fully grown, and letting younger trees mature and continue protecting the ground from erosion. It involves a cycle lasting between 30 and 40 years. A project in Brazil has shown that it is possible to recreate a forest cover almost like the original. Nearly a third of areas selectively logged are cleared completely within 4 years as roads allow access for illegal logging.
Afforestation	This is where areas that are felled are replanted with new trees. This means that there will be trees for people to use in the future .In Brazil, a project known as REGUA collected seeds from the surviving rainforest and planted them in areas that had been previously cleared. This resulted in the rainforest growing back. Disadvantages are that it takes a long time to grow trees. Also it's important that the same types of tree are planted so that the species is kept for the future.
Ecotourism	Countries like Costa Rica, Belize and Malaysia have promoted their forests for ecotourism. Ecotourism aims to introduce people to the natural world, to benefit local communities and protect the environment for the future. Through income generated by ecotourism, local people and governments benefit from retaining and protecting their rainforest. However, this strategy is small scale, and often more expensive for tourists.
Conservation & education	Rainforests can be preserved in conservation areas, such as national parks or nature reserves. These areas can be used for education, scientific research and tourism. Recently large international businesses have supported conservation projects in exchange for carrying out scientific research or the provision of raw materials. Charities (NGOs) such as the WWF and Fauna and Flora are also interested in helping protecting the tropical rainforest. They promote the conservation message through education programmes, provide training for conservation workers, and buy up threatened areas and create nature reserves. A biosphere reserve is a way of protecting part of the rainforest by leaving it untouched except for research and plant breeding. The protected core area is surrounded by a buffer zone in which only certain activities are allowed. A lodge can be built within to educate tourists. However, does everyone value education and conservation over short term economic gain?
International agreements	Rainforests are now understood to be of global importance. They absorb carbon dioxide from the atmosphere, releasing oxygen and maintaining levels of humidity. International agreements have been made to protect the resources and biodiversity of rainforest. The international tropical timber agreement (2006) restricts the trade in hardwoods. The very high prices gained from trading hardwoods has encouraged a large amount of illegal felling. This agreement restricts the trade of hardwood to sustainable managed forest and all timber has to be marked with a registration number. The CITIES treaty blocks the illegal trade in rare and endangered animals and plants.
Debt reduction	Some countries have borrowed money from overseas aid in the form of loans to fund developments. To pay off these debts some have raised money from massive deforestation programmes. Most countries with tropical rainforests are NEEs or LICs. Schemes known as debt for nature swaps are sometimes arranged. In 2010 for example the USA signed an agreement to convert a Brazilian debt of £13.5 million into a fund to protect large areas of tropical rainforest. These swaps are all part of what is know more widely as debt reduction, where some high-income countries (HICs) agree to write off the debts of some poor LICs.

There are, however, some problems. For example:

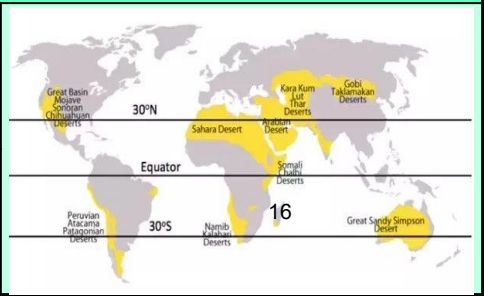
- Few governments are willing to do anything that might slow down the rate of economic development. Citizens expect or want better living standards rather than new nature reserves.
- Governments seem unwilling to enforce and monitor laws aimed at protecting or conserving the rainforest.
- There is a lot of corruption in the way rainforests are treated, for instance by illegal loggers and developers paying bribes.

Hot deserts

Most of the world's hot deserts are found in the subtropics between 20 and 30° north & south of the Equator. The Tropics of Cancer and Capricorn run through most of the worlds major deserts.

Aridity – hot deserts are extremely dry, with annual rainfall below 250 mm. **Heat** – hot deserts rise over 40°c. **Landscapes** – Some places have dunes, but most are rocky with thorny bushes.

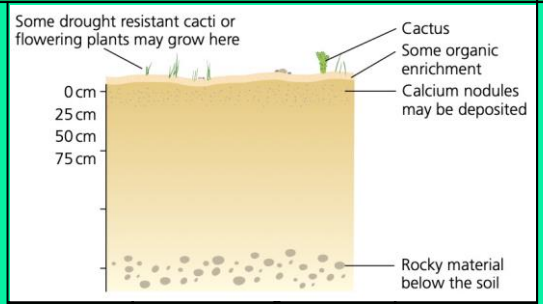
Hot deserts are areas of **high pressure systems**; lack of clouds means it can get very hot during the day, but cold during the night. They have a high diurnal temperature range.



Hot desert soils

In hot climates, soil-forming processes are limited by the shortage of water and vegetation. There may be little organic content due to the lack of vegetation growing there. These sandy, rocky soils are typically around one metre deep, although in some places, wind action builds tall dunes where deeper soils can potentially develop.

Sand dunes should not be classified as soils if there is no organic matter present there at all. Some desert soils are potentially very fertile because important nutrients for plant growth, such as calcium, have not been leached away over time. Once irrigated, the land can become highly productive for agriculture.



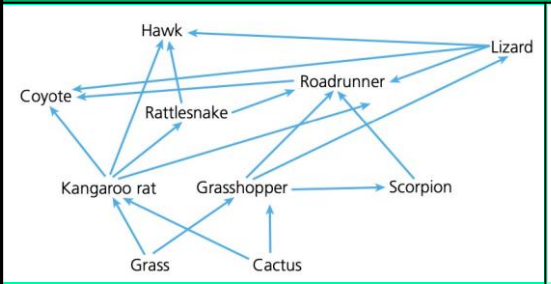
Group	Number of Species	Group	Number of Species
Mammal	56	Plant Species	1700
Birds	400	Mosses	60
Reptiles	36	Lichens	195

Hot desert Interdependence

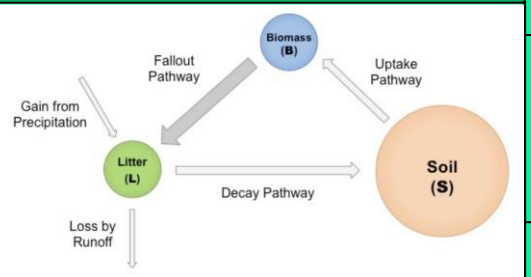
The biotic and abiotic components of an ecosystem are interdependent. Living or 'biotic' creatures play an important role in maintaining a healthy environment (the 'abiotic' parts) and vice versa. Abiotic components of hot deserts include the soil, underlying rocks and water supplies. The **interdependency** between different biotic and abiotic parts of hot deserts is shown by:

- links between different parts of the food web (animals eating plants that have gained nutrients from soils and water, for example)
- the role that vegetation roots play in stabilising sandy soils in semi-arid areas at the edges of deserts. The plants stop the soil from being blown away by the wind. The destruction of desert vegetation sometimes triggers a process called desertification.
- Increasingly unsustainable human use of deserts threatens the interdependence between the physical environment and people.
- The fragility of hot deserts is an important issue affecting biodiversity.

Interdependence



A simplified food web for part of the Western Desert



Large proportion of nutrients in soil due to lack of biomass. Slow transfer due to arid conditions (except biomass to litter)

Hot desert adaptations

How have humans adapted to the hot desert?

- People often live in large open tents to keep cool.
- Food is often cooked slowly in the warm sandy soil.
- Head scarves are worn by people to provide protection from the Sun.
- Often sleep during the hottest part of the day and sometimes work at night when it's cooler

Houses:
- had flat roofs to help collect rainwater
- were small, to reduce sunlight and keep temperatures low inside
- had whitewashed walls to reflect sunlight and keep buildings cool, a tradition which continues today

Plant adaptations

Cactus	Large roots (tap roots) to absorb water soon after rainfall. Needles instead of leaves to reduce surface area and therefore water loss through transpiration. Succulent (stores water). Waxy skin to reduce water loss.
Joshua tree	Needle-like leaves with waxy resin to to reduce water loss through transpiration. Roots can reach up to about 1m in diameter and can develop bulbs deep in the soil to store water.
Tumbleweed	They break away from its roots and are blown about by the wind- this way they can disperse their seeds! Flat desert terrain makes it easy for them to travel. When the desert rains come, seeds that have been previously dispersed begin to grow at a very rapid rate. During the short-wet season these tumbleweeds can pop up all over the place.

Animal adaptations

Camel	Wide feet for walking on the sand and long muscular legs for walking. The hooves have a broad, flat leathery pad so that when the camel walks, the pads spread out and prevent the feet from burying into the hot sand. They have an extremely long large intestine that absorbs every last drop of water from the foods they eat. On a long trip, the fat in their hump(s) will break down to supply their body with the energy it needs. By the end of a difficult trip, their humps may lay over on their side, emptied of the fat that filled them. They have long eyelashes and thin, slit nostrils that they can close to protect them from blowing sand.
Jerboa	The Jerboa is a small rodent. They don't need to drink water! They get all their moisture from their food, mostly plants and insects. By using burrowing systems, the jerboa can escape the extreme heat or cold. Its short forearms and powerful hind legs are made for digging, and it has folds of skin that can close off their nostrils to sand, as well as special hairs to keep sand from getting in its ears. They are nocturnal to avoid the heat and predators.
Lizard	The thorny devil has possibly the most unique way to consume water, the thorny devil drinks by placing its leg in water or walk through dewy plants to get water on its back, then moving its mouth up and down which pumps water through the grooves in-between its spikes until eventually getting to the mouth.

Case study: The Western Desert, USA

The Western Desert region is made up of three hot deserts in the USA: The Mojave Desert, The Sonoran Desert And The Chihuahuan Desert

The Western Desert's indigenous people are made up of many cultural groups. Arizona is home to Navajo people, and the Havasupai people live by the Grand Canyon, which is a spiritually significant place for some indigenous peoples. The Sonoran Desert's Cocopah Tribe, also known as the River People, settled by the Colorado River centuries ago. People of European descent first began to migrate into this region in the 1800s.

Opportunities in The Western Desert, USA

Farming	High temperatures and sunlight are generally favourable for agriculture, provided water can be found for irrigation. Two important sources of irrigation water are: Aquifers (permeable rocks) and canals. Aquifer based farming in California's Coachella Valley produces lush crops of vegetables, lemons, peppers and grapes (and in turn, a wine industry). most canals are used for large-scale industrialised agriculture. Farmers are allocated 80 per cent of Colorado water, even though they make up just 10 per cent of the economy.
Tourism	As US society has grown to have more money and leisure time, tourism has become the Western Desert's most important source of income: The national parks offer visitors a chance to experience a wilderness area. Important areas include the Grand Canyon and California's Joshua Tree National Park. The entire economy of Las Vegas is built around entertainment, attracting 37 million visitors per year. Two major lakes have been created as part of water management projects: Lake Mead and Lake Powell. Combined, they attract two million visitors a year and offer sailing, power boating, water-skiing and fishing.
Mineral extraction	The Western Desert states are rich in minerals, including copper, uranium, lead, zinc and coal. Not all these opportunities have been exploited, due to possible conflicts with other land uses, like tourism and farming. A plan for uranium mining near the Grand Canyon, Arizona was recently halted due to a campaign by the Havasupai people. As uranium is used in nuclear power plants, they were concerned about the risk to wildlife and endangered species, and the contamination of water supplies. Copper mining has taken place for centuries in the Sonoran Desert.
Energy	The strong isolation in desert regions, provides a fantastic opportunity for solar power. The entire Western Desert region is predicted to benefit from the construction of new solar power plants. The Sonoran Solar Project in Arizona is a new solar power power plant project that will ultimately produce energy for 100,000 homes and requires 360 workers to help build it. Hydroelectric power plant also supply Western Desert communities with some of their electricity. These are powered by water leaving Lake Mead. At the peak of its construction in the mid 1930s, the Hoover Dam employed 5,000 people. Fossil fuels bring opportunities to the Western Desert too. People have been drilling for oil in Arizona since 1905. Today, there are 25 active oil production sites, all of which are on land owned by the Navajo people. Since 1998, the Navajo Nation Oil and Gas company (NNOGC) has exploited this economic opportunity for the benefit of local Navajo people. More than 100 employees work to produce oil worth US$50 million.

Challenges in The Western Desert, USA

Inaccessibility	In the Western Desert, the relatively low density population has resulted in a lack of surfaced roads through the desert. Accessibility is thus severely limited in areas of Nevada north of Las Vegas. Tourists and explorers must find their own way. Even where roads are rough tracks have been provided, the extreme temperatures, make this a dangerous place if your car breaks down.	**Solutions/ adaptations**	Accessibility is less of a challenge than it used to be. By the late 1800s, railroad developers moved in, their choice of sites for stations influenced the growth of future key settlements. Soon after the first saloon bars, shops and hotels were built. Better roads were laid in the 1900s. Soon people were driving through the desert in buses or their own cars. Major cities can now be reached directly by air. Las Vegas airport receives over 40 million people annually.
Extreme temperatures	High temperatures lead to high rates of evaporation and water shortages. Work outside is very hard, especially for farmers who have to work during the day. While the average temperature in the Western Desert is around 27°C, summer temperatures can soar above 50°c! Salinisation can occur- which is toxic to plants.		19th and early 20th century migrants quickly adapted to the climate too. Before the arrival of air conditioning and improved water supplies, their houses: Had flat roofs to help collect rainwater . Were small, to reduce sunlight and keep temperatures low inside. Had whitewashed walls to reflect sunlight and keep buildings cool, a tradition which continues today. Outdoors, they wore wide-brimmed cowboy hats to prevent sunburn.
Lack of water	For the Western Desert water transfer, particularly from the Colorado River. This scheme has supplied drinking water and irrigation since the Hoover Dam was constructed in 1935. Piped water now supplies homes, farms and even golf courses. Water supply could be a major problem in the future as demand sores in cities such as Phoenix, Arizona. Temperatures are also forecast to rise as a result of climate change, further affecting water supply.		In 1935, work began on the hoover dam, which stores the equivalent of two years river flow in lake mead. The glen canyon dam was then built in 1963. Together the two dams and their reservoirs smooth out the Colorado' s flow through the year and remove its flood peaks and bring additional benefits. Reservoir water is piped along aqueducts, including the US$4 billion central Arizona project. Where required it feeds the homes, farms and golf courses of the Western Desert. The water transfer has brought many benefits but also costs. n total more than 1.4 million acres of irrigated land produces about 13% Of the USA's livestock.

Desertification

The process by which fertile land becomes desert, typically as a result of drought, deforestation, inappropriate agriculture or climate change. Some of the causes are:

Deforestation	People rely on wood for fuel and for building. This removal of trees causes the soil to be exposed.
Climate change	Reduce rainfall and rising temperatures have meant less water for plants.
Over grazing	Too many animals mean plants are eaten faster than they can grow back. Causing soil erosion. Compaction of the soil by hooves also prevents the soil recharging its moisture when it rains.

Population increase	A growing population puts pressure on the land leading to more deforestation, overgrazing and over-cultivation.
Overcultivation	If crops are grown in the same areas too often, nutrients in the soil will be used up causing soil erosion.
Soil erosion	Over cultivation and overgrazing both result in soil erosion. If vegetation has been eaten by cattle or killed by drought, the exposed topsoil becomes baked hard by sunlight. When it finally arrives intense rain washes over the soil rather than soaking into the ground. As it flows it carried the topsoil away. Once the soil has eroded, it becomes impossible for the vegetation to grow back.
Conflict	Sudan's Darfur region has been hit by conflict since 2003, killing 250,000 people and making around 3 million homeless. Previously the environment was already under pressure; One year out of every five bring drought, crop failure and livestock loss to Sudan. The Sahel's ability to produce food has not kept pace with its growing population. The environment has played a major role in creating conflict. In 2003 nomadic cattle herders and settled farmers began to fight over water supplies and land. Herders were deliberately prevented from reaching water sources by farmers which led to overgrazing. Once the vegetation was gone their cattle died.

Strategies to reduce the risk of desertification

	Description	Advantages	Disadvantages
Appropriate technology	The Upesi stove is a natural ceramic stove and is 35-50% more efficient than the three-stone stove. They are made locally using more available materials like clay, and much smaller amounts of wood and charcoal. Some also have a thermocouple, generating sufficient electricity from the heat to charge a mobile phone- which growing numbers of Sahel farmers own to gain access to weather forecasts.	They key to their success is that the stoves can be made locally using more available materials like clay, and much smaller amounts of wood and charcoal. Parents can teach their children how to make the stoves Some stove designs also have a thermocouple which generates enough electricity from the heat to charge a mobile phone.	Requires initial investment from a charity to teach their construction Sometimes materials to make the stoves may not be easy to come by. Still requires the chopping down of trees 
Low stone walls	One successful strategy introduced in the Sahel countries of Mali and Burkina Faso is the construction of low stone walls called bunds. The stones are planted in line parallel to the slope gradient. They help to prevent soil erosion, and slow down the flow of rainwater over the baked ground. When water pools behind a bund instead of running fast over the land, it has time to soak into the ground.	Doesn't require advanced education to build these low-lying walls. Knowledge can be passed down generations. Effective and cheap, resources can be found freely around the landscape 	What is the correct resources cannot be found locally? People may not be able to afford them to buy... Relies on rainfall! Something desert regions to not receive a lot of! (less than 250mm annually)

Strategies to reduce the risk of desertification

	Description	Advantages	Disadvantages
Planting trees	Tree roots can help to stabilise soil, while their decomposing leaf litter adds valuable nutrients. This makes the planting of trees a practical way to tackle desertification. The African Union's 'Green Wall' is a plan to plant a wall of trees across the entire Sahel. Once complete, the Great Green Wall will be the largest living structure on the planet, 3 times the size of the Great Barrier Reef.	Trees bind soil together (preventing erosion) and the leaves add nutrients back into the soil. It offers hope for sustainable development among communities The project will generate work for desperately poor communities in all the Sahel countries it will help bring about political co-operation in the region. This might reduce conflict and the number of refugee camps, which unfortunately contribute to desertification. Huge media campaign- alerting the world to the issues surrounding desertification.	It will be decades before the Green Wall reaches maturity, trees take a long time to grow Climate change projections suggest increased aridity may threaten the survival of the trees in the long term. Investment needed if trees cannot be sourced locally

Better land management	The majority of the 50 million people who live in the Sahel region suffer from poverty. Niger is losing 250,000 hectares of farmland every year through desertification. Women in some villages now walk as far as 25 kilometres a day to fetch water for their families. But a range of land management measures can help to preserve soil quality and water supplies such as: Planting grass on slopes to help stabilise the top soil, learning more effective agricultural methods and collecting rainwater on roofs by designing a flat roof with a surrounding lip. Deep Bed Farming involves first using a pickaxe to break up hard compacted layers of earth several inches under the ground, which are prevalent across large areas of Malawi.	Knowledge of effective agricultural practices can be passed down generations – sustainable. Creates resilient communities working together, no handouts given. Greater crop yields- almost double! No nutrients lost Doesn't require advanced machinery or advanced levels of education   	Requires start up funding/ initial investment from a charity/ organisation. Some indigenous people may not be willing to give up traditional farming practices, ingrained in their cultures and ancestry. Soils can be so infertile, no matter the agricultural practice, it may not be usable or be able to be rejuvenated.

History Knowledge organiser Cycle 3 – The Civil Rights Movement

Overview: With the end of the American Civil War in 1865, Abraham Lincoln made slavery illegal. This did not end the racist attitudes that existed, especially in the southern states where they used to enslaved people. Black people's rights were initially denied them by the **Jim Crow Laws** that enforced **segregation,** and then by the continuing racist attitudes. Big advances came in the 1950s and 60s with important changes made, however racism continues to be a problem, as shown by events such as the **George Floyd** murder in 2020

Timeline of key events

Date	Event
1861-65	American Civil War – **slavery** made illegal at the end
May 1954	Brown Vs Board of Education court ruling – said that **segregation** in schools was illegal and had to end.
25th Aug 1955	Murder of **Emmett Till**
1st Dec 1955	**Rosa Parks** bus protest – led to the **boycott** of buses
4th Sep 1957	Little Rock Nine – Nine students including Elizabeth Eckford become the first black students to be **integrated** into a formerly segregated school.
28th Aug 1963	March on Washington '**I have a dream**' speech.
2nd July 1964	**Civil Rights** Act signed – gave black and white citizens legal equality.
4th April 1968	**Martin Luther King** assassinated
11th April 1968	**Civil Rights** Act signed by President Johnson – helped end differences in housing for black and white families.
15th July 2013	#BlackLivesMatter used for the first time on twitter
2020	Murder of **George Floyd** sparks the Black Lives Matter protests across the world.

Key terms

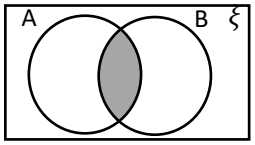
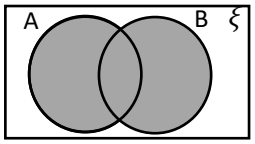
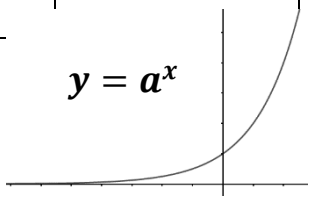
Key Word	Definition
slavery	The state of being enslaved (not free)
abolition	To bring something to an end
segregation	The system that kept black and white people separate in the southern states of USA
boycott	Refusing to use a service or buy from a shop/business as a way of protesting. E.g. The bus **boycotts** – people refused to travel by bus so the company lost money.
civil rights	The rights of citizens to social and political equality
civil disobedience	Breaking the laws that you disagree with on purpose as a way of protesting.
integration	Ending **segregation** – allowing black people to mix freely. E.g. ending separate schools for black and white children.
lynching	The brutal, public murders of black people by white mobs (large groups). This was often done by hanging from trees.
Jim Crow Laws	The laws that made **segregation** legal in the southern states of the USA
Ku Klux Klan	**White supremacist** group who used violence and murder to intimidate African Americans.
white supremacy	The belief that white people are better than black people.

Important people

Emmet till 	14-year-old who was lynched in 1955 after being accused of offending a white woman.	**Elizabeth Eckford** 	One of the Little Rock Nine – a group of nine students who when to a formerly segregated school. A famous photo of Eckford shows white protesters screaming abuse at her
Rosa parks 	American activist in the civil rights movement renowned for bus boycott. She refused to give up her seat for a white passenger	**Malcom X** 	A key civil rights leader. He influenced the Black Panthers, a group who were prepared to use violence to gain **civil rights** for African Americans
Martin Luther King Jr 	Spokesperson and leader in the civil rights movement from 1955 until his assassination in 1968. Gave the famous **'I have a dream'** speech	**George Floyd** 	An African American, murdered by a US policeman in 2020 during his arrest. His death and the trial of the policeman that followed cause a world wide focus on fighting racism

EDUCATION SOUTH WEST

Y9C3 Maths Key knowledge

Item	Description
$A \cap B$	A **'and'** B. Represented by: 
$A \cup B$	A 'union' B (or A 'or' B). Represented by: 
Similar	Shapes with the same angles but different side lengths. **Similar shapes are enlargements of each other.**
Congruent	Shapes with the same angles and side lengths. **Congruent shapes are identical.**
Scale factor	The multiplier that links side lengths of one shape to another. Also called the Length scale factor
Area scale factor	Found by calculating $\boldsymbol{Length\ Scale\ Factor^2}$
Volume scale factor	Found by calculating $\boldsymbol{Length\ Scale\ Factor^3}$
Transformation	There are 4 transformations at GCSE. They are **Rotation**, **Reflection**, **Transformation**, & **Enlargement**
Describe fully	Command words that are asking for all information about a transformation **including the name**. <table><tr><th>Rotation</th><th>Reflection</th><th>Transformation</th><th>Enlargement</th></tr><tr><td>• Angle • Direction • Centre of rotation</td><td>• Mirror line</td><td>• Vector $\begin{pmatrix} x \\ y \end{pmatrix}$</td><td>• Centre of enlargement • Scale factor</td></tr></table>
Exponential curve	A common graph shape. The equation has x as a power. Found a lot in nature and science. 
Speed	$\boldsymbol{Average\ speed = \frac{distance}{time}}$
Speed	The gradient of a distance time graph.
Elevations	2D views of the different sides of a 3D object.
Plan view	The top down/birds eye view of a 3D object.

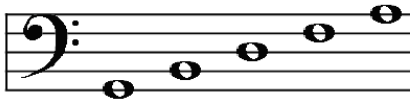
Y9 C1 - C3 End of Year KO C1 Blues, C2 – Motifs Minimalism & Gaming Music, C3 – What Makes a Good Song?

BASS CLEF & BASS CLEF NOTATION

BASS CLEF is a symbol used to show **low**-pitched notes on the stave. It is used by low instruments that play the **BASS LINE**

Notes on the **LINES** of the **BASS CLEF**: **G, B, D, F, A**

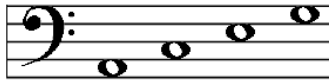
Green **B**uses **D**rive **F**ast **A**lways



G B D F A

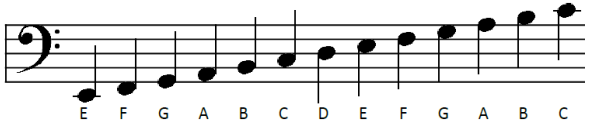
Notes in the **SPACES** of the **BASS CLEF: A, C, E, G**

All **C**ows **E**at **G**rass



A C E G

Bass Clef **STAFF NOTATION**:



E F G A B C D E F G A B C

COMMON INSTRUMENTS USED IN BLUES/JAZZ/REGGAE (BC = USES BASS CLEF)

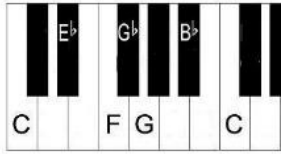
						
Voice	**Guitar**	**Drum Kit**	**Trumpet**	**Trombone (BC)**	**Piano (LH uses BC)**	**Double Bass/Bass Guitar (BC)**

Blues Features & Key Words

THE TWELVE BAR BLUES IN C

This is a common **chord sequence** used in Blues, Jazz and Rock n Roll. It is 12 bars long and uses chords I, IV and V.

CHORD C	CHORD C	CHORD C	CHORD C
CHORD F	CHORD F	CHORD C	CHORD C
CHORD G	CHORD F	CHORD C	CHORD C



BLUES SCALE – a series of notes often used for IMPROVISING in blues, jazz and Rock'n'roll. **Blues Scale in C - C, Eb, F, Gb, Bb, C**

BLUES - a genre of music from the slave era in America which has African music influence. Key features include slow tempo, improvisation and melancholy lyrics.

MORE COMMON KEY WORDS

RIFF/OSTINATO – Short, repeated musical patterns
IMPROVISATION – music created 'on the spot'
CHORD – 3 or more notes played together
TRIAD- 3-note chord (root (1), third and fifth). **C** = C, E, G (triad) *play one, miss one, play one*
7th Chord – a triad that has an added note 7 notes above the root eg **C7** = C, E, G, Bb

How to build a chord

ALWAYS START AT THE BOTTOM (root) & BUILD UP

The **root** of the chord is shown by the **chord name**. e.g. the **Chord C** has the root note **C** and the **chord G** has the root note G etc.
Once you know the root you can build your chord like this -
Use this phrase to build from the root

Play 1, Miss 1, Play 1, Miss 1, Play1

Y9 C2 Gaming Music & C3 What Makes & Good Song

Early Computer and Video Game Music

Early video game music consisted primarily of **SOUND EFFECTS** (an artificially created or enhanced sound used to emphasize certain actions in computer and video games), **CHIPTUNES** or **8-BIT MUSIC.SAMPLING** (the technique of digitally encoding music or sound and reusing it as part of a composition or recording) began in the 1980's allowing sound to be played during the game, making it more realistic and less "synthetic-sounding".

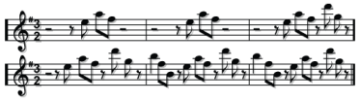
Koji Kondo *Super Mario Bros. (1985) The Legend of Zelda (1986*

How Computer and Video Game Music is used within a Game

Music within a computer or video game is often used for **CUES** (knowing when a significant event was about to occur).

Video game music is often heard over a game's title screen (called the **GROUND THEME**), options menu and bonus content as well as during the entire gameplay. Music can be used to **INCREASE TENSION AND SUSPENSE** *e.g. during battles and chases*, when the player must make a decision within the game (a **DECISION MOTIF**) and can change, depending on a player's actions or situation *e.g. indicating missing actions or "pick-ups"*.

Features of Minimalism



CELLS or **MOTIFS** – short simple ideas.

Use of **REPETITION** – also called **LOOPING**.

LAYERED TEXTURES BUIDING IN A PIECE

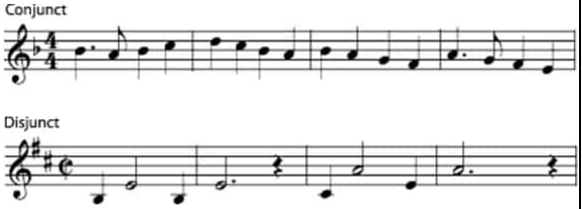
GRADUAL CHANGES OVER TIME

PHASE SHIFT (PHASE IN/OUT) – when two or more motifs or cells begin in **UNISON (together)** and gradually become "out of sync" with each other through displacement, either forwards or backwards.

Character Themes in Computer and Video Game Music

Characters within a video game can also have their own **CHARACTER THEMES** or **CHARACTER MOTIFS** – like **LEITMOTIFS** within Film Music. These can be manipulated, altered and changed – adapting the elements of music – **ORCHESTRATION** (the act of arranging a piece of music for an orchestra and assigning parts to the different musical instruments)**, TIMBRE, SONORITY, TEXTURE, PITCH, TEMPO, DYNAMICS** – depending on the character's situation or different places they travel to within the game

Conjunct and Disjunct Melodic Motion



CONJUNCT MELODIC MOTION – Melodies which move mainly by step or use notes which are next to or close to one another.

DISJUNCT MELODIC MOTION – Melodies which move mainly by leap or use notes which are not next to or close to one another.

MELODIC RANGE – The distance between the lowest and highest pitched notes in a melody.

What Makes a Good Song Keywords

LYRICS – The words of a song, usually consisting of **VERSES** and a **CHORUS**.

HOOK – A 'musical hook' is usually the 'catchy bit' of the song that you will remember. It is often short and used and repeated in different places throughout the piece. Hooks can be either **MELODIC, RHYTHMIC** or **VERBAL/LYRICAL**.

RIFF – A repeated musical pattern often used in the introduction and instrumental breaks in a song or piece of music

MELODY – The main tune of the song often sung by the **LEAD SINGER**.

COUNTER-MELODY – An 'extra' melody often performed 'on top of' the main melody

TEXTURE – The layers that make up a song *e.g., Melody, Counter-Melody, Hooks/Riffs, Chords, Accompaniment, Bass Line.*

SONG STRUCTURE – Intro. Verse, pre-chorus, chorus, middle 8, outro

Pop Bands often feature a **DRUM KIT** and **PERCUSSION** to provide the rhythm along with **ELECTRIC GUITARS** (**LEAD GUITAR, RHYTHM GUITAR** and **BASS GUITAR)** and **KEYBOARDS**. Sometimes **ACOUSTIC INSTRUMENTS** are used such as the **PIANO** or **ACOUSTIC GUITAR**. **ORCHESTRAL INSTRUMENTS** are often found in pop songs such as the **STRINGS**, **SAXOPHONE, TROMBONE** and **TRUMPET.** Singers are essential to a pop song - **LEAD SINGER** – Often the "frontline" member of the band (most famous) who sings most of the melody line to the song. **BACKING SINGERS** support the lead singer provmakeiding **HARMONY** or a **COUNTER-MELODY** (a melody that is often higher in pitch and different, but still 'fits with' the main melody) and do not sing all the time but just at certain points within a pop song e.g. in the chorus.

Year 9 RPE Cycle 3: Religion, peace & conflict

Violence & violent protest

Christianity teaches non-violence, as Jesus said ***"Blessed are the peacemakers"*** and told others to turn the other cheek in the face of violence. Christians are told to love their enemies and love each other. However, God gave humans **free will** and choice and sometimes non-violent protest is ignored, so violence may be used to force change for the common good.

Islam means **peace** and Muslims should act in a peaceful manner, but violence may be used in self-defence. Muslims have a duty to protest about anything unfair and in the UK we have seen protests over wars and issues in the Middle East, what is perceived as **Islamophobia**, **terrorism** and **racism** issues.

Just War & Holy war

Holy war = it is right to fight in the name of God
Just war = It is right to fight in the interests of justice & the greater good

For **Muslims** a holy war is a just war. There are rules for how Muslims should fight a war ibn the Qur'an. A jihad may only be fought as a last resort and must never be against a Muslim nation.

St Paul said Christians should obey their rulers, who had been given power by God. St Augustine was the first to try to write a set of rules regarding this, and eventually the just war rules were written in detail by St Thomas Aquinas. ***Sometimes if you do not fight, you allow a greater evil to happen than a war would have caused, so you have to fight***.

Peace & justice

Justice = fairness; **Peace** = to live in harmony & without fear
Christians will fight for justice under the conditions of **The just war theory**. Whilst God desires peace, He also desires that humans should live in justice and freedom.

Forgiveness & reconciliation

Reconciliation = making up between two groups after a disagreement

"To be a Christian means to forgive the inexcusable, because God has forgiven the inexcusable in you" ~ C.S. Lewis

"Forgive seventy times seven" ~ Jesus

"Love your enemies, and pray for those who persecute you" ~ Jesus

Pacifism

Pacifists believe that all violence is morally wrong. They will not participate in any war, regardless of the reasons for that war. An example of a pacifist Christian group is **The Quakers.**
Conscientious objectors are people who refuse to participate directly in fighting wars on the grounds of conscience. However they will assist in non-military ways such as medics, relief work and mediators. Many believe they have a peace-keeping role.

The Church of England accepts the **just war theory** and sees wars as **necessary** in certain conditions, especially in situations where wars are waged to fight injustice.

Buddhism is a pacifistic religion. **The Five precepts** demand a pacifistic approach to life. **The Dalai Lama** said that ***"Peace can exist if everyone respects all others".***

"Mutual respect for and tolerance of those with different faiths and beliefs and for those without faith"

WMD

Weapons of mass destruction are capable of killing & maiming large groups of people. These weaons are considered unjust because they kill civilians. Some religious believers accept the existence of nuclear weapons as a deterrent.

The Roman Catholic Church does not agree with the use of WMD but thinks they are acceptable as a deterrent.

The Quaker Society **utterly condemn** WMD. They are pacifists, and no outward weapons are acceptable. WMD are indiscriminate and beyond control.

Religion & peace making

Christianity teaches to ***"love your neighbour"*** and Islam means **peace** if both of these teaching were adhered to then there would be peace. Religious groups are regularly involved in peace-keeping in war torn areas and in negotiations to prevent wars happening.

On occasions people have claimed that religion is the cause of war. For example, some fundamentalist groups such as ISIS believe that an Islamic State needs to be created.

Sometimes even with all the best efforts, religion cannot keep peace because there are overriding factors, such as the craving for power, the need to react or attack or to join allies to protect others.

Year 9 RPE: The Holocaust

The Holocaust did not start with the gas chambers and the mass killings. It started with hate speech, prejudice and discrimination. It is important that we understand the definitions of these key terms so that we can explain how the Nazi regime used words and propaganda to disseminate (spread) hate; creating prejudice and intolerance against the Jewish people, which ultimately resulted in the deaths of six million Jewish men, women and children.

A Right is something that you are entitled to have or do (the right to a fair trial)

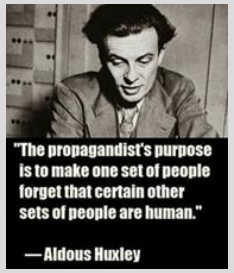
Human rights guarantee people the means necessary to satisfy their basic needs, such as food, housing, and education, so they can take full advantage of all opportunities.

By guaranteeing freedom, equality, and security, **human rights** protect people against prejudice, discrimination, persecution and oppression

A freedom is being able to think and say what you want and act how you want (freedom of expression)

Propaganda

Propaganda is information or messages, that may be biased or misleading, used to promote a point of view and persuade people to think and behave in a certain way



Prejudice means judging someone or having an idea about them before you actually know anything about them and is not based on reason or actual experience. Prejudice can lead to discrimination.

Discrimination is when a person or group of people is treated unfairly compared to others. Most commonly, discrimination h appens because of one's sex, religion, nationality, ethnicity, race, or another personal characteristic.

A personal characteristic is a quality (non-physical) or appearance (physical) that an individual has e.g. sexuality, race, religion

Persecution is hostility, ill-treatment towards an individual or group.

Dehumanisation is the process of depriving a person or group of positive human qualities

Year 9: The Holocaust

What was the Holocaust?

The Holocaust was the murder of approximately six million Jewish men, women and children by Nazi Germany and its collaborators during the Second World War.

The Nazis also persecuted people from other minority groups. These groups included Roma (sometimes referred to as 'Gypsies'), people with disabilities, political opponents, homosexuals, Black people, Jehovah's Witnesses and others.

However, Jewish people "*were the only group that the Nazis sought to destroy entirely*". This is why we have the phrase 'The Holocaust' to describe what happened to Jewish people during the Second World War.

Key Words

Shema

A prayer used by Jews maintaining belief in one God

Mitzvot

Jewish religious laws, good deeds or duties

Shabbat

Jewish name for the holy day also known as the Sabbath

Torah

Jewish Books of the Law

Anti-Semitism

Hostility to or prejudice against Jewish people

Ghetto

A part of a town or city which is especially poor, where a racial group live

What Tactics Did The Nazis Use Against The Jews?

Deception – Jews were told they were going to 'resettlement areas' when they were actually being taken to concentration or death camps.

Terror – The SS publicly shot Jews for smuggling food or any act of resistance.

Starvation – The Jews in the Warsaw Ghetto were only fed 500-1000 calories a day. Hungry people are easier to control!

Who Is Kitty Hart-Moxon?

Kitty Hart-Moxon, OBE is a Polish-English Holocaust survivor. She was sent to the Auschwitz-Birkenau death camp in 1943 at age 16, where she survived for two years, and was also imprisoned. For many years Kitty has been speaking in schools, universities, colleges and to the general public, in the UK and abroad to educate others about the camps by sharing her experiences.

What Was The Warsaw Ghetto Uprising?

In January 1943, the Nazis started a second round of deportations of Jews from the Warsaw Ghetto to the death camps.
Some Jews formed the Jewish Military League and Jewish Combat Organisation and together they began to fight back against the Nazis.
The Ghetto fighters held out for nearly a month but the Nazis crushed the resistance and the fighters were either shot or deported to the death camps.

Infectious Disease

Keywords

Communicable disease - disease caused by pathogens that can be passed from one organism to another.

Pathogens - microorganisms that cause disease.

Non - communicable disease - are not infectious and cannot be passed from one organism to another.

Types of pathogen that make us ill

Bacteria – reproduce and release toxins
Virus – invade our cells, reproduce and cause the cell to burst
Fungi – grow and penetrate our skin, causing disease
Protists – single cell eukaryotes (no nucleus)

How pathogens cause disease

Bacteria – reproduce rapidly by splitting in two (binary fission). May produce toxins or damage cells directly.

Viruses – live and reproduce inside host cells, damaging and destroying them.

Common symptoms – high temperature, headache, rash.

How pathogens are spread

Water – drinking contaminated water, e.g. water infected with cholera (a bacterial infection) or fungal spores in splashes of water spread plant diseases.
Direct contact – transfer of pathogens by touching an infected organism.
Air – pathogens transferred through the air, often in droplets in humans from sneezing or coughing. Fungal spores also spread through the air.

Examples of Diseases

Disease	Caused by	Symptoms	Treatment/Prevention
Measles	Virus	Red skin rash & fever	Vaccination
HIV	Virus	Flu-like symptoms. Long term the body cannot fight other infections.	Antiretroviral drugs
Tobacco mosaic virus (TMV)	Virus	Mosaic pattern on plant leaves. Photosynthesis is inhibited.	
Rose black spot	Fungus	Purple or black spots on rose plant leaves. Photosynthesis is inhibited.	Fungicides. Cutting off the infected leaves.
Malaria	Protist Spread by mosquitos	Fever.	Protection from mosquito bites (nets and insecticides).
Salmonella	Bacteria from contaminated food.	Fever, stomach cramps, vomiting, diarrhoea	Poultry is vaccinated against Salmonella. Cook food properly.
Gonorrhoea	Bacteria A STD.	Pain when urinating. Discharge from penis or vagina.	Antibiotics. Using barrier methods of contraception.

Reducing Spread of Disease

Hygiene – washing hands before cooking and after sneezing.
Killing vectors – Insects that carry diseases are called vectors. Killing them or destroying their habitats can prevent the spread of disease.
Isolating infected people – prevents them passing the disease to anyone else.
Vaccination – the person cannot become infected and pass it on. Animals can also be vaccinated.

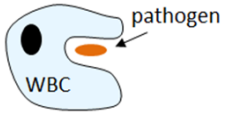
Fighting Disease

Non-specific defences

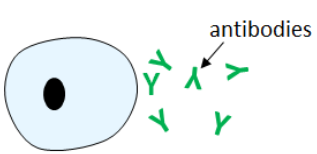
Skin - physical barrier. It also secretes antimicrobial substances to kill pathogenic bacteria. If you cut or damage skin, platelets help form a clot that dries to form a scab.
Nose hairs & mucus – traps pathogens
Trachea and bronchi – secrete mucus to trap pathogens. Cilia lining the tubes beat to waft the mucus up to the back of the throat.
Stomach acid - (hydrochloric) acid kills pathogens in mucus you swallow or take in through food and drink.

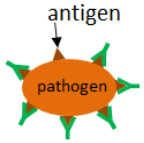
Immune System

1. White blood cells **engulf** pathogens and digest them.



2. White blood cells **produce specific antibodies** that bind to antigens on a pathogen. If the person gets infected with the same pathogen in the future, WBCs produce the antibodies rapidly and in larger quantities so the person does not feel ill – they are immune.





3. White blood cells release **antitoxins** to destroy toxins released by pathogens.

Vaccination

- An inactive or dead pathogen is injected into a person's bloodstream.
- This stimulates their white blood cells to release specifically shaped antibodies that lock on to the antigen and destroy the pathogen.
- If the person is infected with the real pathogen in the future, memory cells rapidly release antibodies in much larger quantities so the person does not feel ill.

Herd immunity

If a large proportion of the population is immune to a disease, the spread of the pathogen in the population is very much reduced and the disease may even disappear. The WHO want 95% of children to have two doses of measles vaccine to give global herd immunity. Current global figures show that 85% of children get the first dose and 56% get the second.

Antibiotic Resistance

1. You start taking an antibiotic.
2. Some bacteria are susceptible to the antibiotic (killed by it).
3. Some bacteria have a random **mutation** (change in the DNA), that makes them **resistant** to an antibiotic.
4. The antibiotics kill the susceptible bacteria but not the mutated resistant strain.
At this point, you may start to feel better and stop taking the antibiotic.
5. The **resistant bacteria will reproduce** as they have less competition for resources, increasing their population.
6. A resistant strain emerges that is very difficult to treat.

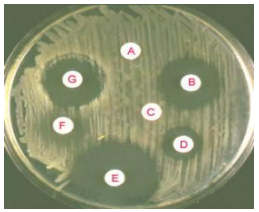
To help prevent the development of antibiotic resistant bacteria doctors should **not over-prescrib**e antibiotics and we should **finish the whole course**.
MRSA is an example of an antibiotic resistant bacteria.

Drugs

Painkillers reduce symptoms of a disease – aspirin, paracetamol

Antibiotics work inside your body to kill bacteria – penicillin.
Antibiotics **do not kill viruses** as they reproduce inside body cells.

Some antibiotics kill a wide range of bacteria whilst others are very specific.



Discovering drugs

Traditionally drugs were extracted from plants and microorganisms.
• The heart drug digitalis originates from foxgloves.
• The painkiller aspirin originates from willow.
• Penicillin was discovered by Alexander Fleming from the *Penicillium* mould.

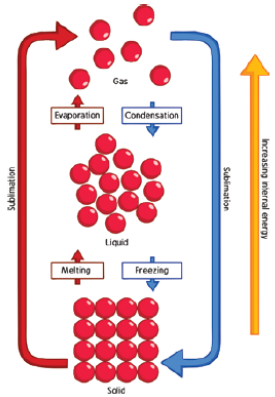
Developing new drugs

New drugs must be:
1. Effective 2. Safe 3. Stable
4. Successfully taken into and removed from your body.

Stages of Drug Development

1. **Research**
   - researchers target a disease and make many possible new drugs.
2. **Preclinical testing**
   - test drugs on **human cell & tissues** in a lab for toxicity and efficacy. Many drugs fail at this stage.
   - Test on **live animals** to check the drug works on a whole living organism to predict how they may behave in humans.
   - Gain information about doses and side effects.

AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter



The three states of matter are **solid, liquid and gas**.

For a substance to change from one state to another, **energy** must be **transferred**.

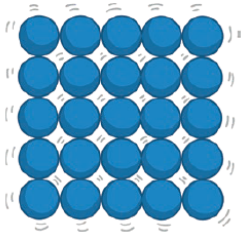
The particles gain energy. This results in the breaking of some of the **attractive forces** between particles during melting.

To evaporate or boil a liquid, more energy is needed to overcome the remaining chemical bonds between the particles.

Note the difference between **boiling** and **evaporation**. When a liquid **evaporates**, particles **leave the surface** of the liquid **only**. When a liquid **boils**, **bubbles** of gas form **throughout** the liquid before rising to the surface and escaping.

The amount of energy needed for a substance to change state is dependent upon the **strength** of the **attractive forces** between particles. The **stronger** the **forces of attraction**, the **more energy** needed to **break them apart**. Substances that have strong attractive forces between particles generally have **higher melting and boiling points**.

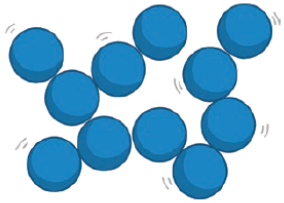
Solid



The particles in a **solid** are arranged in a regular pattern. The particles in a solid **vibrate** in a fixed position and are tightly packed together. The particles in a solid have a **low amount of kinetic energy**.

Solids have a **fixed shape** and are unable to flow like liquids. The particles **cannot be compressed** because the particles are very close together.

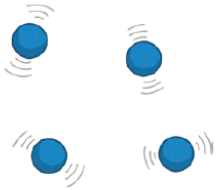
Liquid



The particles in a **liquid** are randomly arranged. The particles in a liquid are able to **move around** each other. The particles in a liquid have a **greater amount** of **kinetic energy** than particles in a **solid**.

Liquids are able to **flow** and can take the shape of the container that they are placed in. As with a solid, liquids **cannot be compressed** because the particles are close together.

Gas



The particles in a **gas** are randomly arranged. The particles in a gas are able to **move around very quickly** in all directions. Of the three states of matter, gas particles have the **highest amount** of **kinetic energy**.

Gases, like liquids, are able to **flow** and can fill the container that they are placed in. The particles in a gas are **far apart** from one another which allows the particles to move in any direction.

Gases can be **compressed**; when squashed, the particles have empty space to move into.

Limitations of the Particle Model (HT only)

The chemical bonds between particles are not represented in the diagrams above.

Particles are represented as solid spheres – this is not the case. Particles like atoms are mostly empty space. Particles are not always spherical in nature.

State Symbols

In chemical equations, the three states of matter are represented as symbols:

solid **(s)**
liquid **(l)**
gas **(g)**
aqueous **(aq)**

Aqueous solutions are those that are formed when a substance is dissolved in water.

Identifying the Physical State of a Substance

If the given temperature of a substance is **lower** than the **melting point**, the physical state of the substance will be **solid**.

If the given temperature of the substance is **between** the **melting point and boiling point**, the substance will be a **liquid**.

If the given temperature of the substance is **higher** than the **boiling point**, the substance will be a **gas**.

AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter

Formation of Ions

Ions are charged particle. They can be either positively or negatively charged, for example Na^+ or Cl^-.

When an element loses or gains electrons, it becomes an ion.

Metals **lose** electrons to become **positively charged**.

Non-metals **gain** electrons to become **negatively charged**.

Group 1 and 2 elements **lose** electrons and group 6 and 7 elements **gain** electrons.

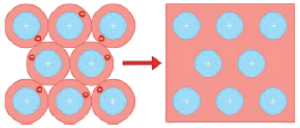
Group	Ions	Element Example
1	+1	$Li \rightarrow Li^+ + e^-$
2	+2	$Ca \rightarrow Ca^{2+} + 2e^-$
6	-2	$Br + e^- \rightarrow Br^-$
7	-1	$O + 2e^- \rightarrow O^{2-}$

Metals and Non-metals

Metals are found on the **left-hand side** of the **periodic table**. Metals are strong, shiny, malleable and good conductors of heat and electricity. On the other hand, non-metals are brittle, dull, not always solids at room temperature and poor conductors of heat and electricity. **Non-metals** are found on the **right-hand side** of the **periodic table**.

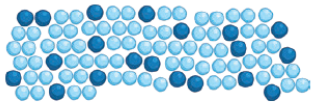
Metallic Bonding

Metallic bonding occurs between **metals only**. Positive metal ions are surrounded by a **sea of delocalised electrons**. The ions are tightly packed and arranged in rows.



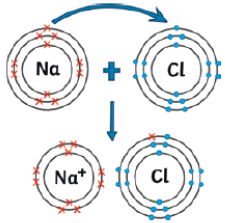
There are strong electrostatic forces of attraction between the positive metal ions and negatively charged electrons.

Pure metals are too soft for many uses and are often mixed with other metals to make alloys. The mixture of the metals introduces different-sized metal atoms. This **distorts the layers** and **prevents them from sliding over one another**. This makes it harder for alloys to be bent and shaped like pure metals.



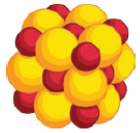
Ionic Bonding

Ionic bonding occurs between a metal and a non-metal. Metals lose electrons to become positively charged. Opposite charges are attracted by electrostatic forces – an ionic bond.



Ionic Compounds

Ionic compounds form structures called giant lattices. There are **strong electrostatic forces of attraction** that **act in all directions** and act between the **oppositely charged ions** that make up the giant ionic lattice.



Properties of Ionic Compounds

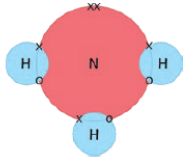
- High melting point – lots of energy needed to overcome the electrostatic forces of attraction.
- High boiling point
- **Cannot conduct electricity** in a **solid** as the ions are not free to move.
- Ionic compounds, when **molten** or in **solution**, can **conduct electricity** as the ions are free to move and can carry the electrical current.

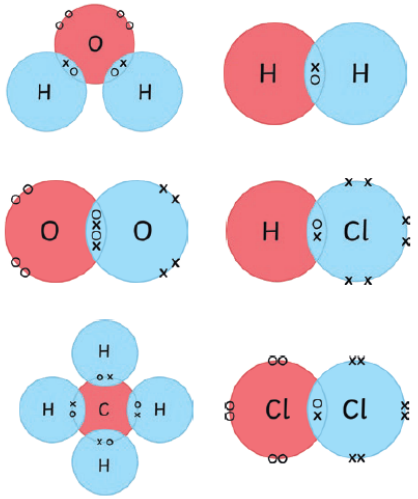
Covalent Bonding

Covalent bonding is the sharing of a pair of electrons between atoms to gain a full outer shell. This occurs between **non-metals only**. Simple covalent bonding occurs between the molecules below. Simple covalent structures have **low melting and boiling points** – this is because the **weak intermolecular forces** that hold the molecules together break when a substance is heated, not the strong covalent bonds between atoms. They **do not conduct electricity** as they do not have any free delocalised electrons.

Dot and cross diagrams are useful to show the **bonding** in **simple molecules**. The **outer electron shell** of each atom is represented as a **circle**, the circles from each atom overlap to show where there is a **covalent bond**, and the electrons from each atom are either drawn as **dots or crosses**. There are **two different types** of **dot and cross diagram** – one with a circle to represent the outer electron shell and one without.

You should be able to draw the dot and cross diagrams for the following simple covalent structures: chlorine, oxygen, nitrogen, water, ammonia, hydrogen chloride and methane.

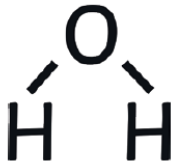




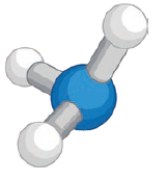
AQA GCSE Chemistry (Combined Science) Unit 2: Bonding, Structure and Properties of Matter

Structural Formulae

In this type of diagram, the element symbol represents the type of atom and the straight line represents the covalent bonding between each atom.

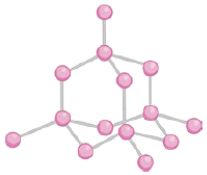


The structure of small molecules can also be represented as a 3D model.

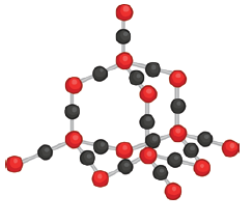


Giant Covalent Structure – Diamond

Each **carbon** atom is **bonded** to **four** other carbon atoms, making diamond very strong. Diamond has a high melting and boiling point. **Large** amounts of **energy** are needed to break the strong covalent bonds between each carbon atom. Diamond **does not conduct** electricity because it has **no free electrons**.

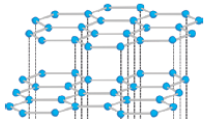


Silicon dioxide (silicon and oxygen atoms) has a similar structure to that of diamond, in that its atoms are held together by **strong covalent bonds**. Large amounts of energy are needed to break the strong covalent bonds therefore silicon dioxide, like diamond, has a high melting and boiling point.



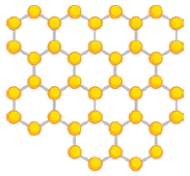
Giant Covalent Structure – Graphite

Graphite is made up of layers of **carbon** arranged in **hexagons**. Each carbon is bonded to **three** other carbons and has **one free delocalised electron** that is able to move between the layers. The layers are held together by weak intermolecular forces. The layers of carbon can slide over each other easily as there are no strong covalent bonds between the layers. Graphite has a high melting point because a lot of energy is needed to break the covalent bonds between the carbon atoms. Graphite can **conduct** electricity.



Giant Covalent Structure – Graphene

Graphene is one layer of graphite. It is very **strong** because of the covalent bonds between the carbon atoms. As with graphite, each carbon in graphene is bonded to three others with one **free delocalised electron**. Graphene is able to **conduct electricity**. Graphene, when added to other materials, can make them even stronger. Useful in electricals and composites.



Nanoscience

Nanoscience refers to structures that are **1–100nm** in size, of the order of a few hundred atoms. Nanoparticles have a **high surface area to volume ratio**. This means that smaller amounts are needed in comparison to normal sized particles. As the side length of a cube decreases by a factor of 10, the surface area to volume ratio increases approximately

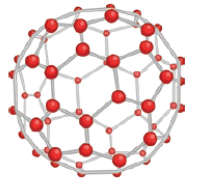
Name of Particle	Diameter
nanoparticle	1–100nm
fine particles ($PM_{2.5}$)	100–2500nm
coarse particles (PM_{10})	2500–10000nm

Polymers

Polymers are long chain molecules that are made up of many smaller units called **monomers**. Atoms in a polymer chain are held together by **strong covalent bonds**. Between polymer molecules, there are **intermolecular forces**. Intermolecular forces **attract** polymer chains towards each other. Longer polymer chains have stronger forces of attraction than shorter ones therefore making stronger materials.

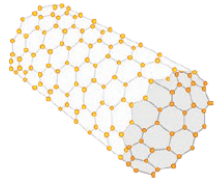
Fullerenes and Nanotubes

Molecules of carbon that are shaped like hollow tubes or balls, arranged in hexagons of five or seven carbon atoms. They can be used to **deliver drugs into the body**.



Buckminsterfullerene has the formula C_{60}

Carbon Nanotubes are tiny carbon cylinders that are very long compared to their width. Nanotubes can conduct electricity as well as strengthening materials without adding much weight. The properties of carbon nanotubes make them useful in electronics and nanotechnology.



Possible Risks of Nanoparticles

As nanoparticles are so **small**, it makes it possible for them to be inhaled and enter the lungs. Once inside the body, nanoparticles may **initiate harmful reactions** and toxic substances could bind to them because of their large surface area to volume ratio. Nanoparticles have many applications. These include medicine, cosmetics, sun creams and deodorants. They can also be used as catalysts.

Modern nanoparticles are a relatively new phenomenon therefore it is difficult for scientists to truly determine the risks associated with them.

AQA GCSE Chemistry (Combined) Unit 5 Energy Changes Knowledge Organiser

Exothermic and Endothermic Reactions

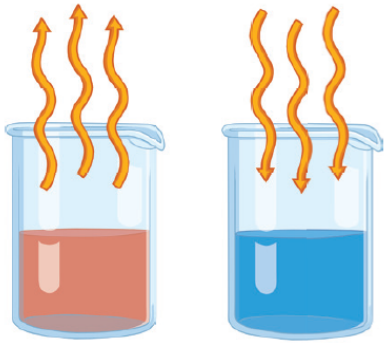
When a chemical reaction takes place, **energy** is involved. Energy is transferred when chemical **bonds are broken** and when new **bonds are made.**

Exothermic reactions are those which involve the transfer of energy **from the reacting chemicals to** the surroundings. During a practical investigation, an exothermic reaction would show an i**ncrease in temperature** as the reaction takes place.

Examples of exothermic reactions include **combustion, respiration and neutralisation** reactions. Hand-warmers and self-heating cans are examples of everyday exothermic reactions.

Endothermic reactions are those which involve the transfer of energy **from the surroundings to** the reacting chemicals. During a practical investigation, an endothermic reaction would show a **decrease in temperature** as the reaction takes place.

Examples of endothermic reactions include the **thermal decomposition** of calcium carbonate.



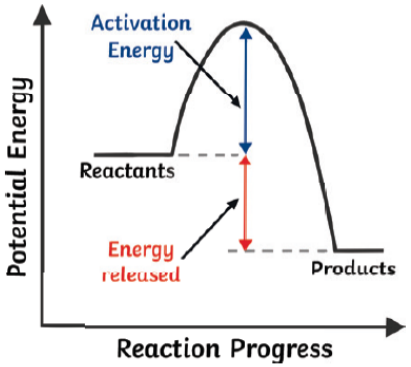
Eating **sherbet** is an everyday example of an endothermic reaction. When the sherbet dissolves in the saliva in your mouth, it produces a cooling effect. Another example is **instant ice packs** that are used to treat sporting injuries.

Reaction Profiles – Exothermic

Energy level diagrams show us what is happening in a particular chemical reaction. The diagram shows us the **difference in energy** between the reactants and the products.

In an exothermic reaction, the **reactants** are at a **higher** energy level than the products.

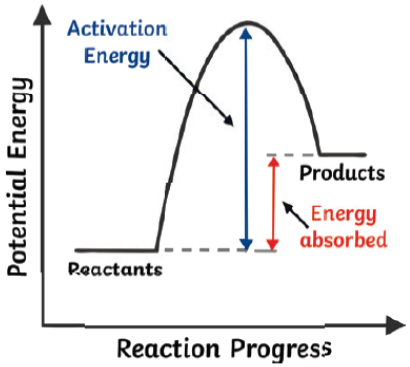
In an **exothermic** reaction, the difference in energy is **released** to the surroundings and so the **temperature** of the surroundings **increases**.



Reaction Profiles – Endothermic

In an **endothermic** reaction, the **reactants** are at a **lower** energy level than the products.

In an **endothermic** reaction, the difference in energy is **absorbed** from the surroundings and so the **temperature** of the surroundings **decreases**.



Activation Energy – the minimum amount of energy required for a chemical reaction to take place.

Catalysts – increase the rate of a reaction. Catalysts provide an alternative pathway for a chemical reaction to take place by **lowering** the activation energy.

Bond Making and Bond Breaking

In an **endothermic** reaction, energy is needed to break chemical bonds. The **energy change (ΔH)** in an endothermic reaction is **positive.**

You may also find, in some textbooks, **ΔH** referred to as the **enthalpy change.**

In an **exothermic** reaction, energy is needed to form chemical bonds. The **energy change (ΔH)** in an exothermic reaction is **negative.**

Bond energies are measured in **kJ/mol.**

Calculations Using Bond Energies (Higher Tier Only)

Bond energies are used to calculate the change in energy of a chemical reaction.

Calculate the change in energy for the reaction: $2H_2O_2 \longrightarrow 2H_2O + O_2$

The first step is to write the symbol equation for the reaction. Once you have done this, work out the bonds that are breaking and the ones that are being made.

H–O–O–H ⟶ H–O–H + O=O

Bond	Bond Energy kJ/mol
H-O	464
O-O	146
O=O	498

On the **left-hand side** of the equation, the **bonds are breaking.**

There are two **O–H** bonds and one **O–O** bond.

So 464 + 146 + 464 = 1074

There are two moles of H_2O_2 therefore the answer needs to be multiplied by two.

So 1074 × 2 = 2148

On the **right-hand** side of the equation, the **bonds are made.**

There are two **H–O** bonds

So 464 + 464 = 928

Two moles of H_2O are made therefore the answer needs to be multiplied by two.

So 928 × 2 = 1856

There is also one **O=O** bond with a bond energy of 498

So 1856 + 498 = 2354

ΔH = sum (bonds broken) – sum (bonds made)

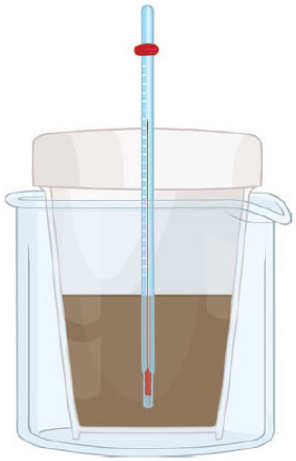
ΔH = 2148 – 2354 = -206 kJ/mol

The reaction is exothermic as ΔH is negative.

Required Practical

Aim

To investigate the variables that affect temperature changes in reacting solutions, e.g. acid plus metals, acid plus carbonates, neutralisations and displacement of metals.



Equipment

- polystyrene cup
- measuring cylinder
- thermometer
- 250cm^3 glass beaker
- measuring cylinder
- top pan balance

Method

1. Gather the equipment.
2. Place the polystyrene cup inside the beaker. This will prevent the cup from falling over.
3. Using a measuring cylinder, measure out 30cm^3 of the acid. Different acids such as hydrochloric or sulfuric acid may be used. Pour this into the polystyrene cup.
4. Record the temperature of the acid using a thermometer.
5. Using a top pan balance, measure out an appropriate amount of the solid (for example, 10g) or use one strip of a metal such as magnesium.
6. Add the solid to the acid and record the temperature. You may choose to record the temperature of the acid and metal every minute for 10 minutes.

AQA GCSE Chemistry (Combined Science) Unit 9: Chemistry of the Atmosphere

The Early Atmosphere

Approximately **4.6 billion years ago** the Earth was formed. Scientists have lots of ideas and **theories** about how the atmosphere was produced and the gases within it, but due to the lack of evidence, they cannot be sure.

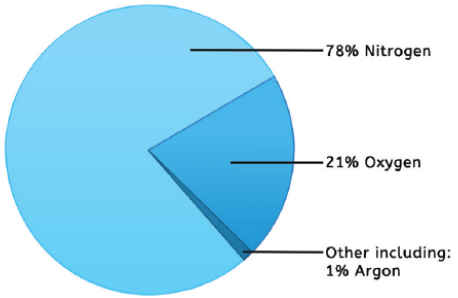
One theory suggested that **intense volcanic activity** released gases that made **Earth's early atmosphere** very similar to that of Mars and Venus. These planet's atmospheres mainly consist of carbon dioxide with little oxygen.

Nitrogen gas would have also been released from volcanoes and would have built up in the atmosphere.

Water vapour in Earth's early atmosphere would have **condensed** to create the **seas and oceans**. Carbon dioxide would have dissolved into the water, decreasing the level in the atmosphere.

Percentage of Gases in the Atmosphere

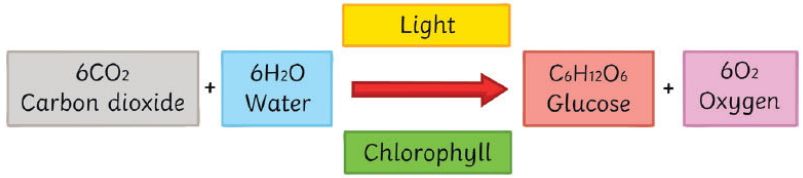
The pie chart below shows the abundance of each gas in our atmosphere.



How Did the Levels of Oxygen Increase?

2.7 billion years ago, algae first produced oxygen. Gradually over time, the levels of oxygen in our atmosphere increased as plants evolved. This was followed by animals as the levels of oxygen increased to a level that would sustain more complex life.

Oxygen is produced by plants in the process of **photosynthesis**.



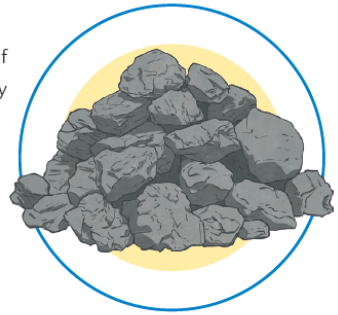
How Did the Levels of Carbon Dioxide Decrease?

Carbon dioxide **dissolves** in water. As water vapour condensed and the oceans and seas formed, the carbon dioxide gas dissolved producing **carbonate compounds**. This process reduced the amount of carbon dioxide in the atmosphere. Carbonate compounds were then **precipitated**: limestone is an example of a sedimentary rock; it has the chemical name calcium carbonate.

Plants in the oceans absorbed **carbon dioxide** gas for **photosynthesis**. The organisms from the food chains that the plants supported were turned into fossil fuels. **Fossil fuels** are **non-renewable** and consist of **coal, crude oil, and gas**, all of which contain carbon.

Crude oil was formed millions of years ago. When aquatic plants and animals died, they fell to the bottom of the sea and got trapped under layers of sand and mud. Over time, the organisms got buried deeper below the surface. The **heat and pressure** rose, turning the remains of the organisms into crude oil or natural gas. Oxidation did not occur due to the lack of oxygen.

Coal is a fossil fuel formed from **giant plants** that lived hundreds of millions of years ago in swamp-like forests. When these plants died, they sank to the bottom of the swamp where dirt and water began to pile on top of them. Over time, pressure and heat increased and the plant remains underwent chemical and physical changes. The oxygen was pushed out and all that remained was coal.



The Human Impact and the Greenhouse Effect

Scientists believe that human activities have resulted in the **increased** amount of greenhouse gases in the atmosphere. Activities such as **farming cattle** and **farming rice** release huge amounts of **methane** into the atmosphere.

Burning **fossil fuels** in cars and power stations releases large amounts of **carbon dioxide**. With large areas of the rainforest being cut down through **deforestation**, the excess carbon dioxide is not being absorbed by photosynthesis.

However, not everyone believes that humans are causing the rise in greenhouse gases. Some believe that the rise in global temperatures is associated with cycles of climate change and natural factors.

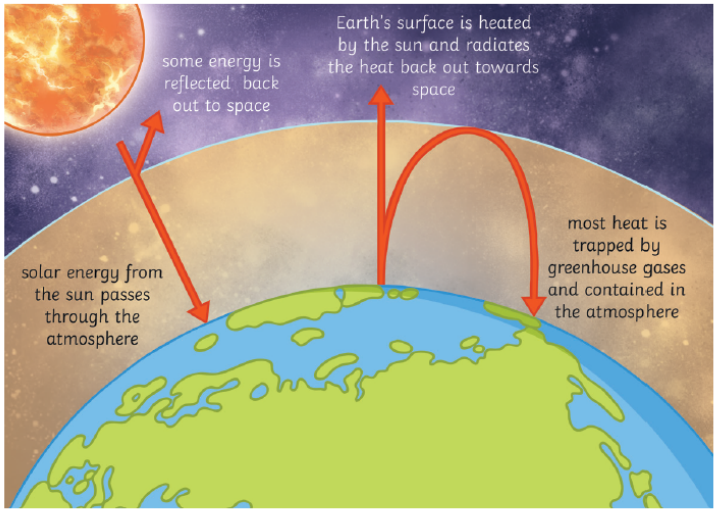
Climate science is often complicated as there are **difficulties** associated with **predicting future global temperatures**. The media present information that can be biased, inaccurate or lacks substantial evidence.

After reading an article on global warming, consider the trustworthiness of the source by considering these factors:

- Is the research done by an expert in that field and do they have the right skills and qualifications to report on the issue?
- Which organisation is reporting the evidence? If it is a newspaper, some stories are sensationalised in order to sell papers.
- Was the research funded by a legitimate organisation and was it conducted in a non-biased way? Think about the methods that were used to obtain the data and the impact the collection and analysis of this data had on the overall result.

AQA GCSE Chemistry (Combined Science) Unit 9: Chemistry of the Atmosphere

The Greenhouse Effect



A greenhouse is a house made of glass and is commonly used by gardeners to help grow plants and keep them warm. As the sun shines through the greenhouse, the air is heated up and becomes trapped by the glass and is prevented from escaping. During daylight, a greenhouse stays quite warm and this lasts into the night.

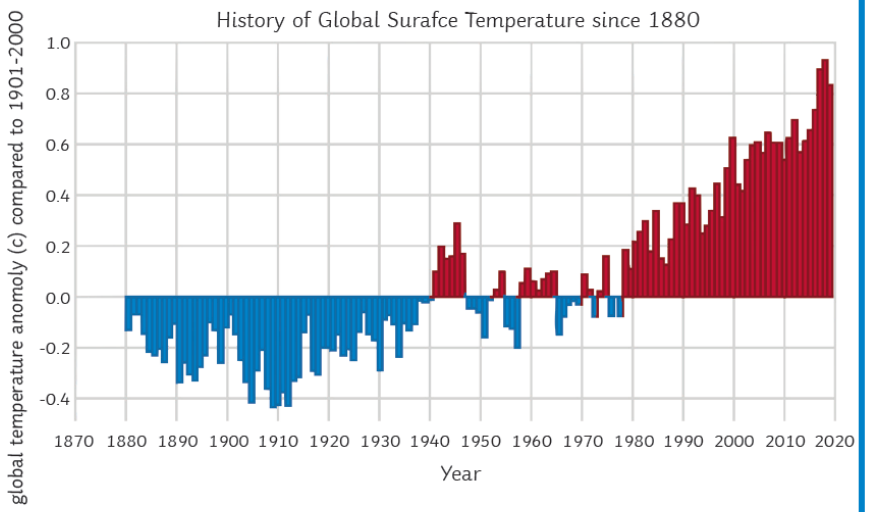
The earth and its atmosphere are very similar to that of a greenhouse. The greenhouse gases in the atmosphere trap the heat and keep the earth warm. The main greenhouse gases are **carbon dioxide**, **water vapour and methane**. During the daylight, the sun warms up the earth's surface. During the night, as the earth begins to cool and release the heat back into the atmosphere, some of the heat is trapped by the greenhouse gases in the atmosphere.

If the **greenhouse effect** becomes too **strong**, the earth will get too warm and melt the Arctic ice. As we burn more fossil fuels, the levels of **carbon dioxide** and the other greenhouse gases **increase** in our atmosphere which makes the greenhouse effect stronger.

What is the Difference Between Climate Change and Global Warming?

Since the Earth was formed over 4.6 billion years ago, its climate has constantly been changing with several ice ages followed by warmer temperatures. Changes in the Sun's energy reaching the Earth and volcanic eruptions were responsible for the changes until about 200 years ago.

Global warming is different to climate change and is used to explain how the earth's climate has warmed up over the past 200 years. Scientists believe that the warming of the climate is due to the activities of humans.



Carbon Footprint

The carbon footprint is the total amount of **carbon dioxide** and other greenhouse gases emitted over the full life cycle of a product, service or event.

An individual's carbon footprint is a calculation of all the activities that that person has taken part in throughout the year.

These activities might involve flying abroad or **travelling** by bus or rail. Each of which might be powered by petrol or diesel. **Heating a home** in winter by using a gas-powered boiler and using electricity to power lights and electronic devices. **Food** also has a **carbon footprint**, for example, beef and rice produces huge amounts of methane when farmed.

Nitrogen

Nitrogen and oxygen react together to make oxides of nitrogen. This occurs inside a **car engine** where there is a high temperature and pressure. Many compounds can be formed when nitrogen reacts with oxygen. The two that are formed inside a car engine are NO and NO_2.

Nitrogen compounds are grouped together with the general formula NO_x. Nitrogen compounds, along with sulfur dioxide, are also responsible for acid rain.

Compounds of nitrogen oxides react in the atmosphere with ultraviolet light from the sun to produce **photochemical smog**. The smog is most noticeable during the morning and afternoon and occurs mainly in densely populated cities.

The presence of smog can have a **major impact on human health**, particularly to those who suffer with **asthma**.

AQA GCSE Chemistry (Combined Science) Unit 9: Chemistry of the Atmosphere

Combustion

Complete combustion occurs when there is **enough oxygen** for a fuel to burn. A hydrocarbon will react with oxygen to produce carbon dioxide and water.

propane + oxygen ⟶ carbon dioxide + water

$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

Incomplete combustion occurs when there **isn't enough oxygen** for a fuel to burn. The products in this reaction are water and poisonous **carbon monoxide**. Carbon particles (soot) may also be seen.

ethane + oxygen ⟶ carbon monoxide + water

$2C_2H_6 + 5O_2 \longrightarrow 4CO + 6H_2O$

Carbon monoxide is a poisonous gas. It is often called the **silent killer** due to it being colourless and odourless. Carbon monoxide works by binding to the **haemoglobin** in your red blood cells. This prevents them from carrying oxygen to the cells around your body. Carbon monoxide detectors are used to detect levels of the gas in the surrounding air and are often placed near gas-powered boilers to detect gas leaks.

Particulate carbon irritates the lining of the lungs making asthma worse and could cause cancer. **Global dimming** is caused by particulates of carbon blocking out the Sun's rays and may reduce rainfall.

Sulfur Dioxide

Sulfur dioxide is an **atmospheric pollutant**. It is a gas that is produced from the burning of **fossil fuels**. Sulfur dioxide is able to dissolve in rainwater and produces **acid rain**. Acid rain causes damage to forests, kills plants and animals that live in aquatic environments, and damages buildings and statues as the acid rain erodes the stone that they are made from.

sulfur + oxygen ⟶ sulfur dioxide

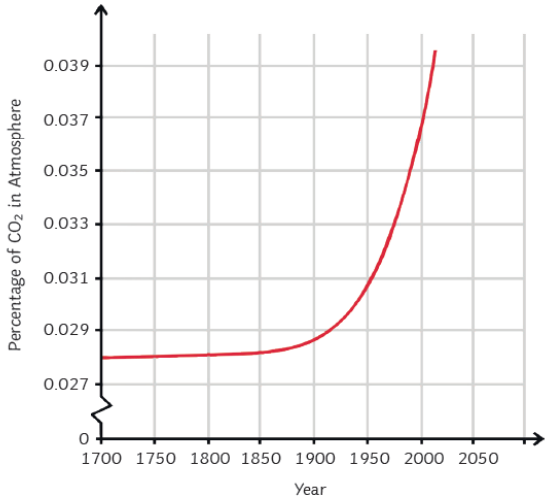
$S + O_2 \longrightarrow SO_2$

Sulfur dioxide can be further oxidised to form sulfur trioxide.

What is the Link Between Carbon Dioxide and Global Warming?

There is a strong correlation between the percentage concentration of carbon dioxide in the atmosphere and increased global temperatures.

The impact of this is that the polar ice caps are melting, sea levels are rising and habitats and rainfall patterns are changing. The impact of which is already being felt around the globe. The consequences of human activity will affect us all.



Electricity – Foundation and Higher

Required Practical

Investigating Resistance in a Wire

Independent variable: length of the wire.

Dependent variable: resistance.

Control variables: type of metal, diameter of the wire.

Conclusion: As the length of the wire increases, the resistance of the wire also increases.

Investigating Series and Parallel Circuits with Resistors

Independent variable: circuit type (series, parallel).

Dependent variable: resistance.

Control variables: number of resistors, type of power source.

Conclusion: Adding resistors in series increases the total resistance of the circuit. In a parallel circuit, the more resistors you add, the smaller the resistance.

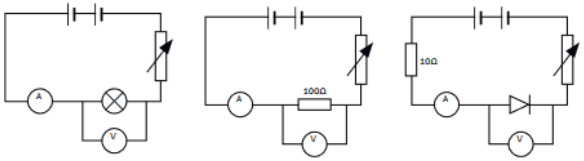
Investigating I-V Relationships in Circuits (Using a filament bulb, ohmic conductor, diode.)

Independent variable: potential difference/volts (V).

Dependent variable: current (A).

Control variable: number of components (e.g. 1 filament bulb, 1 resistor), type of power source.

Set up the circuits as shown below and measure the current and the potential difference.



Draw graphs of the results once collected.

Equations and Maths

Equations

Charge:	$Q = It$
Potential difference:	$V = IR$
Energy transferred:	$E = Pt$
Energy transferred:	$E = QV$
Power:	$P = VI$
Power:	$P = I^2R$

Maths

1kW = 1000W

0.5kW = 500W

Charge

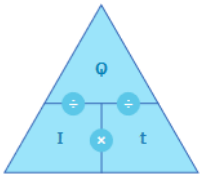
Electric current is the flow of electric charge. It only flows when the circuit is complete.

The **charge** is the current flowing past a point in a given time. Charge is measured in **coulombs (C)**.

Calculating Charge

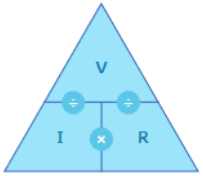
charge flow (C) = current (A) × time (s)

$Q = It$



potential difference = current x resistance

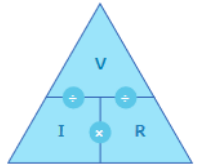
V (V) = I (A) × R (Ω)



Resistance

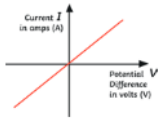
voltage (V) = current (A) × resistance (Ω)

V = IR



Graphs of I-V Characteristics for Components in a Circuit

1. **Ohmic conductor**: the current is directly proportional to the potential difference - it is a straight line (at a constant temperature).



2. **Filament lamp**: as the current increases, so does the temperature. This makes it harder for the current to flow. The graph becomes less steep.

3. **Diode**: current only flows in one direction. The resistance is very high in the other direction which means no current can flow.

Current and Circuit Symbols

Current: the flow of electrical charge.

Potential difference (voltage): the push of electrical charge.

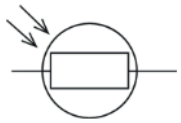
Resistance: slows down the flow of electricity.

cell		closed switch		fuse	
resistor		ammeter	A	LDR	
battery		voltmeter	V	LED	
variable resistor		bulb		thermistor	
open switch		diode			

Electricity – Foundation and Higher

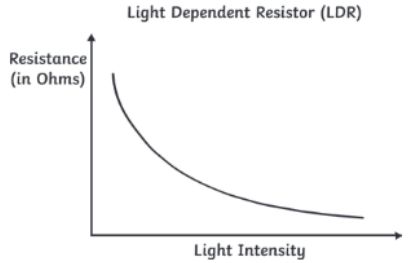
Circuit Devices

LDR – Light Dependent Resistor



An LDR is dependent on light intensity. In bright light the resistance falls and at night the resistance is higher.

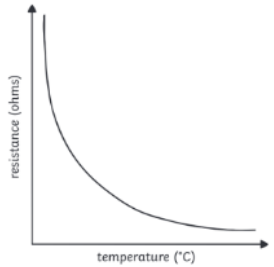
Uses of LDRs: outdoor night lights, burglar detectors.



Thermistor

A thermistor is a temperature dependent resistor. If it is hot, then the resistance is less. If it becomes cold, then the resistance increases.

Uses of thermistors: temperature detectors.



Series and Parallel Circuits

Series Circuits

Once one of the components is broken then all the components will stop working.

Potential difference – the total p.d. of the supply is shared between all the components.

$V_{total} = V_1 + V_2$

Current – wherever the ammeter is placed in a series circuit the reading is the same.

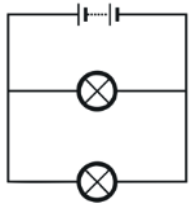
$I_1 = I_2 = I_3$

Resistance – In a series circuit, the resistance will add up to make the total resistance.

$R_{total} = R_1 + R_2$

Parallel Circuits

They are much more common - if one component stops working, it will not affect the others. This means they are more useful.



Potential Difference – this is the same for all components.

$V_1 = V_2$

Current – the total current is the total of all the currents through all the components.

$I_{total} = I_1 + I_2 + I_3$

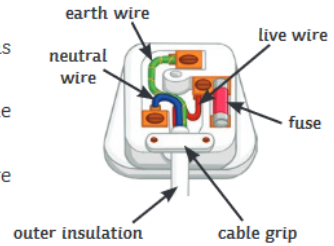
Resistance – adding resistance reduces the total resistance.

Electricity in the Home

AC – alternating current. Constantly changing direction - UK mains supply is 230V and has a frequency of 50 hertz (Hz).

DC – direct current. Supplied by batteries and only flows in one direction.

Cables – most have three wires: live, neutral and earth. They are covered in plastic insulation for safety.



Live wire – provides the potential difference from the mains.

Neutral wire – completes the circuit.

Earth wire – protection. Stops the appliance from becoming live. Carries a current if there is a fault.

Touching the live wire can cause the current to flow through your body. This causes an electric shock.

Energy Transferred – this depends on how long the appliance is on for and its power.

energy transferred (J) = power (W) × time (s) $E = Pt$

Energy is transferred around a circuit when the charge moves.

energy transferred (J) = charge flow (C) × potential difference (V) $E = QV$

power (W) = potential difference (V) × current (A) $P = VI$

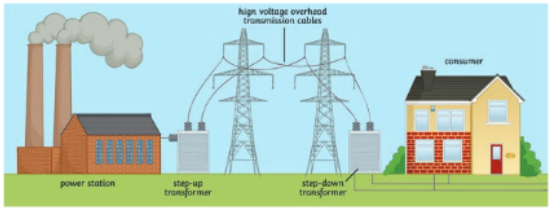
power (W) = current^2 (A) × resistance (Ω) $P = I^2R$

The National Grid

The National Grid is a system of cables and transformers. They transfer electrical power from the power station to where it is needed. Power stations are able to change the amount of electricity that is produced to meet the demands. For example, more energy may be needed in the evenings when people come home from work or school. Electricity is transferred at a low current, but a high voltage so less energy is being lost as it travels through the cables.

Step-up transformers – increase the voltage as the electricity flows through the cables.

Step-down transformers – decrease the potential difference to make it safe.



Year 9 Spanish Learning Cycle 3 Sentence Builder 1:

¿Cómo es Barcelona? = What is Barcelona like?

Place	Verb	Article	Noun	Adjective	Connective	Verb	Location
Barcelona	es = is no es = is not era = was no era = was not será = will be no será = will not be 	una =a	ciudad = city	animada = lively antigua = old bonita = pretty caliente =hot económica = cheap enorme = enormous fea= ugly fresca = fresh/ cool fría = cold histórica = historical ideal = ideal industrial = industrial limpia = clean moderna = modern nueva = new peligrosa = dangerous pobre = poor práctica = practical pura = pure seca = dry sucia = dirty tranquila = peaceful vacía = vacant verde = green mejor (que) = better than peor (que) = worse than NB. All adjectives are feminine to agree with ciudad	y = and pero = but	está en = is (located) in está situada en = is situtated in está cerca de = is near to está lejos de = is far from	España = Spain Cataluña = Catalonia el aire libre = open air la costa = the coast el norte = the north el sur = the south el oeste = the west el este = the east

Year 9 Spanish Learning Cycle 3 Sentence Builder 2:

¿Cómo es Costa Rica? = What is Costa Rica like?

Verb	Place	Connective	Verb	Noun	C'tive	Verb	Verb
Me encanta = I love Me gusta = I like Odio = I hate	Costa Rica	porque = because	hay = there is/are no hay = there isn't/ aren't	un aeropuerto = an airport animales = animals bosques = forests/woods un buen clima = a good climate delitos = crimes desarrollo = development desastres = disasters espacios verdes = green spaces hospitales = hospitals jardines = gardens lagos = lakes mercados = markets montes = hills museos = mountains paisaje = landscape pájaros = birds paro = unemployment parques (nacionales) =(national) parks peligros =dangers pueblos = town/villages puertos = ports restaurantes = restaurants ríos = rivers ruidos = noises silencio = silence tráfico = traffic transporte público = public transport	donde = where	puedo = I can se puede = you can me gusta = I like to	bailar = to dance beber = to drink caminar = to walk comer = to eat descansar = to rest jugar = to play leer = to read montar = to ride nadar = to swim pasear = to go for a walk pintar = to paint viajar = to travel pasarlo bien = to have a good time
Me gustaría visitar = I'd like to visit Me gustaría ir a = I'd like to go to Quiero visitar = I want to visit Quiero ir a = I want to go to Voy a visitar = I 'm going to visit Voy a ir a = I'm going to go to			hace = it does	calor = heat sol = sun			

Year 9 Spanish Learning Cycle 3 Sentence Builder 3:

¿Qué tal lo pasaste en …? = Did you have a good time in?

Time phrase	Verb	Place		Verb	Connective		
El año pasado = last year El verano pasado = last summer La primavera pasada = last spring 	visité = I visited	Barcelona, Costa Rica,	lo mejor = the best lo peor = the worst	fue = was	cuando = when	bailé = I danced bebí = I drank caminé = I walked comí = I ate descansé = I rested me divertí = I had fun jugué = I played leí = I read monté = I rode nadé = I swam paseé = went for a walk pinté = I painted probé = I tried me quemé = I got sunburnt tomé el sol = I sunbathed fui de compras = I went shopping di un paseo = I went for a stroll	
					que= that	había = there was	arena blanca = white sand arquitectura = architecture aventuras = adventures castillos = castles fiestas = parties fruta = fruit islas bonitas = pretty islands montañas = mountains playas = beaches pobreza = poverty tiendas = shops vistas = views

Year 9 Spanish Learning Cycle 3 Sentence Builder 4:

¿Quieres tomar un año sabático? = Do you want to take a gap year?

Time Phrase	Verb		C'tive
En el futuro = In the future Antes de trabajar = Before working Antes de la universidad = Before the university Después de estudiar = After studying Después del colegio = After the school Para un año sabático = For a gap year  	voy a = I am going quiero = I want quisiera = I'd like espero = I hope sueño con = I dream of	aprender a conducir = to learn to drive aprender a tocar la guitarra = to learn to play the guitar aprender otro idioma = to learn another language ayudar en mi comunidad = to help in my community ayudar en un proyecto medioambiental = to help an environmental project beber vino = to drink wine cruzar fronteras = to cross borders enseñar inglés = to teach English ganar dinero = to earn money hacer un viaje en tren por Europa = to do a train journey through Europe practicar mi español = to practice my Spanish ser turista = to be a tourist trabajar como voluntari@ = to work as a volunteer viajar por elm undo con mochila = to travel the world as a backpacker visitar Latinoamérica = to visit Latin America	porque parece = because it looks