KNOWLEDGE ORGANISER BOOKLET

YEAR 11 – CYCLE 2

2025-2026

CORE & HUMANITIES

Name:

Tutor Group:

Contents

CORE & HUMANITIES

Instructions for Use

For all of your subjects, there are certain **facts** that you **need** to know in order for you to best understand the content you study in lessons.

In this booklet are ***Knowledge Organisers*** for each subject which contain the core concepts that you have to know to be successful in your lessons.

The **first 15 minutes** of Home Learning is the same in all subjects (apart from Maths) and should be completed in your single **Home Learning exercise book**:


Look: read a specific section of the *Knowledge Organiser*.


Cover: cover it over or put it to one side;


Write: from memory, write out as much of the information as you can remember for that section;


Check: check back with the *Knowledge Organiser*. Anything missing or incorrect, add in purple pen.


Review: information you didn't recall the first time you may wish to check in a different format, such as repeating the process or creating revision cards.

The next lesson, your teacher will check that you have completed this process and you will be quizzed in your subject lesson to see what you can recall.

Instructions for Use : Example

Show My Homework **for Geography says: 'Knowledge Organiser: How to Read Grid References'.**

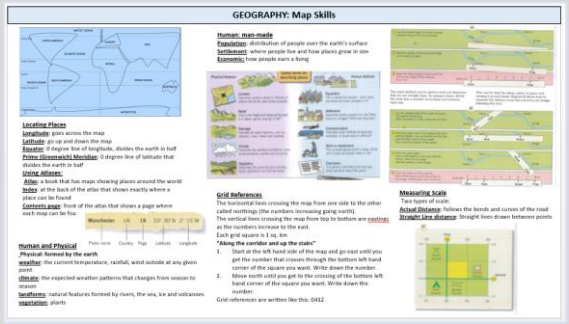
1. L**OOK:** carefully read the section of the *Knowledge Organiser* which you are learning.

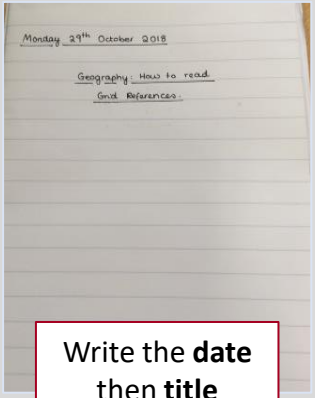
2. **COVER:** cover it over or put it to one side.

3. **WRITE:** write out as many details as you can from memory.

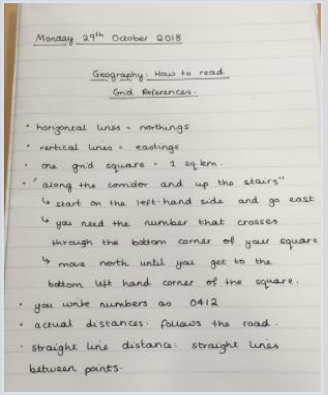
4. **CHECK:** check back over your answer with the *KO*. Anything which is missing or incorrect, add in in **purple pen**.

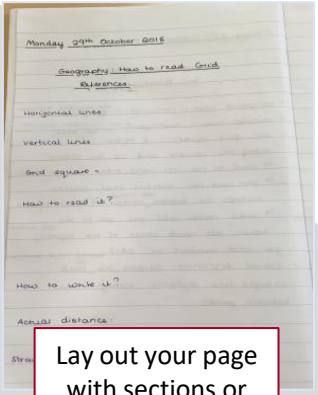
5. **REVIEW:** if you had significant gaps or parts you didn't understand, repeat the process from Step 1.



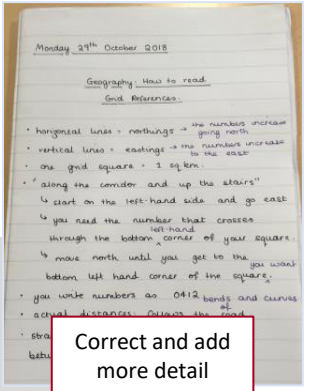


Write the **date** then **title** (**subject: focus**)





Lay out your page with sections or questions to help



Correct and add more detail using your purple pen.

sparx is your Maths homelearning

You do not have a knowledge organiser for maths. This is because the best way to remember and understand mathematics is to do it. Write your Sparx password in the space below so you don't forget it.

Sparx username: ……

Sparx password: ……

How do I log on?

Go to www.sparxmaths.uk. Select ***Kingsbridge Academy*** and enter your username and password.

What do I have to do each week?

Complete all of your Compulsory Section Sparx homework and get it 100% correct. If within your hour of home learning time you should complete the target and optional sections which are designed to help you make better progress in Maths.

How long should it take?

Sparx will adjust your homework so it should take about 1 hour. If you find yourself taking longer than this you should make sure you are coming for help on the difficult bits.

When should I do it?

You should complete your Sparx homelearning in the 4 allocated 15 minute slots in your homelearning timetable

What if I get stuck or can't do it?

You can watch the videos, ask a friend or parent or ask a maths teacher (in person or by email).

Why do I get different questions to my friend?

Sparx creates a custom homework just for you – because you are an individual. We are really pleased that we are able to offer you personalised homework.

Why do I have to do 100%?

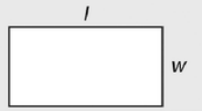
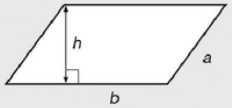
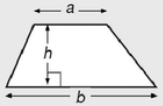
We care about you and believe that you deserve to do well in maths. Students who do all questions learn more and get better results.

GCSE Maths

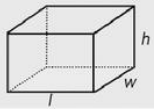
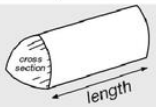
For GCSE Maths you are required to learn the following formulas.

Maths

Areas

Rectangle = $l \times w$	
Parallelogram = $b \times h$	
Triangle = $\frac{1}{2} b \times h$	
Trapezium = $\frac{1}{2}(a + b)h$	

Volumes

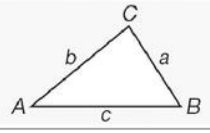
Cuboid = $l \times w \times h$	
Prism = area of cross section × length	
Cylinder = $\pi r^2 h$	
Pyramid = $\frac{1}{3}$ × area of base × h	

Trigonometric formulae

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

Area of triangle = $\frac{1}{2} ab \sin C$



Quadratic equations

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2-4ac)}}{2a}$

Compound measures

Speed

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

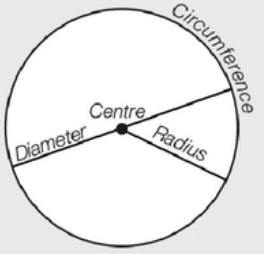
Density

density = $\frac{\text{mass}}{\text{volume}}$

Pressure

pressure = $\frac{\text{force}}{\text{area}}$

Circles

Circumference = $\pi \times$ diameter, $C = \pi d$	
Circumference = $2 \times \pi \times$ radius, $C = 2\pi r$	
Area of a circle = π x radius squared, $A = \pi r^2$	

Foundation tier formulae

Higher tier formulae

GCSE English Literature - R.L. Stevenson's *Jekyll and Hyde:* Knowledge Organiser

English

Key Vocabulary

	Word	Example:
	**curiosity:** The desire to learn or know more about something or someone.	Lanyon's **curiosity** leads to his eventual death.
	**internal conflict:** having two opposite thoughts or feelings at once.	Jekyll experiences an **internal conflict** between civilised and savage behaviours.
	**responsibility:** blame; a duty to care for someone or something.	Jekyll feels very little **responsibility** for Hyde's crimes.
	**morality:** The belief that some behaviour is right and acceptable and other behaviour is wrong.	Stevenson leads us to question the **morality** of Jekyll's experiment.
	**suppression:** not allowing yourself to feel, show, or be affected by (an emotion).	Hyde's outburst is caused by his **suppression** within Jekyll.
	**civilised:** behaving in a polite, reasonable and respectful way. Following the rules of society.	Jekyll is initially presented as a **civilised** member of society.
	**duality:** the quality or state of having two parts.	Stevenson explores the **duality** of human nature.
	**dichotomy:** a division of something into two opposing or contrasting parts.	Jekyll's experiment does create a clear **dichotomy** between good and evil.
	**virtue and vice:** a virtue is a moral behaviour. A vice is an immoral behaviour.	Jekyll desires both **virtue and vice.**
	**consequence:** something that happens as a result of another action.	Jekyll is eventually forced to face the **consequences** of his actions.
	**concealment:** the act of hiding something	The letter within the safe is a good example of **concealment.**
	**savagery: 1.** The quality of being fierce or cruel. 2. The condition of being primitive or uncivilised.	Hyde's violence represents the inner **savagery** of humans.

Key Quotations

Utterson is a lawyer: his affections 'grow like ivy'.	The back of Jekyll's house is a 'sinister block' with 'neither bell nor knocker'. There are no windows.	Hyde 'trampled calmly' over the small girl. He is described as a 'damned Juggernaut'.
When murdering Carew, Hyde 'broke out of all bounds' and broke out in a 'great flame of anger'.	Lanyon changes: 'The rosy man had grown pale; his flesh had fallen away'.	Jekyll discovered that 'man is not truly one but truly two'.
Jekyll describes his transformation: 'racking pangs... a grinding in the bones... deadly nausea'.	Hyde is associated with 'darkness' and 'fog'. After Carew's murder, the fog 'began to lie thickly' in the houses.	Enfield warns us about curiosity: 'You start a question and it's like starting a stone'.

GCSE English Literature - R.L. Stevenson's *Jekyll and Hyde:* Knowledge Organiser

Plot Overview	
Story of the Door	Utterson and Enfield take their regular Sunday walk down a well-maintained street in a dingy neighbourhood. Enfield stops at **a door** and tells **the story of a girl being trampled.** Utterson realises the story is connected to his friend, Henry Jekyll.
Search for Mr Hyde	Utterson is worried by the reference to Hyde in Jekyll's will, but Jekyll laughs off his worries. **Utterson is worried and has nightmares about Hyde. He eventually manages to speak with him.** Hyde is repellent and Utterson feels no better having met him.
Dr Jekyll Was Quite At Ease	Utterson goes to dine with Jekyll. He brings up the subject of Hyde. Jekyll grows pale and wants to drop the subject but Utterson persists**. Jekyll claims he can be rid of Hyde at any moment, but makes Utterson promise to look after Hyde if necessary in future.**
The Carew Murder Case	Nearly a year later, a vicious murder occurs. **Sir Danvers Carew is brutally attacked and killed by Hyde.** Utterson notices the weapon used was a stick he had given to Jekyll. They visit Hyde's flat in Soho but he has disappeared.
The Incident of the Letter	**Utterson visits Jekyll and finds him looking 'deadly sick'.** He gives Utterson a letter from Hyde and asks Utterson to judge what should be done with it. However, Utterson learns that no letter was delivered to the house. Later, **Guest notices that the handwriting is the same as Jekyll's own, but slanted the opposite way**. Utterson thinks Jekyll is covering for Hyde.
The Incident of Dr Lanyon	Jekyll appears recovered and is living a good life. However, in January, he refuses to see anyone. **Utterson visits Lanyon and finds him gravely ill after a huge shock. Lanyon dies** and leaves Utterson a letter, to be opened after Jekyll's death or disappearance.
The Incident at the Window	Utterson and Enfield are back on their Sunday walk. They decide to enter Jekyll's court to try and see him. **Jekyll appears at the window but suddenly his face changes to a look of terror.** The two visitors are left terrified and shocked.
The Last Night	Poole visit Utterson in fear: he believes Hyde is hiding in Jekyll's lab and may even have killed Jekyll. Utterson and Poole break down the door. They find the body of Hyde who has **taken his own life.** There is a letter for Utterson.
Dr Lanyon's Narrative	**Utterson reads Lanyon's letter. It tells him of Lanyon seeing Hyde transform into Jekyll.** This is what shocked him and led to his eventual death.
Henry Jekyll's Full Statement	**Utterson read's Jekyll's letter, in which he explains the nature of his experiment to try and separate good and evil. We learn that his savage, instinctive side took control and he could no longer return to his normal self.**

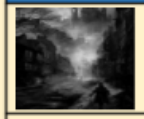
GCSE English Literature - R.L. Stevenson's *Jekyll and Hyde:* Knowledge Organiser

Character Function		
	**Dr. Henry Jekyll**	Jekyll is the main character. He experiments in order to try and separate good and evil. He represents new science and a move away from traditional values.
	**Edward Hyde**	Hyde is the other, savage side of Jekyll. He is amoral and acts on instinct. He represents our hidden, instinctive side.
	**Dr. Hastie Lanyon**	Lanyon is a traditional doctor. He dies after witnessing Hyde's transformation. He symbolises the death of traditional values.
	**Gabriel Utterson**	Utterson is a lawyer. He is a reliable narrator so we believe his account. He functions as a detective and we follow his investigations.
	**Richard Enfield**	Enfield in Utterson's cousin. They walk together. He recalls the 'story of the door' and functions as a catalyst for the story.
	**Sir Danvers Carew**	Danvers Carew is an MP who is murdered by Hyde. He is kind, innocent and virtuous. His death reflects the death of innocence and Hyde's lack of motive.
	**Mr Guest**	Guest only appears in Chapter 5. His role is to 'guess' the link between Jekyll's and Hyde's writing.
	**Female minor characters**	The only females are minor characters. They are passive and weak. Females seem to have little role to play in traditional society.

Writer's Craft:	
light and darkness	Stevenson uses imagery of light to represent the virtuous part of humans. **Darkness symbolises the inner, savage parts of us**. Hyde is always associated with darkness, Jekyll with both.
symbolic setting	**Jekyll's house symbolises the dual nature of humans.** The front (respectable) part is the façade (face) that we put on in public. The back is our hidden, secret instinctive self. Hyde's own flat is in Soho, part of London associated with poverty and immorality. Represents the ability to move easily between good and evil.
figurative imagery	Stevenson uses metaphor and simile throughout**. Many images are linked to animals (e.g. ape-like) and to natural forces (storm of blows).** They help us to imagine this unknown force.
foil	A foil is a character who acts as a contrast to another. Hyde is a foil to Jekyll: his wild behaviour emphasises Jekyll's respectability. Lanyon is also a foil to Jekyll, as he is content with traditional values.
epistolary form	**Epistolary form = written in the form of letters.** This allows Stevenson to delay revealing key information until the end to increase tension. It also **reflects the theme of secrecy.**
structure	**Non-chronological (not in time order) structure** – we find out information alongside Utterson which enhances the sense of mystery.

GCSE English Literature - R.L. Stevenson's *Jekyll and Hyde:* Knowledge Organiser

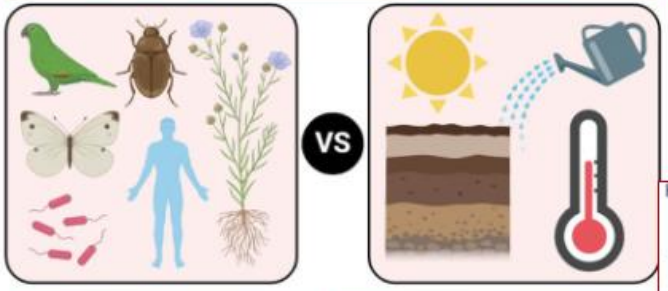
English

Key Context:		
	**gothic genre**	Gothic horror was a popular genre. It relies on psychological fear rather than terror – often fear of the unknown. Darkness and supernatural elements are common.
	**mystery genre**	Mystery was another common genre. People enjoyed following detectives as they investigated mysterious occurrences.
	**changing values**	Traditional Victorians valued reputations, respectability and appearances. These values were beginning to be questioned.
	**attitudes to science**	Science was broadening beyond the traditional biology to become more experimental. People could see experiments in their homes. There was a thirst for new knowledge.
	**attitudes to religion**	Traditional Victorians had been Christian. With the discovery of evolution, religion was being questioned and beliefs were weakened.
	**evolution**	Darwin published 'On the Origin of Species' in 1859, in which he outlined theories of evolution. People started to question creationism.
	**atavism**	The belief that people could start to exhibit behaviours from earlier ancestors (e.g. Hyde's animalistic 'ape-like' violence)
	**shilling shockers**	Shilling shockers were cheap stories of crime and violence. They usually featured lower class criminals – JandH subverts this.
	**physiognomy**	The belief that it was possible to tell a person's character from their outer appearance. This links to the description of Hyde's character, and Jekyll's 'slyish cast'.

Themes and Ideas: Stevenson may be suggesting that...	
the duality of human nature	**... humans are not born 'good' in God's image, but are a complex mix of good and evil.** We are a product of our animal ancestors and our socialisation. Both good and evil are natural to us.
curiosity	**...we should be cautious about what we want to know. Some knowledge can be dangerous.** Once we discover something, we can never 'unknow' it.
science and religion	**...science can be helpful but we shouldn't go too far.** We also need religion to give us a source of morality and control out behaviours. If we have no morals and no consequences, we may revert to savagery.
secrecy and repression	**...the culture of secrecy** and repression in society **could be dangerous as it leads to violence** and sexual repression building up.
fear and violence	**...our biggest fear should be of our own human natures, as they are capable of terrible, destructive acts**. Humans have naturally violent instincts. We also fear the unknown, as we can't deal with it.
friendship	...friendship is valuable. **True friends take risks for others** and have relationships that are built on trust.
human weakness	...humans are easily tempted and may look for easy options. **It is difficult to remain moral at all times**: even the most respectable characters struggle at times.

Biology Year 11 Cycle 2 – Photosynthesis and Ecosystems

Differences between Biotic and Abiotic Factors



Biotic
Living factors

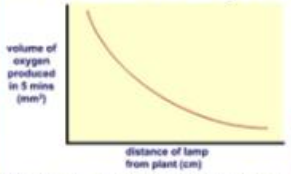
Non-Biotic
Non living factors

Photosynthesis

Carbon dioxide + Water → (Light, Chlorophyll) → Glucose + Oxygen

$6\,CO_2 + 6\,H_2O \xrightarrow{\text{Light, Chlorophyll}} C_6H_{12}O_6 + 6\,O_2$

Here are the results of the light intensity experiment:



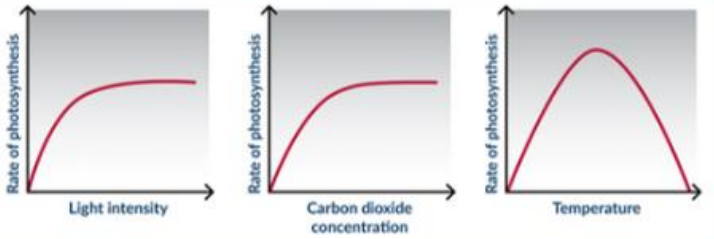
How does changing the lamp's distance affect the rate of photosynthesis?

Inverse square law

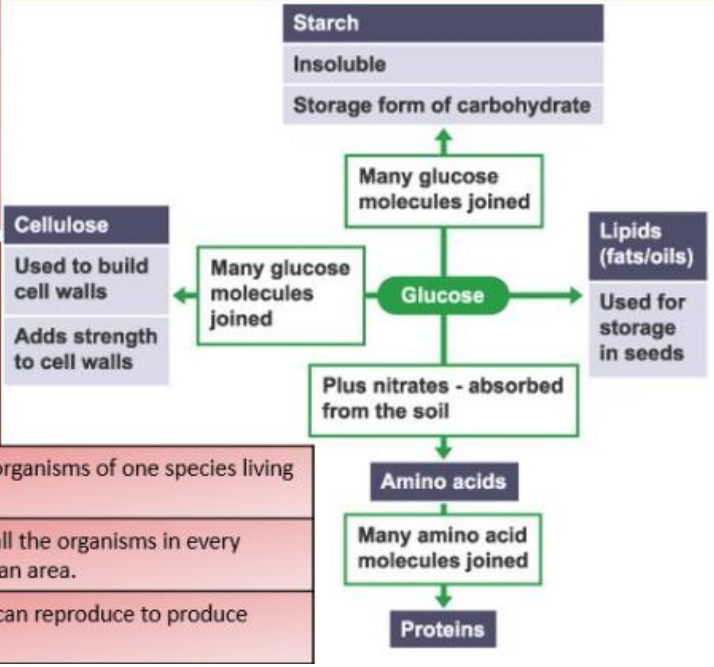
The results show that the volume of oxygen produced (rate of photosynthesis) decreases as distance of the lamp increases.

However, the decrease isn't **linear**; instead it is closer to an **inverse square relationship**. This is because light intensity follows an inverse square relationship with distance.

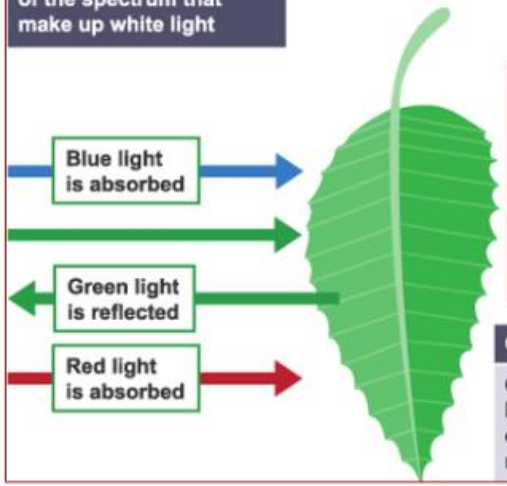
Limiting factors in Photosynthesis



Uses of glucose



Blue, green and red parts of the spectrum that make up white light



Chlorophyll

Chlorophyll absorbs the light energy required to convert carbon dioxide and water into glucose.

Chlorophyll is green - so absorbs the red and blue parts of the electromagnetic spectrum and reflects the green part of the spectrum.

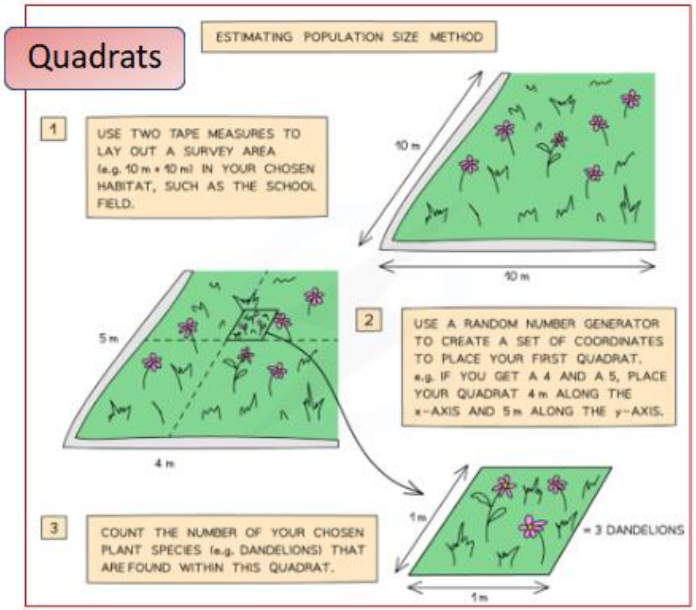
Chlorophyll

Chlorophyll is green because the green part of the spectrum is reflected

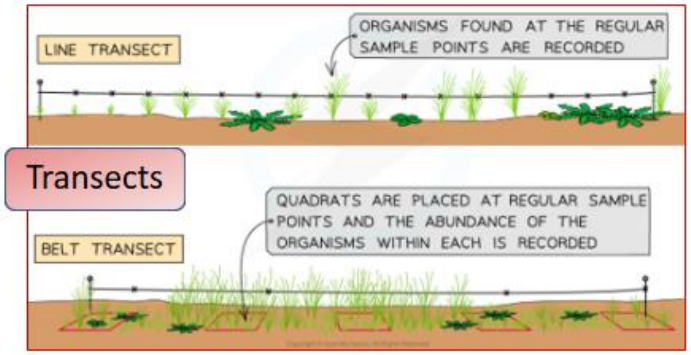
Population	The number of organisms of one species living in an area.
Community	The number of all the organisms in every species living in an area.
Species	Organisms that can reproduce to produce fertile offspring

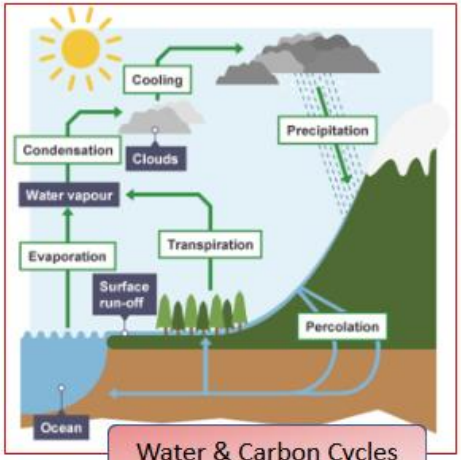
Biology Year 11 Cycle 2 – Photosynthesis and Ecosystems

Quadrats

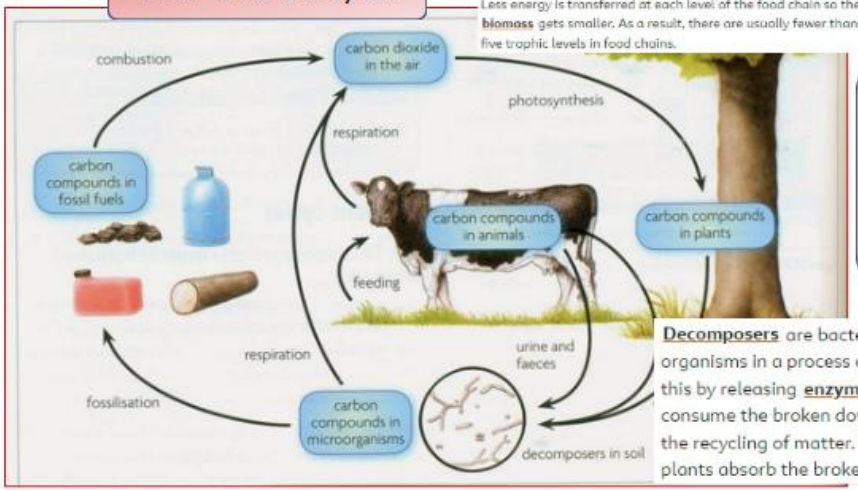


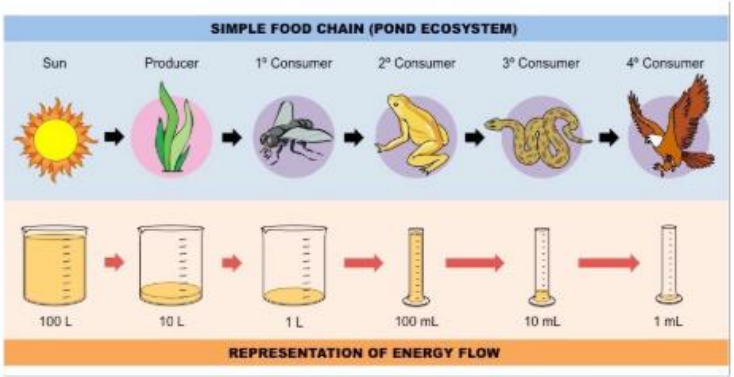
Transects





Water & Carbon Cycles



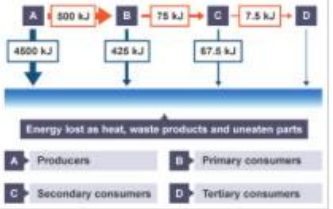


Energy loss

In a food chain only around 10 per cent of the energy is passed on to the next trophic level. The rest of the energy passes out of the food chain in a number of ways:

- it is used as heat energy
- it is used for life processes (eg movement)
- faeces and remains are passed to **decomposers**

Less energy is transferred at each level of the food chain so the **biomass** gets smaller. As a result, there are usually fewer than five trophic levels in food chains.

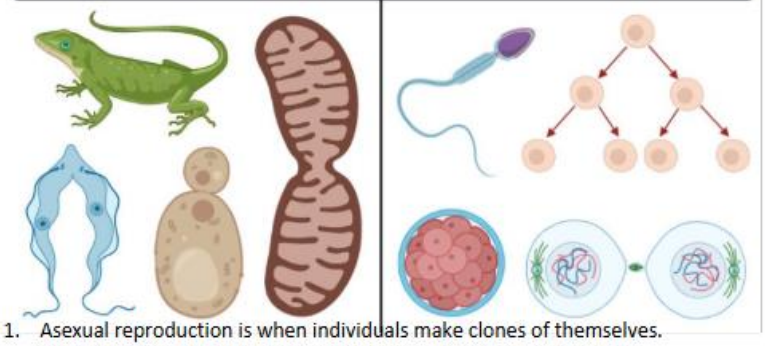


When organisms die and decay they are broken down by fungi and bacteria (decomposers) and the minerals are recycled.

Decomposers are bacteria and fungi, which break down dead organisms in a process called decomposition or rotting. They do this by releasing **enzymes** onto the dead matter and afterwards, consume the broken down substances. They form a vital role in the recycling of matter. When organisms die and **decompose** plants absorb the broken down nutrients through their roots.

Biology Year 11 Cycle 1

Differences Between Asexual and Sexual Reproduction



1. Asexual reproduction is when individuals make clones of themselves. Only one parent involved and no genetic mixing, no variation. Only mitosis involved.
2. Sexual reproduction involves the fusing of gametes, 2 parents and genetic mixing. Gives variation within a population.

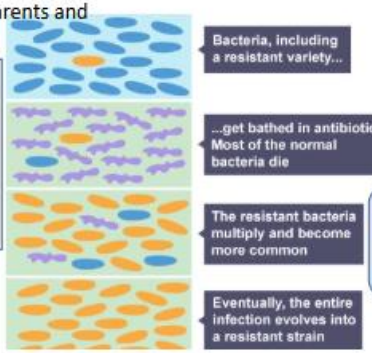
Inherited disorders

Cystic fibrosis: Caused by the inheritance of two recessive alleles. Disorder of cell membranes, mostly affecting lungs and digestive system.

Polydactyly: Caused by the inheritance of a dominant allele. Results in one or more extra fingers and or toes.

Punnet square for working out inheritance.

	T	T
t	Tt	Tt
t	Tt	Tt



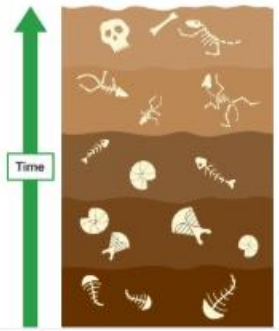
Evidence for evolution: Fossil records and antibiotic resistant bacteria.

Key words	
Gamete	Specialised sex cell; sperm, egg, pollen
Monohybrid inheritance	Controlled by a single gene
Allele	Different version of the same gene
Genotype	The alleles an individual has e.g. Bb
Phenotype	The physical expression of a gene e.g. brown eyes
Dominant allele	Will always be expressed in the phenotype. Represented with a capital letter
Recessive allele	Will only be expressed if there are two present. Represented by a lower case letter
Heterozygous	Two different alleles e.g. Bb
Homozygous	Two of the same allele e.g. BB or bb
Gene	Short section of DNA that codes for a specific protein.
Variation	Difference between individuals. Can be genetic, environmental or both.

Natural selection

- All individuals shows **variation due to mutation**.
- Some individuals **better suited** to the environment due to their advantageous genes. These individuals are more likely to **survive and pass on these genes** to their offspring.
- Individuals not well suited more likely to die.
- Overtime, the species will **evolve**.

Fossils provide a snap shot of the past and allow us to study how much or how little organisms have changed as life developed on Earth.



Linnaeus's system of classification

Kingdom
Phylum
Class
Order
Family
Genus
Species

Biology

Biology Year 11 Cycle 1

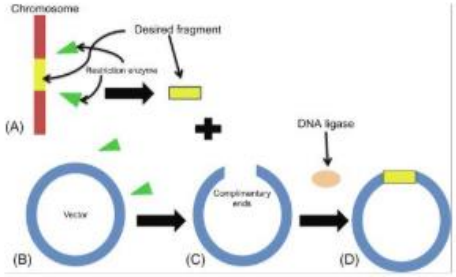
Selective breeding

1. decide which characteristics are important enough to select
2. choose parents that show these characteristics
3. choose the best offspring from parents to produce the next generation
4. repeat the process continuously for many generations

N.B inbreeding can lead to loss of alleles from the population.

Genetic engineering

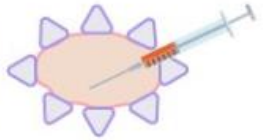
1. selection of the desired characteristic
2. the gene responsible for the characteristic is 'cut out' of the **chromosome**
3. the gene is transferred and inserted into another organism
4. replication of the modified organism.



Type	Examples
Direct contact	This can be sexual contact during intercourse or non-sexual contact, like shaking hands.
Water	Dirty water can transmit many diseases, such as the cholera bacterium.
Air	When a person who is infected by the common cold sneezes, they can spray thousands of tiny droplets containing virus particles to infect others.
Unhygienic food preparation	Undercooked or reheated food can cause bacterial diseases like Escherichia coli which is a cause of food poisoning.
Vector	Any organism that can spread a disease is called a vector. Many farmers think tuberculosis in their cattle can be spread by badgers.

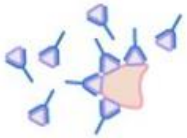
Pathogen	Example in animals	Example in plants
Viruses	HIV potentially leading to AIDS	Tobacco mosaic virus
Bacteria	Salmonella	Agrobacterium
Fungi	Athlete's foot	Rose black spot
Protists	Malaria	Downy mildew

Syringe injects an altered form of the pathogen

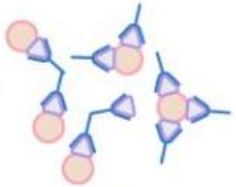


Vaccine

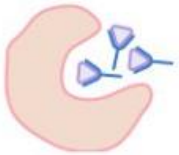
White blood cells release complementary antibodies to the specific antigen



They attach and clump pathogens together

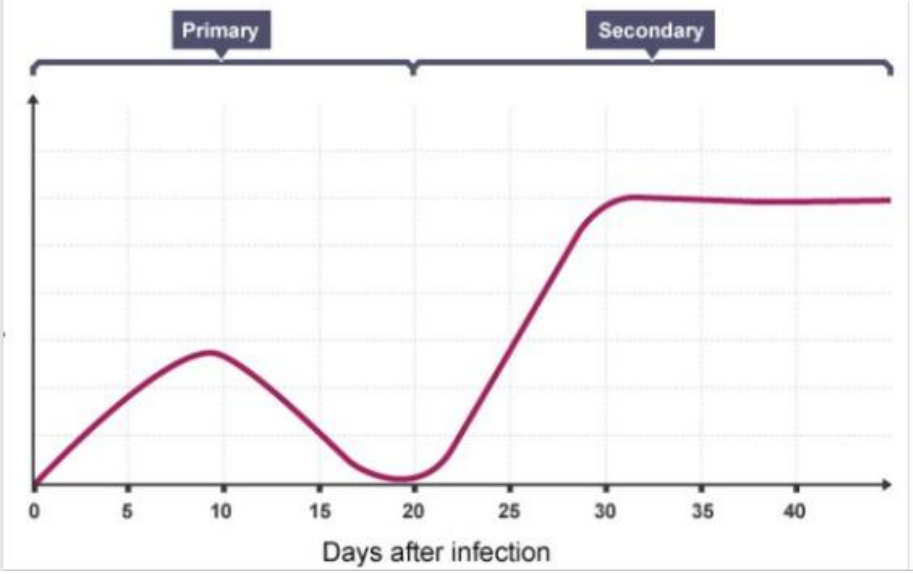


White blood cells engulf the pathogens. Phagocytosis occurs



Antibiotics treat <u>bacteria only</u>

Pathogen	Disease	Symptoms
Virus	HIV	Mild flu like symptoms leading to AIDS
Virus	Measles	Fever, rash, can lead to infertility
Virus	Tobacco mosaic virus (TMV)	Infects chloroplasts, reducing ability to photosynthesis. Stunted. growth.
Bacteria	Gonorrhoea	Yellow/ green discharge, pain when urinating
Bacteria	Salmonella	Food poisoning (sickness and diarrhoea)
Protist (vector spread)	Malaria	Recurrent episodes of fever, headache, vomiting.
Fungus	Rose black spot	Black spots on leaves, reducing photosynthesis



Crude Oil and Fractional Distillation

Crude Oil

Hydrocarbons only contain hydrogen and carbon atoms.

CRUDE OIL — a mixture of many hydrocarbons.

It's a finite resource found in rocks and formed from dead plants and animals that have spent millions of years buried in mud.

Crude oil is processed to produce fuels and to provide stock chemicals used to manufacture polymers, solvents, detergents, lubricants etc.

Combustion

COMPLETE COMBUSTION — an oxidation reaction that occurs when a fuel reacts with plenty of oxygen.

hydrocarbon + oxygen → carbon dioxide + water

Hydrocarbons are used as fuels because combustion releases a lot of energy.

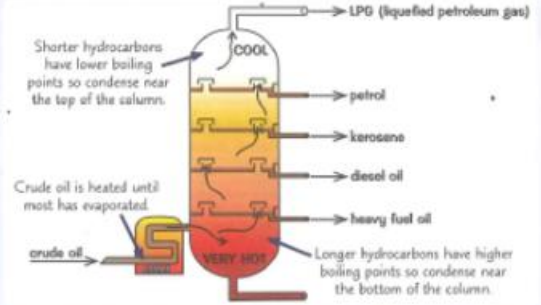
Hydrocarbons

As the length of the hydrocarbon chain increases, the...

- ...boiling point increases.
- ...viscosity increases.
- ...flammability decreases.

Fractional Distillation

FRACTIONAL DISTILLATION — a process used to separate the hydrocarbons in crude oil into fractions according to their boiling points.



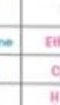
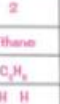
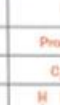
Alkanes and Cracking

Alkanes

Most hydrocarbons in crude oil are alkanes.

ALKANES — the simplest type of hydrocarbon, containing only single covalent bonds (they're saturated).

The general formula for the homologous series of alkanes is C_nH_{2n+2}

Number of carbon atoms	1	2	3	4
Name	Methane	Ethane	Propane	Butane
Formula	CH_4	C_2H_6	C_3H_8	C_4H_{10}
Structure				

Two Methods of Cracking

There is a high demand for fuels with shorter carbon chains.

CRACKING — breaks down long-chain hydrocarbons into shorter, more useful ones.

Alkenes are used to make polymers and are a starting material for making other chemicals.

long-chain alkane → shorter-chain alkane + alkene

Long-chain hydrocarbons are vaporised by heating.

Hydrocarbon vapour is passed over a hot powdered aluminium catalyst.

Hydrocarbon vapour is mixed with steam and heated to a very high temperature.

1 Catalytic cracking

2 Steam cracking

Purity, Formulations and Gas Tests

Purity

	Everyday Definition	Chemical Definition
PURE SUBSTANCE	A substance with nothing added to it, e.g. milk.	A substance containing only one element or compound.

A chemically pure substance will:

Melt at a specific temperature.

Boil at a specific temperature.

You can test the purity of a sample by comparing its melting or boiling point with that of the pure substance.

Impurities in a sample will:

- lower the melting point and increase the melting range.
- increase the boiling point and may also increase the boiling range.

Formulations

FORMULATIONS — useful mixtures with a precise purpose.

Each component in a formulation is present in a measured quantity, and contributes to the properties of the formulation.


metal alloys


cleaning products


medicines


food


fertilisers

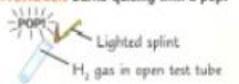

cosmetics


paints


fuels

Four Tests for Gases

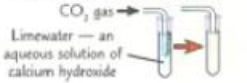
1 **HYDROGEN** burns quickly with a pop.



2 **OXYGEN** will relight a glowing splint.

3 **CHLORINE** bleaches damp litmus paper white.

4 **CARBON DIOXIDE** makes limewater turn cloudy when shaken with or bubbled through it.



Alkenes

ALKENES — unsaturated hydrocarbons that have a carbon-carbon double bond (this is the functional group). The C=C double bond makes them more reactive than alkanes.

Functional group — a group of atoms in a molecule that dictate how that molecule typically reacts.

The general formula for the alkenes is C_nH_{2n}

Number of carbon atoms	2	3	4
Name	Ethene	Propene	Butene
Formula	C_2H_4	C_3H_6	C_4H_8
Structure			e.g. 

The Evolution of the Atmosphere

Volcanic Gases

Intense volcanic activity released gases.

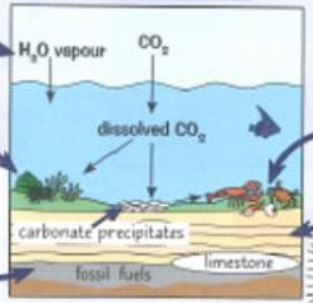
Nitrogen built up over time.

The early atmosphere probably contained mainly carbon dioxide and virtually no oxygen gas.

The early atmosphere was probably like those of Mars and Venus today.

Theories about Earth's early atmosphere have developed over time. They're hard to prove as it's hard to gather evidence from 4.6 billion years ago.

Absorption of Carbon Dioxide from Atmosphere



Water vapour condensed to form oceans.

CO_2 absorbed for photosynthesis.

Carbon became locked up in rocks and fossil fuels that formed as dead organisms were compressed by layers of sediment.

These processes caused an overall decrease in atmospheric CO_2.

Shells and skeletons contain carbonates from oceans.

Layers of sediment formed from carbonate precipitates.

Limestone and coal are sedimentary rocks.

	Crude Oil and Natural Gas	Coal	Limestone
Formed from compressed...	Plankton deposits	Thick plant deposits	Calcium carbonate deposits from shells and marine skeletons

Increase in Oxygen

Algae evolved ~2.7 billion years ago.
Plants evolved over the next billion years.

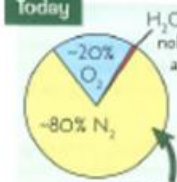
These organisms produce oxygen by photosynthesis.

$$6CO_2 + 6H_2O \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2$$

carbon dioxide + water → (light) glucose + oxygen

The increase in atmospheric oxygen led to the evolution of animals.

Today



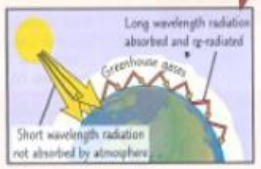
Atmosphere for the last 200 million years.

Greenhouse Gases & Climate Change

The Greenhouse Effect

Greenhouse Gases		
carbon dioxide	methane	water vapour

GREENHOUSE EFFECT — when greenhouse gases in the atmosphere absorb long wavelength radiation and re-radiate it in all directions, including back towards Earth, helping to keep the Earth warm.



Human Activities

Deforestation means less carbon dioxide is removed by photosynthesis.

Burning fossil fuels releases carbon dioxide.

Causes of increased carbon dioxide and methane

Farm animals produce methane.

Decomposition of landfill and agricultural waste releases carbon dioxide and methane.

Climate Change Evidence

Peer reviewed evidence → Most scientists think that increased CO_2 levels have caused the average temperature of Earth's surface to increase and this will lead to climate change

Global climate change is very complex and hard to model. This leads to oversimplified models and speculation in the media where stories are biased or missing information.

Four Possible Consequences of Climate Change

1. Flooding and erosion in coastal areas due to the melting of the polar ice caps causing sea levels to rise.
2. More frequent and severe storms.
3. Difficulty producing food in certain areas if temperature and rainfall patterns change.
4. Changes in the distribution of some wild species if habitats change.

Carbon Footprints and Air Pollution

Carbon Footprints

CARBON FOOTPRINT — how much carbon dioxide and other greenhouse gases are released over something's full life cycle — e.g. a product, service or event.

- Reducing carbon dioxide and methane emissions reduces the carbon footprint.
- Actions to reduce carbon footprints may be limited if individuals and governments are unwilling or unable to make changes.

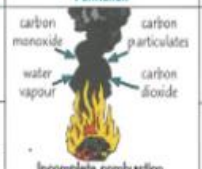
Santa worried about his carbon footprint.

Air Pollution

Fossil fuels contain hydrocarbons and sometimes sulfur impurities.

Combustion of these fuels releases gases and particles which pollute the air.

Carbon monoxide doesn't have any colour or smell, so it's hard to detect.

Pollutant	Formation	Effects
carbon monoxide	 Incomplete combustion of fossil fuels (e.g. coal).	Stops blood from transporting enough oxygen around the body — this can cause fainting, coma or death.
carbon particulates (soot)		Respiratory problems Global dimming
sulfur dioxide	Oxidation of sulfur impurities in fossil fuels during combustion.	 Acid rain
oxides of nitrogen	Reaction between nitrogen and oxygen in the air caused by the heat of burning fuels, e.g. in car engines.	Respiratory problems

Resources & Life Cycle Assessments

Resources

Humans use natural resources for a variety of different purposes:

We can use agricultural or synthetic products in place of certain natural resources, e.g. rubber can be replaced by man-made polymers.

Some natural resources are FINITE — they will eventually run out.

RENEWABLE RESOURCES — resources that reform at a similar, or faster, rate than we use them, e.g. timber.

Finite resources are processed to provide materials and energy.

Life Cycle Assessments

LIFE CYCLE ASSESSMENT (LCA) — an assessment of the environmental impact of a product over each stage of its life.

Life Cycle Assessment Stage	Plastic Bag	Paper Bag
Raw Materials	Crude oil	Timber
Manufacturing and Packaging	Key compounds extracted by fractional distillation. Waste has other uses.	Takes a lot of energy to pulp timber and creates lots of waste
Using the Product	Reusable	Single-use
Product Disposal	Recyclable, not biodegradable	Biodegradable and recyclable

- Some factors (e.g. water, energy sources and waste) are easily quantified.
- Some factors (e.g. pollutant effects) are hard to measure or depend on a person's opinion. This can make life cycle assessments biased.
- SELECTIVE LCA — LCA where some information has been removed to make a product look better than it really is, often to give positive advertising.

Reuse and Recycling

Improving Sustainability

Mining for raw materials is bad for the environment.

SUSTAINABLE DEVELOPMENT — meeting the needs of present society while not damaging the lives of future generations.

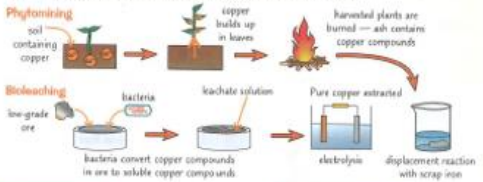
Three ways to improve sustainability:

1. Reducing the amount of raw materials used
2. Reusing products instead of throwing them away
3. Recycling products that can't be reused

Recycling and reusing products reduces the amount of finite natural resources we need to extract, as well as the energy and waste involved in their extraction.

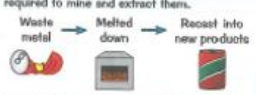
Copper Ores

Copper ore is a finite resource that is becoming scarce.
We can improve sustainability by extracting from low-grade ores.



Recycling Metals

Recycling metals helps to save on the large amounts of energy required to mine and extract them.



Amount of separation required for recyclable metals depends on the metal and final product.

Both waste steel and iron can be added to iron in a blast furnace together to reduce the amount of iron ore required.

Recycling Glass

Glass bottles can also be reused instead of recycling them.

Treating Water

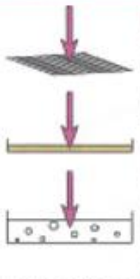
Potable Water

POTABLE WATER — water that is safe to drink.

Potable water is not chemically pure. It can contain low levels of dissolved salts and microbes.

Type of Water	Source	Treatment
Ground water	Underground rocks	Must be filtered and sterilised
Salt water	Sea water	Must be desalinated
Waste water	Sewage treatment and agricultural systems	Requires a lot of treatment

Treating Ground Water



Mesh — to remove any large debris such as twigs

Sand and gravel filtration — to remove any smaller solid bits

Sterilisation — to kill off any harmful bacteria or microbes using chlorine gas, ozone or UV light

This is how rainwater collected in the ground, lakes and rivers is treated in the UK.

Two Methods of Desalination

Desalination is carried out in areas without much fresh water to make sea water potable.

1. DISTILLATION — boiling the water to separate it from dissolved salts.
2. REVERSE OSMOSIS — passing the water through a membrane that only allows water molecules through.

These methods use lots of energy.

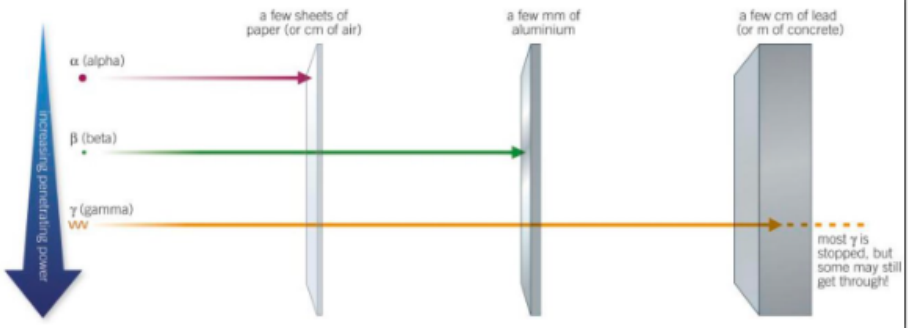
Treating Waste Water

Waste water containing toxic substances may require extra radiation or chemical treatment.

Uses of the electromagnetic spectrum

EM Wave	Use	Why it's suitable	Risks
Radio Waves	Television and radio	Reflected by ionosphere so can broadcast over long distances.	
Microwaves	Satellite communications, cooking food	Able to pass through the atmosphere to satellites. Has a heating effect.	
Infrared	Electrical heaters, cooking food, infrared cameras	Transfers heat. Emitted by objects so can they be detected without a light source.	
Visible Light	Fibre optic communications	Able to pass along a cable by total internal reflection.	
Ultraviolet	Disinfecting drinking water, sun tanning	Ionising effect kills bacteria. Increases amount of melanin (brown pigment) in skin.	Premature skin ageing, increase risk of skin cancer.
X-Rays	Medical imaging and treatments	Absorbed by bone but transmitted through soft tissue.	Ionising – can cause mutation of genes and cancer
Gamma Rays	Medical imaging and treatments	Able to pass out of body and be detected by gamma cameras. Can kill cancerous cells.	Ionising – can cause mutation of genes and cancer

Fig. 3 – Absorption of types of radiation



P4.2 Radioactivity - Key terms

Nucleus	The centre of an atom. It is made up of **protons** and **neutrons** which give it mass.
Element	A type of atom defined by the number of **protons** in the nucleus.
Isotope	Atoms of the same element (same number of protons) but with different numbers of neutrons (hence different mass.) (Fig.1)
Radiation	Particles or waves emitted by radioactive (unstable) nuclei, transferring energy.
Alpha decay	An unstable nucleus emits an alpha particle (made of 2 protons and 2 neutrons.) (Fig. 2)
Beta decay	An unstable nucleus emits a beta particle (made of 1 electron.) (Fig. 2)
Gamma decay	An unstable nucleus emits a gamma ray (a type of electromagnetic radiation.) (Fig. 2)
Activity	The rate of decay of radioactive material (measured in Becquerels, Bq,)
Half-life	The time taken for the activity of a radioactive sample to halve. (Fig. 3)
Irradiation	A person or object is exposed to radiation. This can lead to radiation sickness and cancer.
Contamination	Radioactive material is transferred to a person or object.
Decay equation	An equation for decay showing the parent nucleus on the left and the daughter nucleus and radiation on the right. Atomic mass and proton numbers must balance (Fig. 5)

Fig. 1 – Isotopes of hydrogen

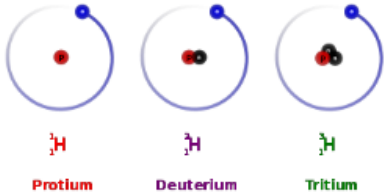


Fig. 2 – Half-life graph

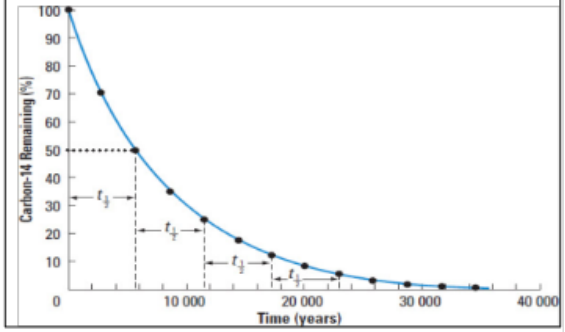


Fig. 4 – Radiation is used for medical imaging and treatment of cancer

Fig. 5 – Example of alpha decay equation

$$^{240}_{94}Pu \rightarrow {}^{236}_{92}U + {}^{4}_{2}\alpha$$

the mass numbers are balanced left and right of the arrow

the proton numbers are balanced left and right of the arrow

P4.2 Radioactivity - QUIZ

1. Complete the sentence: Tritium and deuterium are _____ of hydrogen because they have the same number of protons but different atomic masses.
2. Radiation is particles or waves emitted by what?
3. What type of radioactive decay emits a particle with 2 protons and 2 neutrons?
4. Complete the decay equation: ${}^{14}_{6}C \rightarrow {}^{14}_{7}N +$ 
5. What is the unit for (radio)activity?
6. What word describes the uncontrolled transfer of radioactive material onto a person?
7. Carbon-14 has a half-life of 5,730 years. How long will it take for the activity of a sample to reduce to 25%?
8. How much air can an alpha particle penetrate?
9. What does it take to stop a gamma ray?
10. What is a beta particle made of?

P4.2 Radioactivity - QUIZ

1. Complete the sentence: Tritium and deuterium are _____ of hydrogen because they have the same number of protons but different atomic masses.
   isotopes
2. Radiation is particles or waves emitted by what?
   unstable *or* radioactive nuclei
3. What type of radioactive decay emits a particle with 2 protons and 2 neutrons?
   alpha
4. Complete the decay equation: ${}^{14}_{6}C \rightarrow {}^{14}_{7}N +$ ☐
   ${}^{0}_{-1}\beta$ or ${}^{0}_{-1}e$
5. What is the unit for (radio)activity?
   Becquerel (Bq)
6. What word describes the uncontrolled transfer of radioactive material onto a person?
   contamination
7. Carbon-14 has a half-life of 5,730 years. How long will it take for the activity of a sample to reduce to 25%?
   11 460 years
8. How much air can an alpha particle penetrate?
   a few centimetres
9. What does it take to stop a gamma ray?
   a few centimetres of lead *or* a few metres of concrete
10. What is a beta particle made of?
    an electron

Lesson 1: Natural Hazards

What are Natural Hazards?

Natural hazards are physical events such as earthquakes and volcanoes that have the potential to do damage to humans and property. They become disasters when they cause high levels of death, injury, damage or disruption.

Types of hazard

- **Hydro-meteorological** – Droughts, Tornadoes, Heatwaves, Wildfires, floods, storms
- **Geophysical** – Landslides, earthquakes, volcanic eruptions, tsunamis

What affects hazard risk?

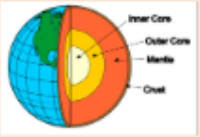
- **Population growth** – a growing population increases the number of people at risk from a natural hazard
- **Global climate change** – evidence is suggesting that this is increasing the intensity of rotating tropical storms and exposing new areas to their dangers.
- **Deforestation** – this contributes to climate change and increases the risk of flooding
- **Wealth (level of development)** - LICs are particularly at risk as they do not have the money to protect themselves e.g. earthquake-proof buildings

1. In your own words, define natural hazard.
2. Give two example of hydro-meteorological hazards.
3. What type of hazard are tsunamis and earthquakes?
4. Explain how population growth affects hazard risk.
5. Explain how level of development affects hazard risk.

Lesson 2: Plate boundaries

Structure of the Earth

The earth has 4 layers

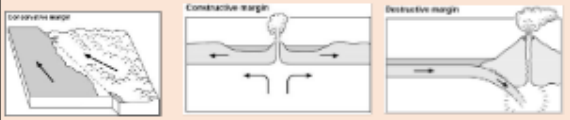


The crust is split into major sections called **tectonic plates**.

There are 2 types of crust: **Oceanic** (thin and younger but dense) and **Continental** (old and thicker but less dense).

These plates move due to convection currents in the mantle and, where they meet, tectonic activity (volcanoes). Where plates meet is called a plate boundary.

Plates either move towards each other (**destructive** margin) away from each other (**constructive**) or past each other (**conservative**).



1. How many layers does Earth's structure have?
2. What are tectonic plates?
3. What moves Earth's tectonic plates?
4. What is happening at a destructive plate boundary?
5. What is happening at a conservative plate boundary?

Lesson 3: Location of tectonic hazards

Distribution of tectonic activity – how it is spread out over Earth's surface

- Along plate boundaries in a linear pattern (in a line)
- On the edge of continents.
- Around the edge of the Pacific ocean - the 'Ring of fire'

Volcanoes

- **Constructive** margins – Hot magma rises between the plates e.g. Iceland. The lava here is 'runny' - this forms Shield volcanoes.
- **Destructive** margins – an oceanic plate subducts under a continental plate. Friction causes oceanic plate to melt and pressure forces magma up to form composite volcanoes e.g. the west coast of South America.

Earthquakes

- **Constructive** margins – usually small earthquakes as plates pull apart.
- **Destructive** margins – violent earthquakes as pressure builds and is then released.
- **Conservative** margins – plates slide past each other. They catch and then as pressure builds it is released e.g. San Andreas fault.

1. What does the word 'distribution' mean?
2. Describe the distribution of volcanoes and earthquakes.
3. How many types of plate boundary are there?
4. What type of volcanoes are found at destructive plate boundaries?
5. Explain how earthquakes are formed at conservative boundaries.

Lesson 4: HIC Case study – Noto, Japan	Lesson 5: LIC Case study – Turkey/Syria	Lesson 6: Contrasting responses
Noto, Japan (HIC) 1st January 2024 4:10pm **7.6 on Richter scale** **Primary effects** • 208 deaths, collapsed buildings • 600 people injured • Extensive damage to buildings • Damage to 15 fishing ports **Secondary effects** • 1-6m Tsunami • Extensive coastal flooding caused by tsunamis generated by the earthquake • Sporadic fires **What's the difference between Primary & Secondary effects?** Primary effects happen immediately. Secondary effects happen as a result of the primary effects and are therefore often later. **Earthquakes** **Primary effects** • Property and buildings destroyed. • People injured or killed. • Ports, roads, railways damaged. • Pipes (water and gas) and electricity cables broken. **Secondary effects** • Business reduced as money spent repairing property. • Blocked transport hinders emergency services. • Broken gas pipes cause fire. • Broken water pipes lead to a lack of fresh water.	**Turkey/Syria (LIC) 6th February 2023 3:17am** **7.8 on Richter scale** **Primary effects** • 55,000 deaths • 130,000 injured • 26 million affected in Syria and Turkey • 164,000 buildings destroyed or severely damaged **Secondary effects** • Psychological impacts from experiencing the event • Estimated that 2.7 million people made homeless • One in three children who lost their homes in the Turkey earthquakes a year ago still living in temporary shelters  	**Japan 2024** **Immediate responses** – short-term measures to help the survivors • Every person receives a text message warning • Emergency co-ordination centre established • 2,000 troops sent to help with the disaster • 62,000 people evacuated due to tsunami warnings • $28m government disaster fund **Long-term responses** – longer-term reconstruction work • K-NET - a network of seismographs installed at approximately 1,000 locations nationwide. Stop all trains and other infrastructure • September 1st - Disaster Preparedness Day • Anti-seismic Design Standard to buildings **Turkey/Syria 2023** **Immediate responses** • World leaders pledged to send aid as an international response. • Use of diggers and sniffer dogs to search for survivors • Offers of aid from 45 countries including NATO and the EU. • Offers of specialist equipment and experts. • Rescue teams working at night - Rescue workers – the 'White Helmets'. **Long-term responses** • Construction amnesty where buildings built illegally were given certificate if a fee was paid. • Building design includes using rubber shock absorbers
1. When and where did the Japan earthquake happen? 2. How powerful was this earthquake? 3. What's the difference between Primary & Secondary effects? 4. Give two primary effects of this earthquake. 5. Give two secondary effects of this earthquake.	1. When and where did the Turkey/Syria earthquake happen? 2. What time of day was the earthquake? 3. How powerful was this earthquake? 4. Give two primary effects of this earthquake. 5. Give two secondary effects of this earthquake	1. In your own words, what is the difference between short and long-term responses? 2. Give an example of a short-term response from Japan 3. How many people from Japan were evacuated due to tsunami warnings? 4. Give two problems with the short-term response in Turkey/Syria 5. Explain why the responses differed between these two earthquakes.

Lesson 7: Living in areas at risk

Why do people live in areas at risk?

- Poor people have no choice
- Hazards are rare so not seen as a threat
- Some people have no experience or knowledge of the risks
- Volcanoes can bring benefits such as fertile soils and rich minerals
- Plate margins sometimes coincide with favourable areas for trade e.g. coastal areas

Living on a plate margin: Iceland

- Iceland is located on a constructive plate margin (The mid-Atlantic ridge)
- The North American and Eurasian plate meet here.
- Geothermal energy generates 25% of Iceland's electricity. Most of the rest is HEP.
- Iceland's landscapes supports a huge tourism industry.
- Naturally occurring hot water provides heating for 90% of all buildings.

1. What type of plate boundary is Iceland on?
2. Which two tectonic plates meet here?
3. Give 3 reasons why people live in areas at risk.
4. How much of Iceland's electricity is generated by geothermal energy?
5. What % of Iceland's homes are heated by naturally occurring hot water?

Lesson 8: Monitoring & 3 Ps

Reducing the impact of tectonic hazards

Monitoring

- Seismometers measure earth movement.
- Volcanoes monitored by remote sensing to detect heat and ground deformation to measure changes in the shape of the ground.
- Gas sensors can also detect rising magma beneath the volcano

Prediction

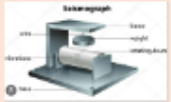
- Observing monitoring data can allow accurate prediction and evacuation before event. e(.g. Eyjafjallajökull, 2010).
- Historical records of earthquakes can help determine probability and so help plan.
- Earthquakes are technically harder to predict as the fault line stretches over a much larger are

Protection

- Earthquake resistant construction of buildings.
- Earth embankments or explosives can be used to divert lava flows.

Planning

- Avoid building in at risk areas.
- Training for emergency services and planned evacuation routes and drills.
- TV adverts to improve peoples preparedness for these events



1. What scientific instrument measures earth movement?
2. What type of method is using historical earthquake records?
3. Give an example of a method of protection.
4. How can people be better prepared for these events?
5. How can the emergency services improve their response?

Lesson 9: Atmospheric circulation

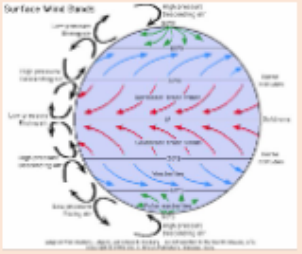
At the equator, the sun's rays are most concentrated – highest levels of **solar insolation.** This means that temperatures are high there. This one fact causes global atmospheric circulation at different latitudes.

As the air heats at the equator, it rises – causing low pressure. As it cools, it sinks, causing high pressure. Winds move from high pressure to low pressure. They curve because of the **Coriolis** effect (the turning of the Earth) creating the Trade winds.

Geographers have identified three cells of air movement in the atmosphere:

- Hadley
- Ferrell
- Polar

These cells interact with each other and are responsible for the world's different climate zones & biomes like the hot deserts.



Remember
High pressure = sinking air, dry
Low pressure = rising air, wet

1. What are levels of solar insolation like at the Equator?
2. What happens to the air at the Equator?
3. What type of pressure does this create?
4. Name the three cells that make up the Global Atmospheric Circulation.
5. What force causes the air movement between the cells to curve/bend?

Lesson 10: Rotating tropical storms

Where do they occur- how are they distributed over Earth's surface?

Occur in low latitudes between 5° and 30° north and south of the equator (in the tropics). Ocean temperature needs to be above 27° C. Happen between summer and autumn when the ocean temperature is high enough.

Atlantic Ocean - Hurricanes
Indian Ocean – Cyclones
Pacific Ocean- Typhoons

Sequence of a tropical storm

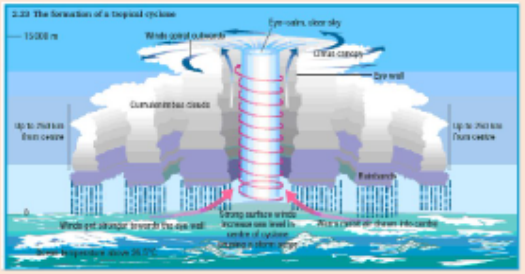
1. Air is heated above warm tropical oceans.
2. Air rises under low pressure conditions.
3. Strong winds form as rising air draws in more air and moisture causing torrential rain.
4. Air spins due to Coriolis effect around a calm eye of the storm.
5. Cold air sinks in the eye so it is clear and dry.
6. Heat is given off as the water vapour cools (latent heat) further powering the storm.
7. On meeting land, it loses its source of heat and moisture so loses power.

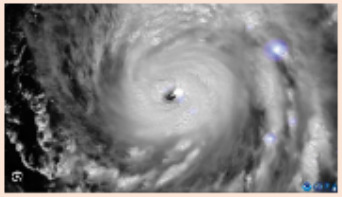
1. Describe the distribution of rotating tropical storms.
2. What ocean temperature is needed for them to form?
3. What are they called in the Indian Ocean?
4. Study the map. In what general direction are their paths?
5. What happens when the storm goes over land?

Lesson 11: Structure & features of tropical storms

There is a **common structure** to all rotating tropical storms:

- Central eye – clear sky, calm weather, descending air
- Eye wall – this surrounds the eye and is where the strongest winds are found
- Alternating band of swirling cloud
- Beneath the storm the sea bulges upwards due to the very low pressure. This causes a storm surge which results in serious flooding for coastal areas.





- From space these storms form a Catherine wheel shape

1. What is found in the centre of a tropical storm?
2. What surrounds this?
3. Describe the characteristics of the storm in the satellite image.
4. Name three hydro-meteorological hazards associated with these storms.
5. Describe the structure and features of a tropical storm

Lesson 12: Case study – Super-Typhoon Haiyan

Typhoon Haiyan, Philippines, November 2013
Category 5 314km/hr winds 281.9mm or rain in under 12 hours

Primary effects

- At least 6340 killed
- 314 km/hr wind speeds.
- 5m Storm Surge
- Habitats & Crops destroyed
- 90% buildings in Tacloban destroyed

Secondary effects

- 130,000 houses destroyed, leaving 4.2 million homeless
- $14 Billion of damage
- Water supply polluted
- Public Order – Looting
- Airports unusable for supplies

Immediate responses

- 1,069 emergency shelters set up in public buildings.
- Disaster Emergency Committee helped
- 3,316,500 people outside these centres by providing aid.
- UK aid charities provided shelter, food and medical supplies for up to 800,000

Long-term responses

- UN appeal raised $480 million.
- Typhoon warning systems have been improved.
- People are now better educated about how to respond.

1. Where and when did this storm occur?
2. Describe the path of this storm (see map).
3. Give two primary effects of this storm.
4. Give two secondary effects of this storm.
5. Explain how improving the warning system and better educating the population will help in future events like this.

Lesson 13: Climate change impact on tropical storms	Lesson 14: Tropical storms MPPP	Lesson 15: UK weather hazards
There is strong scientific evidence of global warming and this may be impacting upon natural systems including the distribution, frequency & intensity of tropical storms Over the last few decades sea surface temperatures in the Tropics have increased by 0.25-05 degrees Celsius. In the future this may affect tropical storms in the following ways: 1. **Increased intensity** – rainfall totals in particular seem to be increasing, leading to increased flooding 2. **They may extend** to the South Atlantic and areas in the Sub-Tropics 3. **Frequency** of these storms may increase 4. **Stalling** – changes in upper atmospheric winds may result in increased stalling of these storms. This is when they remain stationary over an area for several days, increasing the damage caused. 	**Tropical storms cannot be prevented, but they can be monitored and their tracks predicted.** **Prediction** • Monitoring wind patterns allows path to be predicted. • Use of satellites to monitor path to allow evacuation **Planning** • Avoid building in high risk areas • Emergency drills so that people know what to do • Evacuation routes – people clear on where to go if disaster strikes **Protection** • Reinforced buildings and stilts to make safe • Flood defences e.g. levees and sea walls • Re-planting Mangroves to improve protection for coastal areas 	The UK does experience weather hazards despite its **moderate climate:** **Thunderstorms** - following hot weather bring lightning and torrential rainfall **Prolonged rainfall** over a long period - leads to river floods **Drought and extreme heat** - causes rivers to dry-up and reservoirs to run low. Can also result in wildfires. **Heavy snow & extreme cold** – less common these days but can cause significant hardship (particularly in remote rural areas) and transport disruption. Pipes often burst once the cold spell ends. **Strong winds** - can cause disruption to power supplies, transport and severe damage in coastal areas  
1. In recent years, how much have sea surface temperatures increased in the Tropics? 2. What might be more intense in future storms? 3. What might happen to frequency? 4. Give two other possible effects of climate change on tropical storms.	1. Can tropical storms be prevented? 2. How are satellited used? 3. Why are emergency drills important? 4. Explain how can buildings be made safe. 5. How does re-planting mangroves help?	1. How is the UK's climate described? What does this mean? 2. What problems can string winds cause? 3. What weather hazard causes rivers to dry-up and reservoirs to run low? 4. Give two problems caused by heavy snow. 5. When was the 'Beast from the East'? (Google this one)

Lesson 16: 2014 Somerset floods

December 2013 - February 2014 – Somerset Floods, SW England

This is a very low-lying area, which experiences winter flooding. Wettest January on record. 350mm of rain fell in January and February, about 100mm above average

Social Effects

- Residents evacuated to temporary accommodation for months
- 600 homes flooded across Somerset Levels.
- 16 farms evacuated.
- Villages such as Moorland and Muchelney cut off. This affected people going to school, shopping etc.

Economic effects

- Estimated £10 million damage by Somerset County Council.
- Local roads cut off by floods.
- Over 1000 livestock evacuated.
- Bristol to Taunton Railway line closed at Bridgwater.

Environmental effects

- Floodwaters heavily contaminated with sewage, oil and chemicals.
- Huge amounts of debris had to be cleared. Stagnant water had to be re-oxygenated before being pumped back into the rivers.

Management strategies

- A £20 million Flood Action Plan was launched by Somerset County Council.
- 8km of the River Tone and River Parratt were dredged to increase the capacity of the channel (March, 2014)
- By 2024 a tidal barrage at Bridgwater is being considered.

1. Where in the UK is Somerset?
2. Give two physical causes of this flood?
3. What was the estimated cost of this flood event?
4. How many homes were flooded across the Somerset levels?

Lesson 17: Evidence for climate change

Evidence for climate change shows changes before humans were on the planet. So some of it must be natural. However, the **rate** of change since the 1970s is unprecedented. Humans are responsible!

The Met Office has reliable climate evidence since 1914 – but we can tell what happened before that using several methods.

Ice and Sediment Cores

- Ice sheets are made up of layers of snow, one per year. Gases trapped in layers of ice can be analysed. Ice cores from Antarctica show changes over the last 400 000 years.
- Remains of organisms found in cores from the ocean floor can by traced back 5 million years.

Pollen Analysis

- Pollen is preserved in sediment. Different species need different climatic conditions, so this is a record of past climate.

Tree Rings

- A tree grows one new ring each year. Rings are thicker in warm, wet conditions
- This gives us reliable evidence for the last 10 000 years.

Temperature Records

- Historical records date back to the 1850s. Historical records also tell us about harvest and weather reports.

1. What has happened to the rate of climate change since the 1970s?
2. Explain how ice cores help scientist describe past Earth climates.
3. Explain how past weather records help scientists describe past Earth climates.

Lesson 18: Causes of climate change

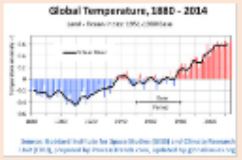
There are a number of Natural and Human causes of climate change

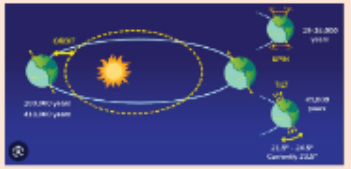
Natural causes

- **Orbital changes** – The sun's energy on the Earth's surface changes as the Earth's orbit is elliptical its axis is tilted on an angle.
- **Solar Output** – sunspots increase to a maximum every 11 years.
- **Volcanic activity** – volcanic aerosols reflect sunlight away reducing global temperatures temporarily.

Human causes

- **Fossil fuels** – release carbon dioxide with accounts for 50% of greenhouse gases.
- **Agriculture** – accounts for around 20% of greenhouse gases due to methane production from cows etc. Larger populations and growing demand for meat and rice increase contribution.
- **Deforestation** – logging and clearing land for agriculture increases carbon dioxide in the atmosphere and reduces ability to planet to absorb carbon through photosynthesis.





1. Give one example of a natural cause of climate change.
2. Give one example of a human cause of climate change.
3. Explain how volcanic activity causes climate change.
4. Explain how Deforestation causes climate change.

Lesson 19: Effects of climate change	Lesson 20: Managing climate change	Keywords
Social and Economic effects • Increased disease e.g. skin cancer and heat stroke. • Winter deaths decrease with milder winters. • Crop yields affected by up to 12% in South America but will increase in Northern Europe but will need more irrigation. • Less ice in Arctic Ocean increases shipping and extraction of oil and gas reserves. Trapped methane released as permafrost melts. • Droughts reduce food and water supply in sub-Saharan Africa. • Water scarcity in South and South East UK. • Increased flood risk. 70% of Asia is at risk of increased flooding • Declining fish in some areas affect diet and jobs. • Increased extreme weather • Skiing industry in mountain areas e.g. Alps (Europe) threatened.    **Environmental effects** • Increased drought in Mediterranean region causing environmental stress for plants and animals with possible extinction • Lower rainfall causes food shortages for orangutans in Borneo and Indonesia. • Sea level rise leads to flooding and coastal erosion of coastal habitats • Ice melts threaten habitats of polar bears. • Warmer rivers and oceans affect marine wildlife e.g. coral bleaching and decline in biodiversity • Forests in North America may experience more pests, disease and forest fires.	There are two ways that climate change can be managed: Mitigation and Adaption **Mitigation** means taking actions to reduce the long-term risk of climate change **Adaption** means taking actions to adjust to climate change **Mitigation methods** • Alternative energy production will reduce CO2 production. • Planting Trees – helps to remove carbon dioxide. • Carbon Capture – takes carbon dioxide from emission sources is stored underground. • International Agreements e.g. the Paris Climate Agreement **Adaption methods** • Changes in agricultural systems need to react to changing rainfall and temperature patterns and threat of disease and pests e.g. planting drought-resistant crops • Managing water supplies – e.g. by installing water efficient devices and increasing supply through desalination plants. • Reducing risk from rising sea levels would involve constructing or upgrading defences like the Thames Flood Barrier or restoring mangrove forests or raising buildings in areas at risk from flooding on stilts. 	Hazard risk Natural hazard Convection current Conservative plate margin Constructive plate margin Destructive plate margin Earthquake Monitoring Prediction Global atmospheric circulation Management Adaptation Mitigation Quaternary period Subduction
1. Name one positive social effect of climate change. 2. Name one negative social effect of climate change. 3. How will water supply be affected in the UK? 4. How will the Arctic be affected? 5. How will coastal areas be affected?	1. What is the difference between mitigation and adaption? 2. Give an example of a mitigation method and explain how it works. 3. Give an example of an adaption method and explain how it works. 4. What do you think is best – mitigation or adaption?	

Lesson 1 Measures of Development

Development means positive change that improves the lives of people in a country. It can be measured using a number of economic & social measures/indicators:

Development Indicators: these can be single or composite measures.

GNI	Gross National Income (Money earned by residents of a country including money earned abroad).
HDI	Human Development Index. Calculated using life expectancy, education, and per capita income.
Infant Mortality	How many children per 1000 die before they are 1.
Literacy Rate	The % of adults that read and write acceptably.

You must know **advantages** and **disadvantages** of each of these measures, particularly single measures vs **composite** measures like **HDI**. Single measures can be misleading for many reasons. This could be that they are averages and so don't represent spatial variations, different aspects develop at different rates, or a country might score well one aspect and not another.

1. What does **development** mean?
2. What does **HDI** stand for?
3. Is GNI a **social** or **economic** indicator?
4. What is defined as **the % of adults that read and write acceptably**?
5. What is a **disadvantage** of a **single measure** like GNI?

Lesson 2 Classifying different parts of the world

The 3 main global groups of countries:

The World Bank classifies HIC, NEE and LIC as follows:

- A High Income Country (HIC)has a GNI per capita of over $12,000.
- A Newly Emerging Economy (NEE) has an economy that is rapidly progressing.
- A Low Income Country (LIC) has a GNI per capita of below $1,000.

Standard of living refers to material wealth e.g. Income, whether they own a car, house etc. The economic level of their daily lives. $£

Quality of life includes **standard of living** and other things that aren't easy to measure, how much space they have, safety, access to clean water, environmental factors etc (Composite Measure).
Quality of Life is harder to classify as it means different things to different people in different parts of the world

1. What does **HIC**, **LIC** and **NEE** stand for?
2. How does the **World Bank** classify a **HIC** (what is the GNI per capita)?
3. How does the **World Bank** classify a **LIC** (what is the GNI per capita)?
4. What is **standard of living**?
5. Why is **Quality of life** difficult to measure?

Lesson 3 Demographic Transition Model

The Demographic Transition model shows how a country's population changes as it becomes more developed, from subsistence farming (LICs) to HICs.

Stage	1	2	3	4	5
Birth Rate	High	High	Falling	Low	Very Low
Death Rate	High	Falls rapidly	Falls slowly	Low	Low
Pop. Change	Static	Rapid rise	Increase slows	Stable	Slow decrease
e.g.	Remote tribes	Kenya	Brazil	UK	Germany

1. How many **stages** are there to the DTM?
2. In which stage does the **death rate fall** rapidly?
3. In what stage does the **birth rate fall below the death rate**?
4. What happens to the population in **stage 3**?
5. What country is an example of **stage 1**?

Lesson 4 Economic Structure and the DTM	Lesson 5 Causes of uneven development	Lesson 6 Consequences of uneven development-wealth
Countries at different stages of the DTM have different **population pyramids.**  Population pyramids change over time – from having a high birth rate (a wide base), to good healthcare and more elderly people (a wide top). **Population structure linked to economic structure of the country:** **Stage 1 - Hunter-gathers.** Insecure supplies of water and food and no modern medicine. Family sizes are large, children play a key role in the family. **Stage 2 - Primary industry** e.g. farming. Children are useful for this. In addition, lack of contraception means high birth rates. **Stage 3 - Secondary industry** e.g. Manufacturing. Children are less useful and there are increasing laws around child labour. **Stage 4 and 5 - Tertiary Industries** e.g. Services, teachers, doctors, lawyers, electrician, plumbers. Also children are expensive to raise. Women have education, careers and are marrying later having fewer children.	**Physical Environment** - Soil erosion, desertification, climate (and climate change), overgrazing and infertile soils affect farming. Areas without fertile land, natural resources, water and energy suffer. Countries suffering from Natural hazards make little progress with development. **Health** - Diseases can make people too weak to work or go to school. 80% of all developing world disease is water-related. 2 million people die a year. LIC's are unable to invest in good quality health care. **Trade** - Trade blocs favour member states. Primary products sold by LICs are sold for low prices that can fluctuate. HICs make more expensive products so earn more. Poor infrastructure and/or conflict means many people cannot sell their goods at all. **History** - Colonialism: Many countries in Asia, South America and Africa were controlled and exploited by European powers until very recent times. Since independence many have suffered from political instability & civil wars which have seriously affected their development.	**Disparities in Wealth:** **Positives** All countries are developing and increasing their GNI. In **2014** the fastest growth of wealth was North America which now hold **35%** of the global wealth. **Negatives** There are large disparities, Africa has the smallest share of global wealth of about **1%**. There are disparities within countries. China has the highest growth rate since **2000** but half its population are still in poverty **Disparities in Health:** **LIC's:** People are more likely to die from infectious diseases such as HIV/ Aids, Malaria, Cholera. Complications in child birth is the main cause of death in under 5s. **HIC's:** People in HIC have longer life expectancy(80) but are more likely to have lifestyle diseases. Lung infections are the only major infectious cause of death –often caused by smoking.
1. Would a high birth rate give a wide or narrow base to a population pyramid? 2. What does a wide top to a population pyramid mean? 3. What type of industry are stage 2 countries mainly doing? 4. Give an example of a tertiary job in stage 4 & 5 countries. 5. What industry do stage 3 countries mainly do?	1. State one way in which the physical environment can cause uneven development. 2. What % of all developing world disease is water-related? 3. How many people die a year from water-related disease? 4. What type of products are traded by LIC's? 5. Countries in Asia, South America and Africa were colonised by which group of countries?	1. What is happening to all countries GNI? 2. Which country had the fastest growth of wealth in 2014? 3. Which continent has the smallest share of global wealth – how much is it? 4. What diseases are people likely to die from in LIC's? 5. What is the main cause of death in children under 5 in LIC's?

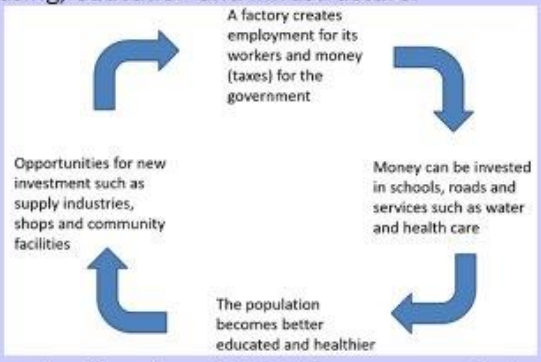
Lesson 7 Consequences of uneven development – international migration	Lesson 8 Reducing the Gap – Aid & Intermediate Technology	Lesson 9 Reducing the Gap – Fair Trade, Debt Relief and Microfinance
Migration – movement of people from one place to live in another permanently or semi-permanently. More people are moving within and between countries. **Economic Migration:** When people move for a new job. Since 2004, over 1.5 million eastern Europeans moved to the UK. There are also illegal economic migrants from central Africa moving to Europe.  **Forced Migration:** When people have no choice about moving. Many people are forced to move due to wars, they are refugees and can legally claim asylum. Approximately **2 million refugees** have left **Iraq** since **2007** when the 2nd Gulf War started. They travelled to Turkey, Jordan, Lebanon and Europe. 	**Aid**: is the transfer of money, goods and expertise from the donor country to the recipient country. Top down, long-term aid provides the country with large scale projects that encourage investment. Example: **Lesotho Water Transfer Project** Lesotho has a low GDP per capita of US$988. This project provides safe water for the 10% of the South African population without safe access. Bottom-up aid is small scale and will meet the needs of the people. This usually involves **intermediate technology.** Example: **Wakel River Basin Project, India** United States Agency for International Development (USAID) funded a project called: The Global Water Sustainability Program (2004-2014). USAID is an example of a non-government organisation (NGO). **Intermediate Technology**: This is sustainable technology that is appropriate to the needs, skills, knowledge and wealth of local people.	**Fair Trade:** Farmers receive a fair and stable price for their cash crops which enables them to plan for the future and invest. **Example:** Over 90% of small coffee farmers in eastern Uganda have joined the Gumutindo Coffee Cooperative to gain economies of scale. **Debt Relief:** HIC's will work with the World Bank to cancel LIC's debts to other countries and banks. **Example:** In 2006, the world's richest countries (known as the G8) agreed to cancel the debts of many of the Highly Indebted Poor Countries (HIPC's). **Microfinance loans:** These are small loans ($100) and for low income people start a small business, such as mending clothes. **Example:** The Grameen Bank in Bangladesh was set up in 1976. The bank was founded to help people, especially women, use skills to develop small businesses, like a mobile phone business.
1. Define migration. 2. What is economic migration? 3. How many eastern Europeans moved to the UK since 2004? 4. What is forced migration? 5. Why are people forced to move? 6. How many refugees have left Iraq since 2007?	1. What is aid? 2. What type of aid provides large scale projects? 3. What type of aid is the example of the Lesotho Water Transfer Project? 4. What type of aid is the Wakel River Basin Project? 5. What is Intermediate technology?	1. What is Fair trade? 2. What % of small coffee farmers have joined a fair trade co-operative? 3. What is debt relief? 4. What does HIPC stand for? 5. When was the Grameen Bank set up in Bangladesh?

Lesson 10 Reducing the Gap - Investment

Investment: When countries or TNCs invest money and set up an industry or business in another country.

TNC investment: TNCs and HICs may invest such as China in Africa, these give people jobs and income. It can also stimulate **industrial development** such as Shell in Nigeria.

Positive Multiplier Effect: industrial development brings employment and opportunities to invest in housing, education and infrastructure.



Example: More than 2000 Chinese companies have invested billions of dollars in Africa, mainly in energy, mining, construction and manufacturing. This includes a power plant in Zimbabwe, hydro-electricity in Madagascar and railway construction in Sudan.

1. What is investment?
2. What is a positive of TNC's investing in another country?
3. What is the positive multiplier effect?
4. How many Chinese companies have invested in Africa?
5. Give one example of the investment and which country it is in.

Lesson 11 Tourism Growth in LIC

Background:

LIC in Caribbean. Independent from the UK in 1962. Tourism has helped to reduce the development gap for some countries e.g. Bahamas and Jamaica. Jamaica is a relatively small island in the Caribbean with a **GDP of 14 billion.**

Attractions: Countries with tropical beaches, spectacular landscapes or abundant wildlife have become tourist destinations.

This has led to investment and increased income from abroad, which can be used for improving education, infrastructure and housing.

Positive Impacts

Tourism has led to a high level of **investment** on the North Coast, this includes new hotels, ports and **cruise liner facilities at Trelawny &** expansion of the airport. There are 200,00 jobs. Tourism contributed to 34% of Jamaica's GDP.

Negative Impacts

Mass tourism can create excessive waste, harmful emission, habitat destruction and degradation if it is not managed carefully.

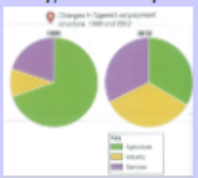
Not all Jamaicans benefit from tourism, there is still high levels of deprivation.

1. When did Jamaica become independent from the UK?
2. What is the GDP of Jamaica?
3. List 3 positive impacts of tourism in Jamaica.
4. List 3 negative impacts of tourism in Jamaica.
5. List one attraction of Jamaica.

Lesson 12 Global Importance of Nigeria

- West Africa, borders Benin, Niger, Chad, Cameroon and Atlantic
- Capital: Abuja; largest city: Lagos (Megacity – 15.4m population)
- Hot and wet in South, long dry season in North (Sahel).
- 2014: world's 21st largest economy (due to oil industry).
- Fifth largest contributor to UN peacekeeping missions.
- NEE: with fastest growing economy in Africa.
- Still very poor with average per capita incomes around $5,000 per year (compare to $32,000 per person per year in UK)
- 60% population live on less than a $1 a day

1. Name the 4 neighbouring countries to Nigeria.
2. What is the capital city and the megacity.
3. Where did Nigeria rank with it's economy in 2014 and why?
4. What economic grouping does Nigeria fall into (HIC, LIC or NEE)?
5. What % of the population live on less than $1 a day?

Lesson 13 Context of Nigeria	Lesson 14 Changing Economic and political links	Lesson 15 TNC's in Nigeria
Political context Nigeria was a UK colony, becoming independent in 1960. Political instability followed and affected Nigeria's development and led to widespread corruption and Civil war 1967-70.Since 1999 it has had a stable government. Increasing foreign investment in Nigeria e.g. China is boosting economic growth. **Social context** Multi-ethnic, multi-faith country This is a strength but has also been a source of conflict e.g. 1967-70 civil war Economic inequality between the Islamic north and Christian south has led to new tensions. **Cultural context** Nigerian music – e.g. musician Fela Kuti Nollywood – Nigerian film industry 2nd largest in the world Nigerian football team v. successful- has won the African cup of nations 3 times **Environmental context** Natural environments form a series of E-W bands because of decreasing rainfall towards the north. Semi-desert in the north, grasslands and forests further south.	**Changes in employment structure** 1999 large agriculture sector 2012 a more balanced economy, industry and services have grown  **Industry** Growing manufacturing sector, oil industry and related petrochemical industries. Also rapid advances in IT sector- beginning to drive the economy rather than oil. However, political corruption has damaged economic growth for many years. Industrial growth has led to pollution and destruction of habitats in effort to grow the economy (e.g. Niger delta) This has also led to rapid urban growth due to rural to urban migration leading to slum- problems with waste disposal, urban services failing to keep pace with the rates of economic growth.	A TNC is a Transnational Corporation. They tend to have a **major headquarters** in **HICs** and regional sub-offices and factories in other LIC and NEE countries to take advantage of labour, lower environmental standards and raw material costs. Two big TNCs in Nigeria are: **Unilever:** HQ in London and Rotterdam. In Nigeria since 1923. Makes toothpaste, soap etc. Employs 1500 people in Nigeria. **Shell Oil:** oil found in Niger Delta in 1958. Since then major contributor to taxes and export revenue. 65,000 workers and 250,000 jobs in related industries **Social issues:** Fish farms affected by oil spills therefore jobs affected. Oil thefts and sabotage Workers poorly paid **Economic issues:** Profits do not remain in Nigeria, they return to the HICs (Netherlands and UK) **Environmental issues:** Niger delta Oil spills (Bodo 2008/2009) Leaks in major oil pipelines. Ogoni people who live on the Niger delta have suffered from pollution caused by the oil industry.
1. When did Nigeria become independent? 2. Which country had colonised it? 3. Which country has been investing in Nigeria in recent years? 4. How stable is Nigeria today? 5. What is the name of Nigeria's film industry? 6. Describe Nigeria's natural environment.	1. How has Nigeria's economy has changed? 2. What key raw material has played an important part in Nigeria's development? 3. Give two negative consequences of Nigeria's development 4. What problem has held back Nigeria's development? 5. What problem has rapid rural to urban migration created?	1. What is a TNC? 2. Why do many TNCs locate their factories in LICS/NEES? 3. Give an example of two TNCs found in Nigeria. 4. Give two advantages & disadvantages of TNCs in Nigeria. 5. What is the issue on the Niger delta? 6. Give one negative social & one negative environmental impact of oil extraction here.

Lesson 16 Impact of Aid in Nigeria

Emergency aid is short term, following natural disaster or famine. **Development aid** is charity based, long term support such as roads, schools or health centres
Nigeria receives 4% of the aid sent to Africa, mostly from the USA and UK.

The most successful aid projects are community based, supported by small charities and NGOs
Long-term Development aid helps Nigeria mainly through community based projects, charities and NGOs.

Aduwan Health centre: 2010 clinic to educate mothers about immunisations (polio), HIV and AIDS, aim to reduce Infant Mortality Rate.

NGO nets for life – educates on malaria prevention and issues free anti-mosquito nets to many households.

Aid might not be used effectively in Nigeria: corruption in government means that some aid has been redirected or stolen.

1. When is Emergency aid used?
2. How much of Africa's aid does Nigeria receive?
3. Who are the main donors?
4. What are the most successful aid projects?
5. Why do you think this is?
6. What problem affects aid programmes in Nigeria?

Lesson 17 Impacts – Environment and Quality of Life

Environment
In Kano and Lagos, industrial pollutants go directly into rivers. Also, air pollution from industry.
70-80% of Nigeria's forests have been destroyed by farming, industrial development and urban growth.
Unplanned urban growth, waste disposal and traffic congestion are major issues in urban areas
Mining & oil extraction has caused significant water pollution e.g. on the Niger delta

Quality of life
Positive: HDI rapidly improving in Nigeria over time. Now HDI=0.5. Better more reliable jobs, lead to improvements in Quality of Life. Longer life expectancies, better access to safe water, smaller family sizes, lower Infant Mortality Rates.

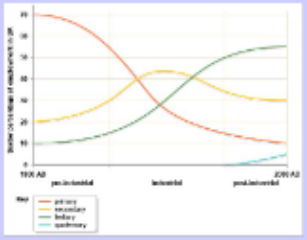
Year	Life Expectancy	Safe water %	Fertility Rate
1990	46	46	5
2013	52 (still low)!	64	2.5

Negative: However, 60% of Nigerians still live in poverty, the country is still unstable, still a religious divide and kidnappings by terrorist group Boko Haram still affect inward investment and confidence in the country.
Gap between rich & poor has become wider

1. What problem is industry causing in cities like Kano and Lagos?
2. How much of Nigeria's forests have been destroyed?
3. Why is this?
4. Is quality of life improving? Why?
5. Why are 60% of Nigerians still living in poverty?

Lesson 18 Causes of changing UK economy

Industrialisation took place in the UK during the 1800s. Most early manufacturing industry took place in areas with coal fields which provided energy. This was a 'break of bulk location', reducing transport costs.



De-industrialisation is the decline in secondary (manufacturing) industries, and the subsequent growth in tertiary and quaternary employment.

The UK experienced de-industrialisation in the 1980s, changing into a post-industrial economy; with more tertiary & quaternary industries. Secondary industry has moved to countries with lower wage costs e.g. China. High levels of unemployment, poverty and environmental dereliction in old industrial areas e.g. NE England

1. When did industrialisation happen in the UK?
2. Where did it take place?
3. Why did it happen there?
4. What is deindustrialisation?
5. What parts of the UK were affected?
6. What new types of jobs emerged?

Lesson 19 UK Post Industrial Economy

For many years, the UK economy thrived due to its **secondary industries**. However, following deindustrialisation in the 1980s, many of these jobs are now gone. It is now **a post-industrial economy**; one where most manufacturing jobs have been replaced by jobs in the service industries.

A new sector that is growing rapidly is the **quaternary industry**. Quaternary jobs are those that involve highly skilled people who carry out research, provide information and give advice e.g. financial advisers, research scientists. These jobs are well paid.

CAMBRIDGE SCIENCE PARK

Located to the **north-east of Cambridge,** the site is home to over 1,500 IT and bio-technology (quaternary) companies. Location factors include closeness to a major junction of the A14 which provides rapid access to the M11, and thereafter Heathrow and London. It is on cheaper land at the edge of the city. This land is flat and there is room for expansion. The proximity to Cambridge University promotes strong working relationships and access to the best University graduates.

1. What do we mean by a post-industrial economy?
2. What are quaternary jobs?
3. Where is the Cambridge Science Park?
4. Why is it located there?
5. What companies are located there?
6. Why is being close to Cambridge university important for these companies?

Lesson 20 UK Environmental Impact

Impacts of industry on the physical environment

- Negative visual impact of factories
- Air, water & soil pollution
- Pollution from road transport

Quarrying impacts

- Destroys natural habitats
- Pollutes streams & rivers
- Scars landscape
- Noise & dust pollution
- Increased road traffic

Torr Quarry, Somerset, SW England – making quarrying more sustainable

Limestone quarry for roads, buildings, cement etc.
100 people work at Torr Quarry

- Quarry being restored to create wildlife lakes
- Tree planting and grass to blend in with environment
- Monitoring – noise, air, dust, vibrations
- Rail transport of stone instead of road
- Digging quarry deeper, not wider to reduce impact.

1. Give one negative impact of industry on the physical environment.
2. Give two negative impacts of quarrying on the physical environment.
3. Where is Torr quarry?
4. What is quarried there?
5. Explain how quarrying at Torr has become more sustainable

Lesson 21 UK Changes in Rural Areas

Rural areas in the UK face a **number of problems**: depopulation, lack of employment, few services and poor transport links.
Not all areas are the same and some face different problems.

An area of population growth: South Cambridgeshire (close to London)
Population of 150,000 due to migration into the area
Social effects: young people cannot afford the high housing costs so move away, large edge-of-village estates means loss of community
Economic effects: loss of employment in agriculture as land is sold for housing

An area of population decline: the Outer Hebrides (remote location)
The population has declined by 50% since 1901
Social effects: outmigration of younger people means falling numbers of children and therefore school closures. Also, ageing population as young leave
Economic effects: services closing, limited employment opportunities

1. Give 2 problems that many rural areas face
2. What's the population of South Cambridgeshire?
3. What problems has population growth there caused?
4. What has happened to the population of the Outer Hebrides since 1901?
5. What problems is this causing?

Lesson 22 UK North South Divide	Lesson 23 UK and the Wider World	Key Terms:
Most areas affected by de-industrialisation (since 1970s) are in the north and west of the UK. The areas of industrial growth today tend to be in the south and west. The divide has led to social and economic differences. **Unemployment** in the north east is 5.5% higher than the south east. **Average pay** is £4,000 higher in the south and life expectancy is 2.5 years longer. In attempt to reduce the differences between the north and south governments have supported a number of schemes:  **HS2** HS2 is a High Speed rail link that will run from London to Birmingham (northern link to Manchester & Leeds cancelled in 2023) **Benefits** - 100,000 jobs will be created. **Problems** - The scheme will cost £100 billion **New road building in the north** £6 billion will be invested in northern roads to reduce congestion. **Benefit** - This will encourage economic growth as it will reduce the cost associated with longer transport times. **Problem** – negative environmental impacts of road building e.g. habitat loss	**UK Global links** **Commonwealth** The UK is a member of the Commonwealth. A group of 56 countries, most of which were British colonies. There are important trading and cultural links e.g. the Commonwealth games. **EU – Trade bloc** The UK joined the EU in 1973 with the aim of becoming part of the common market and improving trade between countries. The UK opted to leave in 2016. The future is uncertain but Britain is now free to arrange its own trade agreements. 42% of all UK trade is with the EU **Other links** The UK is a member of the G7, a group of 7 countries whose leaders meet to discuss important issues. The UK is a member of NATO (North Atlantic Treaty Organisation) a military alliance group of European countries and the USA.. The UK is a member of the UN Security Council. The UN is an international organisation promoting peace and stability. This role gives the UK significant global influence.	**Define these following terms:** Birth rate Business Park Bodo Death rate De-industrialisation Development Debt Debt Relief Employment structure Fair trade HDI Quality of Life Quaternary industry Intermediate technology Migration NGO North South divide Ogoni people Post-industrial economy Rural Science Park Sustainability Tourism TNC Trade bloc
1. What parts of the UK have been most affected by deindustrialisation? 2. Why? 3. Give two pieces of evidence that shows there is a North-South divide in the UK. 4. Give one benefit and one cost of HS2 5. Give one benefit and one cost of new roads	1. What is the Commonwealth? 2. Give an example of a link that it gives the UK to the rest of the world. 3. Why did the UK join the EU in 1973? 4. What happened in 2016? 5. How has this affected the UK's links with the EU? 6. Give two other examples of the UK's links to the rest of the world.	Notes

Nazi Germany (Democracy to Dictatorship) Knowledge Organiser

1	How did the Depression affect Germany?	High unemployment meant people found the Nazi message more appealing and voted for them.
2	When did Hitler become Chancellor?	January 1933
3	When was the Reichstag Fire?	February 1933
4	Which political party did the Nazis blame the fire on?	The Communists
5	When was the Enabling Act passed?	March 1933
6	How did the Enabling Act help Hitler secure power?	It gave him powers of a dictator. He used it to ban other political parties, make Trades Unions Nazi and took control of local governments and newspapers.
7	What does Gleichschaltung mean?	'Bringing Germany into line'
8	During the period of Gleichschaltung who was affected?	The Jewish were persecuted by law, Trade Unions were shut down as were political opposition.
9	When was the Night of the Long Knives?	June 1934
10	Who was the leader of the SA that was killed during the Night of the Long Knives?	Ernst Rohm
11	How did the Night of the Long Knives help Hitler?	The army became loyal to the Nazis; The SA's power was reduced; A culture of fear was created.
12	When did President Hindenburg die?	August 1934
13	How did Hindenburg's death help Hitler?	The German Army swore an oath of loyalty to Hitler. Hitler combined the offices of Chancellor and President to become 'Fuhrer' (meaning 'leader')

Key Terms

Reichstag	The German seat of government (like Britain's Parliament)
SA	The 'Storm Troopers'. The Nazis' army (different to Germany's army). It lost strength after the Night of the Long Knives.
SS	Hitler's personal army. This gained strength after the Night of the Long Knives. The members were more purely 'Aryan'.
Enabling Act	The law passed that meant Hitler could pass laws without consulting the Reichstag.
Fuhrer	The title Hitler created after Hindenburg died. It means 'Leader'

Nazi Germany (Controlling Germany) Knowledge Organiser		
1	How did the Nazis control Germany?	Propaganda; Terror; Weak opposition; The Nazis were popular.
2	Who was the head of propaganda in Nazi Germany?	Josef Goebbels
3	Who led the SS?	Heinrich Himmler
4	What was the Gestapo?	Nazi Secret Police
5	What examples of terror did the Nazis use?	Nazis controlled the police, the judges, they used the SS and Gestapo and they used concentration camps.
6	What examples of propaganda did the Nazis use?	Newspapers, Posters, 'People's Radio' sets, Rallies, Film, Berlin Olympics
7	Which political groups opposed the Nazis?	The Communists; the Social Democrats
8	Why were political groups not effective?	Social Democrats and Communists remained divided. Communists were identified and arrested by Gestapo.
9	Name the anti-Nazi Protestant Church	The Confessional Church
10	Who led the Confessional Church?	Martin Niemoller
11	Why was the Church ineffective at opposing the Nazis?	Nazis closed down Church schools and arrested some Church leaders, like Niemoller.
12	What was the name of the 'Nazi' Church?	Reich Church
13	In what ways was the Church successful in opposing the Nazis?	6000 pastors joined the Confessional church; Cardinal Galen criticised the Nazis successfully.
14	Which youth groups opposed the Nazis?	Swing Kids; Young Communists; Edelweiss Pirates

Key Terms

Concentration Camp	A prison for people who went against the Nazi regime
Gestapo	Secret police. Relied on denunciations from people. Used brutal methods to get people to confess.
Denunciation	To tell the Nazi authorities about someone who is not loyal to the Nazi regime
Propaganda	Exaggerated or even false information that is published in order to influence people.

Nazi Germany (Changing lives for Germans) Knowledge Organiser		
1	How did life for workers improve?	Most people had a job; Average wages rose; Beauty of Labour improved conditions.
2	How did life for workers get worse?	Trade Unions were abolished; People forced into National Labour Service; Cost of living rose.
3	What was the Strength through Joy?	It organised better leisure activities and holidays for workers (although most didn't benefit)
4	What was the one condition of the Marriage Loan?	The wife had to leave her job
5	In what ways were Nazi policies towards women successful?	Marriages increased to 772,000 by 1939; Number of women in higher education dropped.
6	In what ways were Nazi policies towards women unsuccessful?	Births dropped by 1939; Number of women in employment increased (eg. 3.3 million in industry)
7	What roles were children prepared for at school?	Girls to be mothers/housewives; boys to be soldiers.
8	In what ways were Nazi policies towards children successful?	School lessons designed to indoctrinate children; specialist schools for leaders; Hitler Youth made compulsory in 1939.
9	In what ways were Nazi policies towards children unsuccessful?	Many children bored by Hitler Youth and resented the message. 3 million had not joined by 1938
10	What were Jews banned from in March 1933?	Jewish lawyers banned from conducting legal affairs in Berlin.
11	What did the Nuremburg Laws of 1935 involve?	Marriages banned between Aryans and Jews. Jews are no longer citizens.
12	What happened on Kristallnacht in 1938?	267 synagogues destroyed; 91 Jews killed; 30,000 Jews sent to concentration camps.
13	What did Jews have to do by 1939?	Jews have to hand over jewellery, gold, silver and pearls.

Key Terms

Eugenics	The study of improving the human race. It is not at all considered a science today.
Beauty of Labour	Aimed to improve the workplace by building new toilets, showers and facilities.
Adolph Hitler Schools	Schools for children who were seen as future leaders of Nazi Germany. They were not very successful.
Hitler Youth	Groups (a bit like Scouts) for indoctrinating children and encouraging physical exercise.
Indoctrination	Brainwashing eg. Making sure schools indoctrinated children into Nazi thinking.

Nazi Germany (Germany in War) Knowledge Organiser		
1	What kind of problems did Germans face when war broke out?	Foods, clothing, shoes and coal were strictly rationed; German civilians spent much time queuing and the quality of products was reduced. In the spring of 1940, the RAF began bombing campaigns in Germany.
2	What items were soon rationed in Germany?	Bread, potatoes, butter, milk, cheese, eggs, cereal.
3	By 1941, what percentage of Germans were in war-related work?	55%
4	Who was made Minister of Armaments and War Production?	Albert Speer
5	How did the war change lives for women?	1.5 million were in the workforce by 1941
6	Who carried out the 1944 bomb plot against Hitler?	Colonel von Stauffenburg
7	Which religious leaders publically criticised the Nazis?	Dietrich Bonhoeffer and Cardinal Galen
8	How did the White Rose Group criticise the Nazis?	Leaflets. One was called 'An appeal to all Germans'
9	Who led the White Rose Group?	Sophie and Hans Scholl
10	What examples of passive resistance were there?	Reading banned literature; listening to the BBC; hiding Jews
11	How did total war impact people in Germany?	Women to join war effort; more shortages; more propaganda
12	How many people died in the bombing of Dresden?	25,000
13	What did Goebbels do to ensure Germany was focused on war?	½ million workers had to be soldiers; forced labour from other countries; more propaganda
14	When did the Nazis surrender?	May 1945

Key Terms	
Military expenditure	The amount a country spends on war
Passive resistance	Non-violent opposition
Total War	When everyone is enlisted to support the war effort
Volksturm	People's Storm (army). An army of young and old not already fighting. It was ineffective.

Nazi Germany (Occupation of Europe) Knowledge Organiser

1	What did Nazis aim to achieve in Poland?	Himmler in 1940 tried an experimental strategy in Poland – to remove as many of the Polish and Slavic people as possible and replace them with Germans.
2	What did the Nazis do to the Polish people?	Between 1939-45 over 1.5 million Poles were deported and forced to work in labour camps.
3	Why did the Nazis treat the Netherlands better?	Dutch people were considered by the Nazis to have an 'Aryan background'
4	What else demonstrated the Nazis were less harsh to the Netherlands?	The Dutch education system wasn't changed as the Nazis knew there would be a backlash to this.
5	What happen to the 1944 Polish Uprising to resist the Nazis?	The uprising was brutally crushed by the Nazis.
6	What kind of resistance happened in the Netherlands?	Anti-Nazi leaflets were printed and registry offices were attacked to gain access to ration cards and blank identity cards
7	What was the name of France that collaborated with the Nazis?	Vichy France
8	When did the Nazis starting putting Jews in ghettos?	1940
9	How many Jewish people did the Einsatzgruppen kill in 1941?	Around 1 million
10	What was the name of the gas used to kill Jewish people?	Zyklon B
11	What did senior Nazis decide at the Wannsee Conference in 1942?	To mass murder all Jewish people in Europe
12	How many people died at Auschwitz?	About 1.1 million killed

Key Terms

Hans Frank	The name of the Nazi Governor in charge of part of Poland
Ghettos	Enclosed districts where Jews would live in isolation from non-Jewish people
Einsatzgruppen	Killing units which were made up of SS, police& locals. When they reached villages the Einsatzgruppen rounded up Jews and communists
Wehrmacht	The German Army
Collaboration	Working with (the Nazis) to help them in their occupation

Geography Answer Sheet

Geography Knowledge Organiser Answer Sheet

Lesson 1	Lesson 2	Lesson 3	Lesson 4
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

Lesson 5	Lesson 6	Lesson 7	Lesson 8
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

Lesson 9	Lesson 10	Lesson 11	Lesson 12
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

Lesson 13	Lesson 14	Lesson 15	Lesson 16
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

Lesson 17	Lesson 18	Lesson 19	Lesson 20
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

Lesson 21	Lesson 22	Lesson 23	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	