Year 9 Cycle 2

Knowledge Organisers

Contents

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

SUBHEADINGS

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

BIG IDEAS

1. Look at the list of ideas the writer is trying to convey.
2. For each idea, write down HOW the writer does this.

MINDMAP

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

PICTURES

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

VOCABULARY

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

Questions

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

'Remains' – Knowledge Organiser

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

What is the context of the poem?

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

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

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

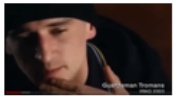
What other ideas are explored in the poem?

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

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

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



Design & Technology *knowledge organiser* Year 9

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

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

Know the meanings of these keywords

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

Types of movement and motion

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

Product Analysis – Identifying key features of trophy or award designs

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

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

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

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

Nutrition recall

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

8 tips for a healthy diet

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

VITAMINS AND THEIR FUNCTIONS

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

MINERALS AND THEIR FUNCTIONS

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

Questions:

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

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

Diet, nutrition & Health

Over vs under-nutrition

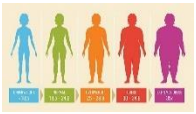
Over-nutrition – eating too much food, or too much of a certain food.
Under-nutrition - eating too little food or too little of a particular nutrient

Definitions:

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

The main health problems linked to obesity?

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



The main the risk factors are for CHD

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

The signs of type 2 diabetes

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

Normal

Blocked

Questions:

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

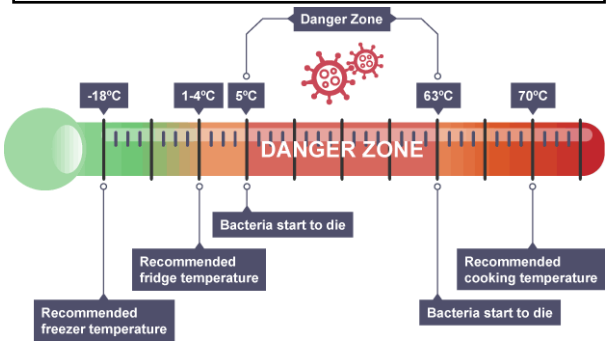
Homework 3 https://forms.office.com/e/ChZMtFxpu0

Food Poisoning bacteria, symptoms and causes

Food safety advice when handling food:

How do bacteria grow?

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



Definitions:

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

Food poisoning bacteria and symptoms

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

Symptoms of food poisoning:

- Vomiting
- Diarrhoea
- Nausea
- Stomach pains
- Dehydration

Questions:

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

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

Seasonality and food waste

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

How is food wasted?

There are 2 main reasons we waste food at home:

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

Using leftovers

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

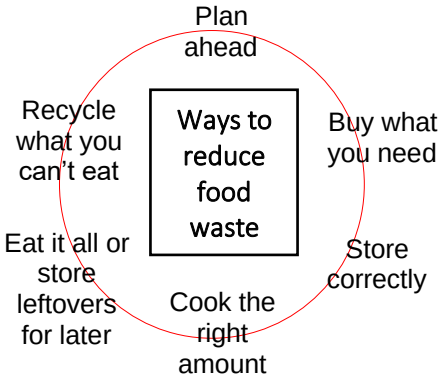
- Rice and pasta in salads
- Bread for breadcrumbs. Used to coat fishcakes, chicken goujons
- Potatoes used for bubble and squeak or frittata
- Chicken used in chicken curry or pie

Advantages of seasonal foods

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

Disadvantages of seasonal foods

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



Questions:

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

DRAMA — THEATRE IN EDUCATION (TIE) - KNOWLEDGE ORGANISER

Theatre in Education (TIE) is theatre created for **a particular age group or specific target audience.** The aim of Theatre in Education is to **educate the audience about a topic, issue or debate** – while also entertaining them and inspiring them. TIE can also bring stories from history or literature to life.

How Theatre in Education Started

The ground-breaking TIE movement was pioneered in 1965 by the **Belgrade Theatre Company** in Coventry. It was developed for young people and used theatre and drama to create a range of **learning opportunities for young people to explore political, ethical and moral issues** in a safe environment. Actor-teachers from the Belgrade Theatre Company would **tour local schools** where they would **perform short pieces of theatre and lead workshops** that allowed students to **explore important issues and ideas in active and creative ways.** One of their most successful projects is called **'Big School'** – a performance that helps young people transition from **primary to secondary school.**

Other Famous TIE Companies

Founded in 1982 **Big Brum** is another famous TIE company. They are based in the West Midlands and they run educational programmes which **tour primary, secondary and other educational settings.** Big Brum works across all ages, backgrounds and abilities, using theatre and drama to **help young people make meaning of their lives and the world around them.**

The **National trust** is not only Europe's **largest conservation charity**, it also runs an award winning schools programme led by experienced facilitators and theatre practitioners, with workshops, plays and interactive drama for primary and secondary students.

Forum Theatre

Augusto Boal (a Brazilian Theatre Director) developed 'Forum Theatre' during the 1960s. He understood how Theatre could be a powerful tool to educate and empower people to make changes to their current situation.

Forum Theatre is best described as interactive Theatre. One of the characters in the play or scene has some kind of dilemma or problem that they are trying unsuccessfully to overcome. Audience members are allowed to stop the action and make suggestions as to what the character could do. The scene is replayed several times with different audience members' suggestions being tried until the problem is successfully overcome. Forum Theatre developed further when Boal invited a female member of the audience onstage to show the actor what she wanted to be acted out. This was because she became so frustrated and angry with an actor who did not understand her suggestion. This event led to the birth of the spect-actor!!!!

"Theatre is a form of knowledge; it should and can also be a means of transforming society. Theatre can help us build a future, rather than just waiting for it." Augusto Boal

Key Features of Theatre in Education

· **Target Audience** — Who the play is aimed at e.g. different school year groups, university students, car drivers, the Elderly, young offenders, prisoners.
· **A Relevant Topic** — Something sensitive that could effect the Target Audience.
· **A Strong Message** — A clear aim and educational objective running throughout. TIE often explores issues from various viewpoints, so we can see the effect of an action upon a range of people.
· **Educational Information** — The inclusion of facts and figures to educate the audience.
· **Small Versatile Casts** — TIE tours between venues and is low budget so actors must multirole, operate technical equipment and sometimes play musical instruments.
· **Costume** — The costumes are simple and symbolic/representational, especially if actors have to multi-role.
· **Basic Set & Props**— The production design must be portable so the design must be simple and representational/symbolic.
· **Basic Lighting and Sound** — Often TIE companies use the venues house lights but some companies tour with a small portable lighting rig.
· **Audience Participation** — The audience are often spoken to directly (breaking the fourth wall) and asked to participate in parts of the performance — there is often a workshop after the show.
· **Forum Theatre** — A form of audience participation developed by Augusto Boal where the audience can suggest ways to change the outcome of the performance.
· **Balance between Theatre & Education** — One of the hardest things in TIE is finding the right balance between the theatrical experience and educating the audience.
· **Visual elements** — Use of Projectors/PowerPoint/Placards to emphasise the message.
· **Episodic** - Smaller scenes that can stand alone.
· **Use of Narrator/Narrating** — A storyteller. It could be someone who lives outside the world of the play or a character in the story.
· **Direct Address** — Characters acknowledge and talk to the audience, often asking for their advice.
· **Multi-roling** — Actors playing more than one part.
· **Stereotypes** —Characters in TIE are often stereotypical (caricatures) in order to make an immediate point to the audience.
· **Monologue** — A continuous uninterrupted speech by one actor. It could be to another actor or the thoughts of the character said aloud.
· **Movement & Physical Theatre** — Mime, physical theatre and movement work are often favoured over naturalism.
· **Music & Dance** — Music is a great way of quickly creating the correct atmosphere and dance is popular in TIE with younger target audiences.

Steps to Devising a piece of TIE

1. Decide on the **target audience**
2. Decide on the **topic** of the scene
3. Agree the **key message/educational information**
4. **Research** the topic
5. **Setting**— Consider where the play takes place
6. **Write/devise** the **scene/play**
7. **Audience participation**
8. **Evaluation**

Geography Knowledge Organiser

Year	9	Cycle	2	Topic	Resource Management

Subject vocabulary

Resource	A stock or supply of something that has a value or purpose. The three most important resources are food, energy and water
Malnourishment/ Undernourishment	Lack of proper nutrition to support good health, caused by not having enough to eat or by not eating enough of the right things.
Food Supply	How much food is available in an area
Surplus	More than enough of a resource per person
Deficit	Not enough of a resource per person
Food miles	The distance food has travelled from producer to consumer
Organic food	Food grown/ produced without chemicals (often small scale and more expensive)
Agribusiness	Treating agricultural production like a large scale industrial business
Demand	How much something is wanted
Carbon Footprint	The amount of carbon a person releases into the environment because of their own individual activities.
Eutrophication	Excess fertilisers from land in a body of water, promoting algae growth- which eats up oxygen supply in water
Water transfer schemes	When water is transferred from areas of surplus to areas of deficit
Renewable Resources	A resource that will not run out, relies on nature to harness energy. For example: Solar, wind, tidal, hydro-electric, biomass/biofuel, geothermal.
Fossil Fuels	A natural fuel in the form of coal, oil or gas that is formed form the remains of living organisms. It is 'non-renewable' (It will eventually run out)
Fracking	The process of injecting liquid at high pressure into rocks to force open existing cracks to extract oil or gas
Energy mix	The different categories of energy used by a country.
Poverty	The state of being extremely poor. Often described as a 'vicious cycle'
Famine	Extreme scarcity of food (causing many deaths)
Drought	A prolonged period of low rainfall = to a shortage of water
Appropriate technology	Technology that is suited to the needs, skills, resources, wealth and knowledge of the people who live in a local area, for the environment in which they live. For example, solar powered lights, simple pump systems etc
Food security	Having access to safe, nutritious food
Hydroponics	Growing plants without soil. Instead, they use nutrient solution.
Aeroponics	Plants are suspended in air and a fine mist of water containing nutrients is sprayed onto the roots.
Irrigation	Artificially watering the land so crops can grow. Useful in dry areas- makes crops more productive.
Biotechnology	Genetically modified (GM) crops changes the DNA of foods to enhance productivity and properties
The New Green Revolution	Aims to improve yields in a more sustainable way. Involves using both GM varieties and traditional and organic farming.
Permaculture	Growing food with help from natures systems. For example, instead of using pesticides to remove aphids (small green flies) using ladybirds instead as aphids' natural predator
Food loss	Food thrown away before point of sale. Combat this by shops selling 'wonky veg!'. Body shop wonky carrot face mask.
Food waste	Food thrown away after sale- household waste. Educating people on use by and sell by dates. App- Too Good To Go.
Urban farming	Using empty land, roof tops and balconies to grow food and raise animals in towns and cities (Allotments)
Sustainable meat	Free range, grass fed. Encouraging more white meat to be eaten. Food labels such as 'red tractor' to ensure consumers know where their meat has come from
Sustainable fish	Diving for seafood instead of bottom trawling. Pole and line instead of nets.
Rice-fish culture	Growing rise and fish together. They have a symbiotic relationship.

Significance of key resources

Resources such as food, energy and water are what is needed for basic human development.

FOOD	WATER	ENERGY
Without enough nutritious food, people can become **malnourished**. This can make them ill . This can prevent people working or receiving education.	People need a supply of **clean and safe water** for drinking, cooking and washing. Water is also needed for food, clothes and other products.	A good supply of energy is needed for a basic standard of living. People need **light and heat** for cooking or to stay warm. It is also needed for industry.

Demand outstripping supply

The demand for resources like food, water and energy is rising so quickly that supply cannot always keep up. Importantly, access to these resources vary dramatically in different locations

1. Population Growth

- Currently the global population **is 7.3 billion**.
- Global population has risen **exponentially** Global population is expected to reach **9 billion by 2050**.
- With more people, the **demand** for food, water, energy, jobs and space **will increase**.

2. Economic Development

- As **LICs** and **NEEs** develop further, they require **more energy** for industry.
- **LICs** and **NEEs** want similar lifestyles to **HICs**, therefore they will need to **consume more resources**.
- Development means **more water is required** for food production as diets improve.

3. Changing Technology and Employment

- The demand for resources has driven **the need for new technology** to reach or gain more resources.
- More people in the **secondary and tertiary industry** has increased the **demand for resources** required for electronics and robotics.

Food in the UK

Growing Demand

- The UK imports about 40% of its food. This increases people's **carbon footprint**.
- There is growing demand for greater choice of **exotic foods** needed all year.
- Foods from abroad are more affordable.
- Many food types are unsuitable to be grown in the UK.

Impact of Demand

Foods can travel long distances (food miles). Importing food adds to our carbon footprint.
+ Supports workers with an income + Supports families in LICs. Taxes from farmers' incomes contribute to local services.
- Less land for locals to grow their own food. Farmers exposed to chemicals.

Agribusiness

Farming treated like a large industrial business. This is increasing food production.
+ Intensive faming maximises the amount of food produced.
+ Using machinery which increases the farms efficiency.

- Only employs a small number of workers.
- Chemicals used on farms damages the habitats and wildlife.

Sustainable Foods

Organic foods that have little impact on the environment and are healthier.
Local food sourcing is also rising in popularity.

- **Reduces emissions** by only eating food from the UK.
- **Buying locally sourced** food supports local shops and farms.
- A third of people **grow their own food**.

Water in the UK

Growing Demand

The average water used per household has risen by 70%. This growing demand is predicted to increase by 5% by 2020. This is due to:

- A growing UK population, Water-intensive appliances, Showers and baths taken, Industrial and leisure use, greenhouses.

Deficit and Surplus

The north and west have a **water surplus** (more water than is required).
The south and east have a **water deficit** (more water needed than is actually available). More than half of England is experiencing **water stress** (where demand exceeds supply).

Pollution and Quality: Cause and effects include:

Chemical run-off from farmland can destroy habitats and kills animals. Oil from boats and ships poisons wildlife. Untreated waste from industries creates unsafe drinking water. Sewage containing bacteria spreads infectious diseases.

Management

UK has **strict laws** that limits the amount of discharge from factories and farms.
Education campaigns to inform what can be disposed of safety. **Waste water treatment plants** remove dangerous elements to then be used for safe drinking. Pollution traps (reed beds) catch and filter pollutants.

Water Transfer

Involves moving water through pipes from areas of surplus (Wales) to areas of deficit (London).
Opposition includes:
Effects on **land and wildlife**. High maintenance **costs**. The **amount of energy** required to move water over long distances.

Energy in the UK

Growing Demand

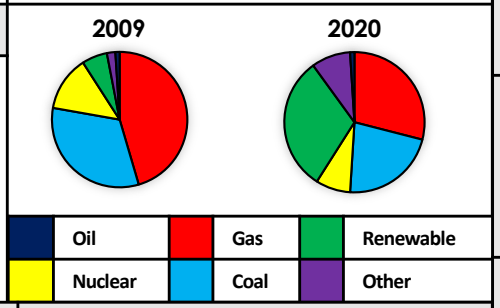
The UK **consumes less energy** than compared to the 1970s despite a smaller population. This is due to the **decline of industry**.

Energy Mix

The majority of UK's energy mix comes from **fossil fuels**. By 2020, the UK aims for 15% of its energy to come from **renewable sources**. These renewable sources do not contribute to **climate change**.

Changes in Energy Mix

- 75% of the UK's oil and gas has been used up.
- Coal consumption has declined (about 1%)
- UK has become too dependent on imported energy.



Significance of Renewables

+ The UK government is investing more into low carbon alternatives.
+ UK government aims to meet targets for reducing emissions.
+ Renewable sources include wind, solar and tidal energy.
- Although infinite, renewables are still expensive to install.
- Shale gas deposits may be exploited in the near future

Exploitation

Nuclear

+ New plants provide job opportunities.
- Problems with safety and possible harm to wildlife.
- Plants are expensive.

Wind Farm

+ Locals have low energy bills.
+Reduces carbon footprint.
- Construction cost is high.
- Visual impacts on landscape.
- Noise from wind turbines.

Option 1: FOOD

The impacts of food insecurity

Famine	A large-scale scarcity of food; often causes large loss of life
Undernutrition	When you don't get enough nutrients of a particular sort to keep your body healthy.
Soil erosion	If people are struggling to get enough food, they may not use the best agricultural practices, e.g. they may over-cultivate the land (grow crops repeatedly, without allowing time for the soil to recover its nutrients).
Rising prices	When there isn't enough food available, food prices usually increase. This is because shops don't have to lower their prices to compete for customers — people will pay any price to get the food they need. This means that the poorest people can't afford to feed themselves properly.
Social unrest	People expect governments to help them get enough food during times of food insecurity, e.g. during a drought. If governments don't appear to be doing enough, make the situation worse or distribute aid unfairly, it can cause rioting and even turn into a bigger conflict, e.g. a civil war.

A large scale agricultural development: Almeria, Spain

The southeast of Spain near Almeria has always been an arid area. Most of the UK's out-of-season crops, such as tomatoes, lettuce etc. are grown here. Almost all the plants are grown using hydroponics.

Increasing Food Supply

Hydroponics - A method of growing plants without soil. Instead they use nutrient solution.
Aeroponics - plants are suspended in air and a fine mist of water containing nutrients is sprayed onto the roots.
New Green Revolution - Aims to improve yields in a more sustainable way. Involves using both GM varieties and traditional and organic farming.
Biotechnology - Genetically modified (GM) crops changes the DNA of foods to enhance productivity and properties.
Irrigation - Artificially watering the land so crops can grow. Useful in dry areas to make crops more productive.
Appropriate technology - Using appropriate technologies involves choosing ways of increasing food production that are suited to local environments and the needs, skills, knowledge and wealth of the people in those areas. For example, in LICs: Individual wells with easy to maintain, mechanical pumps are more suitable than larger, diesel powered pumps.

Option 1: FOOD

Food Security is when people at all times need to have physical & economic access to food to meet their dietary needs for an active & healthy life. This is the opposite to Food Insecurity.

Human

- **Poverty** prevents people affording food and buying equipment.
- **Conflict** disrupts farming and prevents supplies.
- **Food waste** due to poor transport and storage. **Climate Change** is affecting rainfall patterns making food production difficult.

Physical

- The **quality of soil** is important to ensure crops have key nutrients.
- **Water supply** needs to be reliable to allow food to grow. **Pest, diseases and parasites** can destroy vast amounts of crops that are necessary to populations. **Extreme weather** events can damage crops (i.e. floods).

A large scale agricultural development: Almeria, Spain *Continued…*

Advantages	Disadvantages
• Large amounts of cheap, temporary labour • The advance of hydroponic growing techniques. • Low energy costs all-year-round warmer temperatures • Relatively cheap fresh fruit and vegetables • A new desalination plant supplying fresh water from sea water • New scientific agribusiness companies, providing high-skilled jobs in research and development	• Increased use of pesticides has led to increased health risks • Many immigrants are working illegally and so have little control • Clashes between immigrants from different countries • Labour is paid very low wages and often in poor conditions • Large amounts of chemical containers and plastic sheeting. • Aquifers in the area are drying up • The greenhouses reflect sunlight back into the atmosphere and have contributed to the cooling of the area. (Albedo effect)

A local sustainable food production scheme: Jamalpur, Northern Bangladesh

Over **57% of the income is from agriculture**. Many farmers are subsistence farmers who grow food to feed their family. The main crops in the area are **rice**, jute and wheat. The charity **Practical Action** has been working with farmers to increase their income and also to improve the **nutrition**.

They have been doing this through the use of **rice–fish culture**, where small local fish are introduced to the paddy fields. The small fish are safely hidden from predators (birds) among the rice plants. The **fish provide a natural fertiliser for the rice with their droppings**, **eat insect pests** and help to **circulate the oxygen** in the water around the rice plants. Using this method rice **yields** have been **increased by 10%!**

The fish provides a valuable supply of **protein** for the local people, so improving their **health**. The increased rice yield not only helps to feed the farmers' families, but also provides a **surplus to sell at market**, so increasing their **incomes**. This method of farming increases food production **without** the use of **chemicals** or impact on the environment.

The most important aspect of this scheme is that it is **sustainable**. It is run by the local people to increase food production. They **teach** each other and **pass on their knowledge once trained**. They use crops and livestock suitable for the local conditions and do not use large amounts of chemicals or large-scale irrigation**, so do not need vast amounts of financial investment**. The impact on the local environment is minimal, but the impact on local food supply is great.

Sustainable food supply

Organic Farming	No use of chemicals, often sold locally reducing food miles
Permaculture	Working with nature's systems- using ladybirds to control aphid populations
Urban Farming	Using empty land, roof tops and balconies to grow food and raise animals in towns and cities, e.g. allotments. Reduces food miles, improves mental health & education
Sustainable fish and meat	Fish- reducing bottom trawling and large net fishing. Diving for seafood and pole and line. Reducing red meat consumption, encouraging free range grass fed. Food labels such as red tractor or RSPCA assured to encourage ethical shopping
Food waste and loss	Food loss is food thrown away before point of sale, many shops (Aldi/ Lidl) selling wonky veg/fruit boxes for £1.50. Food waste- domestic, educating consumers on labels

Lessons:

(If you cannot access the QR code, ask your teacher to share the folder with your school email)

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

Key concepts

These are '**big ideas**' in Geography. They help us link different areas of the subject together through a common thread.

Processes	A sequence of actions, natural and/or cultural, that shape and change environments, places and societies. Processes are the driving forces (cogs) behind natural and human change.
Risk	The probability of an event causing harmful consequences (loss of life, injuries damage) to humans and the environment. Humans can become resilient towards risk.
Adaptation	The process of change. This can be how humans alter their behaviour in order to become more resilient, or can refer to organisms adapting in order to suit their environment better.
Sustainability	Meeting our needs today without compromising future generations to meet their own needs. It is all about being caring and considerate of the present and the future.
Inequality	This means unequal. This normally is applied in human geography when looking at development, migration and resources.

Knowledge organiser - Cycle 2 – Interwar years

Department: History

Scheme of learning: Interwar Years

Overview: This period was marked by struggles in much of the world, as Europe struggled to recover from the devastation of the First World War. It was at this time that the Weimar Republic in Germany gave way to two episodes of political and economic turmoil. The first with the German hyperinflation of 1923 and the second brought on by the worldwide depression, resulted in the rise of Nazism.

Timeline of key events

11th November 1918	Armistice signed ending the fighting of World War One
28th June 1919	The Treaty of Versailles is signed, officially bringing World War One to an end
January 1920	The new League of Nations meet for the first time
October 1922	Benito Mussolini starts his rule in Italy, initially as Prime Minister before later setting himself up as a legal dictator
January 1923	France and Belgium occupy the industrial region of the Ruhr in Germany over reparations
1923	Germany suffers from hyperinflation, causing huge social and economic problems
1924	Dawes Plan reorganises reparations in Germany's favour
October 1925	Locarno Conference – Germany voluntarily accepts its western borders
June 1929	Young Plan eases reparations burden but hated by many Germans
October 1929	Wall Street Crash
January 1933	Hitler becomes Chancellor of Germany
1935-1939	Hitler begins to repeal terms of the Treaty of Versailles and gain territory whilst Britain and France follow a policy of appeasement in hopes of avoiding a new war

Key terms

Democracy	A form of government in which the people have the authority to choose their governing legislation
Dictator	A ruler with total power over a country, typically one who has obtained control by force
Treaty	A formally concluded and ratified agreement between countries
Hyper-inflation	Inflation of money at a very high rate
Reparations	The action of making amends for having done something wrong, by providing payment or other assistance to those who have been wronged
Capitalism	Capitalism is an economic system based on the private ownership of the means of production and their operation for profit.
Communism	a theory or system of social organization in which all property is owned by the community and each person contributes and receives according to their ability and needs.

How did NSDAP gain control?

Institutions of terror - Hitler ruled Germany with 'henchmen'. These Nazis made the German people feel too afraid to express any criticism or opposition.

- SS – paramilitary unity
- Gestapo – secret state police

Propaganda - On the 13th march, 1933 the ministry of public enlightenment and propaganda was created – headed by Josef Goebbels. Using clever messages to win the hearts of the German people, propaganda was quickly implemented around the country.

Key people

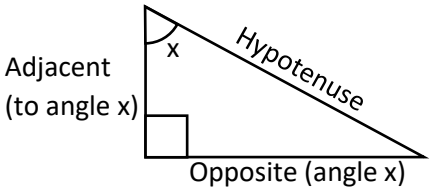
Adolf Hitler German politician and leader of the Nazi Party.

Josef Goebbels German Nazi politician and Reich Minister of Propaganda of Nazi Germany from 1933 to 1945.

Benito Mussolini Italian politician and journalist who founded and led the National Fascist Party.

Josef Stalin Soviet politician who ruled the Soviet Union from the mid-1920s until his death in 1953.

Y9C2 Key knowledge

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>The sides of a right angled triangle</td><td>Hypotenuse (H)
Adjacent (A)
Opposite (O)
 
</td></tr>
<tr><td>SOHCAHTOA</td><td>$sin(x) = \frac{O}{H}$ $cos(x) = \frac{A}{H}$ $tan(x) = \frac{O}{A}$</td></tr>
<tr><td>Coordinate</td><td>A place. Written as (x, y)</td></tr>
<tr><td>Vector</td><td>A movement.
Written as $\begin{pmatrix} x \\ y \end{pmatrix}$
A quantity that has size and direction</td></tr>
<tr><td>Scalar</td><td>A quantity that just has size (ordinary numbers are scalars)</td></tr>
<tr><td>Percentage multiplier</td><td>A decimal value that increases or decreases and amount by a percentage.
<table>
<tr><th>Multiplier</th><th>Effect</th></tr>
<tr><td>$\times 1.04$</td><td>Increases by 4% (100% + 4% = 104%)</td></tr>
<tr><td>$\times 1.4$</td><td>Increases by 40% (100% + 40% = 140%)</td></tr>
<tr><td>$\times 0.6$</td><td>Decreases by 40% (100% - 40% = 60%)</td></tr>
</table></td></tr>
<tr><td>The repeated percentage change formula</td><td>$new\ value = starting\ value\ \times multiplier^{time\ period}$

Also known as the compound interest formula</td></tr>
<tr><td>Interest</td><td>Money paid regularly at a particular rate for the use of money lent, or for delaying the repayment of a debt. Usually given as a percentage.</td></tr>
<tr><td>Compound interest</td><td>Interest that is calculated on the original amount and the interest already paid (or charged).</td></tr>
<tr><td>Simple interest</td><td>Interest that is only calculated on the original amount.</td></tr>
<tr><td>Depreciation</td><td>A decrease in value. Eg. The value of the car depreciated (decreased).</td></tr>
</table>

Y9 French LC2 SB1 French festivals & culture : Quelle est ta fête préférée?

Opinion verb	Festival nouns	pronoun	present tense phrase	opinion		adjective
Ma fête préférée est (My favourite festival is) J'ai toujours aimé (I've always liked) Je n'ai jamais aimé (I've never liked)	le jour de Noël (Christmas Day) la fête Nationale (Bastille Day) le jour de l'an (New Year's Day) la fête des rois (Twelfth Night) la Saint Valentin (Valentine's Day) le 1er avril (April Fool's Day) Pâques (Easter) Diwali (Diwali) Eid (Eid/Ramadan) Hanoucca (Hanukkah)	pour célébrer on (to celebrate we) d'habitude on (usually we) 	s'offre des cadeaux (give presents) colle un poisson sur le dos (Stick a fish to the back) fait un défilé/un concert (have a parade/concert) regarde les feux d'artifice (watch the fireworks) envoie des cartes/fleurs (send cards/flowers) prend des photos (take photos) mange un repas spécial (eat a special meal) on mange du chocolat/un gâteau (we eat chocolate/a cake) on va à l'église/ à la mosquée/ à la synagogue/au temple (we go to church/mosque/ synagogue/temple)	selon moi c'est (according to me it's)	assez (quite) très (very) vraiment (really) trop (too) hyper (super)	inoubliable (unforgettable) romantique (romantic) animé (lively) traditionnel (traditional) joyeux (merry/happy) formidable (wonderful) amusant (fun) délcieux (delicious) nul (rubbish) barbant (boring)

Y9 French LC1 SB2 : Describing family celebrations: Qu'est-ce que tu as fait pour fêter ton anniversaire ?

Time marker	past tense phrase	occasion	subject	auxiliary	tense	opinion tense	opinion phrase
		mon anniversaire (my birthday)					
Récemment (recently) Hier (yesterday) l'année dernière (last year) Il y a deux ans (two years ago)	j'ai célébré (I celbrated) j'ai fêté (I celebrated) on a célébré (we celebrated) on a fêté (we celebrated) 	l'anniversaire de (the birthday of) le mariage de (the marriage of) le PACS de (the civil partnership of) la naissance de (the birth of)	mon père/mon beau-père ma mère/ma belle-mère ma sœur/ma belle-sœur mon frère/mon beau-frère mon cousin ma cousine mon oncle ma tante mes grands-parents mon copain ma copine mon neveu ma nièce	j'ai (I) on a (we)	mangé un gâteau (ate a cake) fait la fête (had a party) donné des cadeaux (gave presents) reçu des cadeaux (received presents) lancé des confettis/fleurs (threw confetti/flowers) pris beaucoup de photos (took lots of photos) invité beaucoup de gens (invited lots of people porté des beaux vêtements (wore beautiful clothes)	c'était (it was)	inoubliable (unforgettable) romantique (romantic) amusant (fun) passionnant (exciting) joyeux (joyful) formidable (wonderful) fou (crazy) embêtant (annoying) fatigant (tiring)

Y9 French LC2 SB3: Daily routine : Que fais-tu normalement ?

Time marker	present tense reflexive	connective	time marker	tense	verb phrase	connective /verb	adjective
Avant d'aller au collège (before going to school) D'abord (Firstly) Le matin (In the morning) Pendant la semaine (during the week) D'habitude (Usually) 	je me lève tôt (I get up early) je me lave (I wash myself) je me brosse les cheveux (I brush my hair) je prends le petit déjeuner (I have breakfast) je bois un thé/café (I drink a tea/coffee) je lis mes messages (I read my messages) je fais mes devoirs (I do my homework) Je vais au collège (I go to school)	mais (but) cependant (however) pourtant (however)	pendant les grandes vacances (during the summer holidays) le weekend prochain (next weekend)	je vais (I'm going to)	me lever tard (get up late) me resposer (rest) rester au lit (stay in bed) rencontrer mes amis (meet my friends) faire du sport (do sport) regarder la télé (watch TV) écouter de la musique (listen to music)	car ce sera plus (because it will be more) car ce sera moins (because it will be less)	agréable (pleasant) amusant (fun) formidable (terrific) reposant (relaxing) intéressant (interesting) sociable (sociable) fatigant (tiring) stressant (stressful) barbant (boring)

Y9 French LC2 Sentence Builder 4: Illnesses : Tu étais malade ?

Time marker	Past tense	Connective	Time marker	Present tense	Past tense	Illness phrase
Hier (Yesterday) Lundi dernier (Last Monday) Mardi dernier (Last Tuesday) Le weekend dernier (Last weekend)	j'étais malade. (I was ill) j'ai eu un accident. (I had an accident))	Malheuresement (Unfortunately)	quand j'étais en train de (I was in the middle of)	faire du sport (doing sport) traverser la rue (crossing the road) étudier en classe (studying in class) regarder un film (watching a film) faire du ski/surf (doing skiing/surfing)	j'ai eu (I had)	mal à la tête (a headache) mal au dos (a bad back) mal au cœur (I felt sick)
					je me suis cassé (e) (I broke)	le bras (my arm) le pied (my foot) la jambe (my leg)
donc (so) mais maintenant (but now) alors maintenant (so now)	je me sens mieux (I feel better) je suis fatigué(e) (I'm tired) je dois rester au lit (have to stay in bed) je dois aller à l'hôpital (have to go to the hospital) je prends des médicaments (I'm taking medecine) je vais chez le médecin (I'm going to the doctor) je dois me reposer (I have to rest)					

Year 9 Spanish Learning Cycle 2 Sentence Builder 1:

¿Por qué te llevas bien con...? = Why do you get on well with…?

<table>
<tr><th>Verb</th><th>Noun</th><th>Connective</th><th>Verb</th><th>Quantifiier</th><th>Adjective</th></tr>
<tr><td rowspan="4">Me encanta = I love

Me gusta = I like

Me llevo bien con…
= I get on well with…

Me peleo con…
= I fight with…

Me divierto con…
= I have fun with…</td><td rowspan="4">mi pareja
= my partner

mi novio
= my boyfriend

mi novia
= my girlfriend

mi amig@
= my friend

mi hermano
= my brother

mi hermana
= my sister

mi profesor de...
= my ... teacher</td><td rowspan="4">porque =
because</td><td>es = he/she
is</td><td>demasiado= too
tan= so
muy= very
bastante= quite
un poco = a bit</td><td>alegre = cheerful
ambicios@ = ambitious
bonit@ = pretty/nice
débil = weak
enojad@ = angry
fiel = faithful/ loyal
gracios@ = funny
nervios@ = nervous
optimista = optimistic
orgullos@ = proud
perezos@ / vag@ = lazy
sensible = sensitive
tolerante = tolerant
tont@ = silly</td></tr>
<tr><td>Time phrase</td><td colspan="2">Verb phrase</td></tr>
<tr><td>siempre =
always
nunca =
never</td><td colspan="2">me apoya = (he/she/it) support me
me ayuda = (he/she/it) helps me
me escucha = (he/she/it) listens to me
me critica = (he/she/it) criticises me
me acepta como soy =(he/she/it) accepts me as I am
me hace reír/ llorar = (he/she/it) makes me laugh/ cry</td></tr>
<tr><td colspan="2">tenemos mucho en común = we have lots in common</td></tr>
<tr><td colspan="3">un buen amig@ es alguien que =
a good friend is someone who</td><td colspan="3">  </td><td>te apoya = supports you
te ayuda = helps you
te escucha = listens to you
no te critica = doesn’t criticise you
te conoce bien = knows you well</td></tr>
</table>

Year 9 Spanish Learning Cycle 2 Sentence Builder 2:

¿Quién es tu influencer preferido? = Who is your favourite influencer?

<table>
<tr><th>Verb</th><th>Connective</th><th></th><th>Verb</th><th>Adjective</th></tr>
<tr><td rowspan="3">Sigo a… =
I follow…</td><td rowspan="3">porque = because
aunque = even though</td><td rowspan="3">Creo que = I think that

Diría que = I'd say that

Para mí = in my opinion</td><td>es = he/she is
era = he/she was
será = he/she will be</td><td>artístic@ = artisitic
bisexual = bisexual
conocid@ por = known for
especial = special
famos@ = famous
gay = gay
gracios@ = funny
heterosexual = heterosexual
joven = young
latin@ = Latin American
musical = musical
ric@ = rich
solter@ = single
transgénero = trangender
únic@ = unique</td></tr>
<tr><td>Verb</td><td>Noun</td></tr>
<tr><td>lucha por =
he/she fights for

lucha contra =
he/she fights against</td><td>el amor = love
el arte = art
el comportamiento = behaviour
el conflicto = conflict
la cultura = culture
el deporte = sport
la discriminación = discrimination
las drogas = drugs
la identidad = identity
la imagen (de) = image (of)
la industria = industry
la política = politics
las víctimas = victims</td></tr>
</table>

Year 9 Spanish Learning Cycle 2 Sentence Builder 3:

¿Quién es tu model a seguir? = Who is your role model?

Noun	Verb	Adjective	Connective	Verb	Noun
Mi modelo a seguir = my role model	es = he/she is era = he/she was	Carlitos Alcaráz Ibai Llanos Frida Kahlo Lin Manuel Miranda Rigoberta Menchú Rosalía alemán(a) = German argentin@ = Argentinian británic@ = British chin@ = Chinese chilen@ =Chilean colombian@ = Colombian cuban@ = Cuban español(a) = Spanish europe@ = European francés(a) = French inglés(a) = English italian@ = Italian lati@ = Latin American mexican@ = Mexican católico = Catholic cristian@ = Christian judí@ = Jewish musulmán(a) = Muslim religios@ = religious vegan@ = vegan vegetarian@ =vegetarian blanc@ = white negr@ = black	y	es = he/she is era = he/she was	un gran activista = a great activist un gran actor/actriz = a great actor/actress un gran autor = a great author un gran cantante = a great singer un gran carácter = a great character un gran compañer@ = a great colleague un gran cuidador(a) = a great carer un gran deportista = a great sports person un gran escritor = a great writer una gran estrella = a great star un gran influencer = a great influencer un gran jugador(a) de... = a great … player una gran mamá = a great mum un gran modelo = a great model un gran músic@ = a great musician un gran papá = a great dad un crack = a legend 

Year 9 Spanish Learning Cycle 2 Sentence Builder 4:

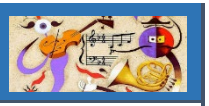
¿Qué son tus planes para el futuro? – What are your plans for the future?

Prep.	Verb	Adjective/ Noun	Auxiliary Verb	Verb
Para = (in order) to	ser = to be	famos@ = famous conocid@ = well known	voy a = I am going to vas a = you (s) are going to va a = he/she is going to vamos a = we are going to vais a = you (pl) are going to van a = they are going to	actuar en una obra = to act in a play bailar en un espectáculo = to dance in a show cantar en un concierto = to sing in a concert casarme con una estrella = to marry a star dirigir un película = to direct a film engañar a mucha gente= to trick lots of people fundar = to set up ganar un premio Nobel = to win a Nobel prize grabar un video = to record a video influir la moda = to influence fashion jugar a muchos deportes = to play lots of sports leer = to read pasarlo bien = to have a good time promover = to promote tener una voz = to have a voice tocar un instrumento = to play an instrument viajar por el mundo = to travel the world
	tener = to have	éxito = success respeto = respect		

El Futuro

Y9C2 Music: new Directions

Exploring ways to develop music from small ideas in C20th Music
An exploration of MINIMALISM and COMPUTER & GAMING music.



A. Features of Music in the Twentieth Century (How Composers used the Elements of Music)

Melody & Dynamics	Harmony	Rhythm	Timbres and Sonorities
CONJUNCT - wide leaps, angular and spiky. **CHROMATIC** -uses all 12 notes (black and white) of the **CHROMATIC SCALE**. **DISSONANCE** - harsh sounds. **EXTREMES OF DYNAMICS** - *(pppp-ffff)* No clear melody/"tune".	**ATONALITY** – no (sense of) key. **DISCORDS** – dissonant, clashing chords.	**SYNCOPATION** – half beat followed by full beat emphasising weaker beats of the bar. **IRREGULAR TIME SIGNATURES** – 5 or 7 beats per bar.	Strange, intriguing, and exotic sounds; striking, sometimes explosive, contrasts. **PERCUSSION** – expanded in orchestra and more emphasis on percussion timbre and sonorities. Unfamiliar sounds from strange instruments such as **EXTREME PITCH RANGES** and playing instruments in different and unusual ways. **TOTALLY NEW SOUNDS** often involving **ELECTRONIC EQUIPMENT** and **MAGNETIC TAPE**.

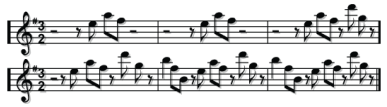
Minimalism

Minimalist pieces are often based on simple motifs or cells that are then manipulated or developed to create a complete piece of music. These motifs and the development is very similar to the use of leitmotif in film music. There is often no clear long melody. Minimalism is not only a musical style for orchestral composers but appears also in the Film music and is used in rock music. Two groups which write minimalist rock music are Kraftwerk and Talking Heads. Kraftwerk is a German electronic rock group whose music is often made up of very repetitive ideas: small melodies and vocal lines are used over and over again. Some songs by Talking Heads also use the same device and show this group's interest in using different types of styles in their music.

Famous Minimalist Composers include: *Terry Riley, Steve Reich, Philip Glass, Michael Nyman.*

TUBULAR BELLS (1972) – Mike Oldfield used minimalist techniques to write Tubular Bells. He made use of repeating patterns called MOTIFS that change gradually. This gradual change means that the "feel" of the music stays the same but the listener does not get bored. The music was used in the film The Exorcist.

<u>COMMON FEATURES OF MINIMALISM & WAYS TO DEVELOP OR MANIPULATE A MOTIF</u>



CELLS or **MOTIFS** – short simple ideas.
Use of **REPETITION** – also called **LOOPING**.
LAYERED TEXTURES BUIDING IN A PIECE
GRADUAL CHANGES OVER TIME
PHASE SHIFT (PHASE IN/OUT) – when two or more motifs or cells begin in **UNISON (together)** and gradually become "out of sync" with each other through displacement, either forwards or backwards.
METAMORPHOSIS – tiny changes are made over time to one note or to one part of the rhythm. This can go a "full circle" and end up exactly the same at the end.

ADDITIVE MELODY – adding notes to an original melodic cell gradually.
AUGMENTATION – doubling the note values of a motif or cell.
DIMINUTION – halving the note values of a motif or cell.

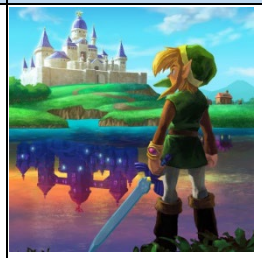
INVERSION (intervals upside down – mirror image)
RETROGRADE (backwards)
POLYRHYTHM - The use of several rhythms performed simultaneously, often overlapping each other to create a thick texture

Y9C2 Music: Computer and Video Game Music

Early Computer and Video Game Music

Early video game music consisted primarily of **SOUND EFFECTS** (an artificially created or enhanced sound used to emphasize certain actions in computer and video games), **CHIPTUNES** or **8-BIT MUSIC** (a style of electronic music which used simple melodies made for programmable sound generator (PSG) sound chips in vintage computers, consoles and arcade machines) and early sound **SYNTHESISER** technology (an electronic musical instrument that generates audio signals that may be converted to sound). **SAMPLING** (the technique of digitally encoding music or sound and reusing it as part of a composition or recording) began in the 1980's allowing sound to be played during the game, making it more realistic and less "synthetic-sounding".

How Computer and Video Game Music is used within a Game



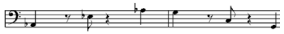
Music within a computer or video game is often used for **CUES** (knowing when a significant event was about to occur).

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

Musical Features of Computer and Video Game Music

JUMPING BASS LINE

Where the bass line often moves by **LEAP** (**DISJUNCT MOVEMENT**) leaving 'gaps' between notes

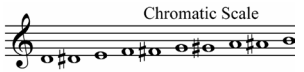


STACCATO ARTICULATION

Performing each note sharply and detached from the others. Shown by a dot.

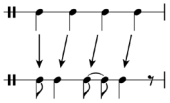
CHROMATIC MOVEMENT

Melodies and bass lines that ascend or descend by semitones.



SYNCOPATION

Accenting the weaker beats of the bar to give an "offbeat" jumpy feel to the music.



How Computer and Video Game Music is Produced

Fully-orchestrated **SOUNDTRACKS** (video game music scores) are now popular – technology is used in their creation but less in their performance. The composer uses **MUSIC TECHNOLOGY** to create the score, it is then played by an **ORCHESTRA** and then digitally converted and integrated into the game. Video game **SOUNDTRACKS** have become popular and are now commercially sold and performed in concert and on dedicated radio shows.

Character Themes in Computer and Video Game Music

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

Famous Computer and Video Game Music Composers and their Soundtracks

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

Daniel Rosenfield
Minecraft (2011)

Rom Di Prisco
Fortnite (2017)

Key Words

Sound effects - an artificially created or enhanced sound used to emphasize certain actions in computer games

Synthesiser - an electronic musical instrument that generates audio signals that may be converted to sound

Music Technology – Computer programs specifically for composing music

Orchestration - the act of arranging a piece of music for an orchestra and assigning parts to the different musical instruments

Sampling - the technique of digitally encoding music or sound and reusing it as part of a composition or recording

Year 9 Cycle 2 Sport and PE Knowledge Organiser

Week 1 and 2	Week 3 and 4	Week 5 and 6	Week 7 and 8	Week 9 and 10	Week 11 & 12
Training methods	**Training methods**	**Training methods**	**Principles of training**	**Principles of training**	**Training intensities**
Continuous training – steady- state low-moderate intensity with no rest breaks for a min of 20 minutes. Improves Cardiovascular endurance and muscular endurance. Fartlek training – a form of continuous training involving different intensities (speeds) and terrains (roads/fields, flat/hills). Improves cardiovascular endurance, muscular endurance and speed. Interval Training (also known as HIIT) – periods of exercise followed by periods of rest used by both aerobic and anaerobic performers. Improves speed, muscular endurance and cardiovascular endurance 	Circuit Training – a series of exercise stations arranged in a specific order to usually alternate muscle groups. Can also improve skill and develops a range of components of fitness.  Weight Training – a series of exercises organised into repetitions with an intensity and recovery time specific to the individual. Targets specific muscles. High reps/low weight improves muscular endurance Low reps/High weight improves strength/power 	Plyometrics – a series of explosive exercises (jumping, bounding) to improve the speed at which a muscle contract. Used by performers who sprint, jump or throw to improve power.  Static stretching– Stretch as far as you can and hold this (isometric contraction) for up to 30 seconds. Improves flexibility Can you identify which training methods are suitable for a range of sports/performers? e.g. continuous training for a long distance runner 	When planning a training programme, you need incorporate the basic principles of training. One of these principles is called the FITT principle. **The FITT Principle:** Each letter in the FITT is a different way in which you can adapt your training. Through **Frequency** *(how much),* **Intensity** *(how hard),* **Time** *(how long)* **and Type** *(what type).* **F – FREQUENCY** – The number of training sessions you complete over a period of time. **I – INTENSITY** – How hard you train. This can be done through heart rate or reps per exercise. **T – TIME** – How long you train for. Aim for 15 to 60 mins. This can depend on the intensity of the exercise. **T – TYPE** – Appropriate types of training should be used depending on your needs and goals.	When planning a training programme, you need incorporate the basic principles of training. One of these principles is called the SPORT principle. **The SPORT Principle:** **S – SPECIFIC -** training must be **relevant** to the **individual** and their **sport.** **P – PROGRESSIVE –** This means the training needs to get harder over time. **O – OVERLOAD –** This can be used through the FITT principle. You can overload through frequency, intensity, time and type. **R – REVERSIBILTY -** systems **reverse** or de-adapt if training stops or is significantly reduced or injury prevents training from taking place. **T – TEDIUM –** Training needs to be varied to stop boredom from taking place.	To maximise the chance of improving your fitness you should train within your target zones. **Your 'Aerobic Training zone' is 60 – 80% of your MHR** **Your 'Anaerobic Training Zone' is 80 – 90% of your Maximal Heart R**ate (MHR) To calculate your MHR (maximum heart rate) you need to: 220 – Age = Try working out your MHR and what your heart rate needs to be to work in the two zones above (to work out 60% times your MHR by 0.6) 

RPE: Religion, crime and punishment

Good & evil actions and intentions

Some people suggest that those who commit the worst crimes are evil.
But where does evil come from?

Christianity: Evil is seen as the abuse of the **free will** God gave to humans. In order to be able to appreciate good, then evil has to exist. Most Christians believe in a figure called **the devil** or Satan. So, evil is a combination of internal and external factors.

Islam: The **Qu'ran** says there is a devil who was an angel. Iblis was expelled from paradise because he refused to bow to Adam. Iblis continually tempts and punishes humans to be wicked. Evil is a mix of powerful evil being and the weakness of humans.

3 aims of punishment

Retribution: is the least positive of the 3 aims of punishment. It means that society, on behalf of the victim, is getting its own back on the offender. In the Old Testament it is referred to as *lex talionis* (the law of retaliation). **"An eye for an eye, a tooth for a tooth"**

Deterrence: This is the belief that if offenders are seen to be punished for wrongdoing, then this may 'put off' others from committing that offence. The offender themselves might also be put off from reoffending.

Reformation: This is the aim of punishment most Christians prefer because it seeks to help offenders by working with them to help them understand that their behaviour is harming society. It is hoped that offenders will change their attitudes and become responsible, law-abiding members of the community.

Reasons for crime & types of crime

Causes of crime include: *upbringing, mental illness, poverty, opposition to existing laws, greed/hate, or addiction.*

There are 3 key **types** of crimes: *Crimes against the **person** (e.g. murder); Crimes against **property** (e.g. burglary); Crimes against the **state** (e.g. terrorism).*

***St Paul** tells Christians to "obey the laws of the land"*

Suffering

For many people, suffering is an unfortunate part of living. It may be caused by something natural, such as an illness, or it may be due to how people have behaved. Whatever the cause, Christians believe they should try to help others who are suffering. Christians feel that they should follow the example of Jesus, who helped many whom he saw were suffering, and who taught that those who believe in God should help those who suffer.

Heller Keller was a Christian writer and activist who became deaf and blind when she was only 19 months old. She said *"We are never really happy until we try to brighten the lives of others".*

Treatment of criminals

Christians do not disagree with discipline. They see a positive need for it: ***"He who spares the rod hates their children, but the one who loves their children is careful to discipline them".*** However, they may question the method used since Jesus' teachings on love and caring for people rule out any physical punishment. Instead, Christians focus on positive sanctions that help offenders to realise the error of their ways and reform. Jesus always treated people with respect, and Christians believe they should follow his example.

Corporal punishment: to punish the offender by causing physical pain. It is illegal in the UK but allowed in some other parts of the world. For example some Muslim countries such as Iran and Saudi Arabia, allow caning as punishment for offences such as gambling and sexual promiscuity.

Community service: offers offenders a chance to make up for what they have done and receive help in reforming their behaviour. Christians are in general agreement that it is a suitable punishment for fairly minor offences.

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

The death penalty

Abolished in the UK in 1965 and is now illegal in many EU countries.

The Principle of Utility = an action is right if it promotes the maximum happiness for the maximum number of people.

The sanctity of life = God gave life, so only He has the right to take it away.

For	Against
• It is a justifiable retribution for serious crimes • It is a deterrent • It gives the victim's family a sense of justice	• Only God has the right to take life • Jesus taught a message of love and forgiveness • It is hypocritical

Forgiveness

Forgiveness is a core Christian belief and one Jesus emphasised in his teachings.

Christians are expected to be forgiving towards those who wrong them, if they expect to be forgiven themselves: ***"Forgive us our sins, as we forgive those who sin against us".***

Many Christians would argue that forgiveness is not a replacement for punishment.

During his ministry Jesus was asked how many times you should forgive someone who wrongs you and he replied ***"I tell you not seven times, but seventy-seven times"***

Biology: Cell division and stem cells

Cell cycle	The 3 stage process of cell division in body cells.
Mitosis	Part of the cell cycle where one set of new chromosomes is pulled to each end of the cell forming two identical nuclei during cell division.
Differentiate	The process where cells become specialised for a particular function.
Stem cells	Undifferentiated cells with the potential to form a range of different cell types.
Cloning	The production of identical offspring by asexual reproduction.
Zygote	The single new cell formed by the fusion of gametes in sexual reproduction.
Embryonic stem cells	Stem cells from an early embryo that can differentiate to form the specialised cells of the body.
Adult stem cells	Stem cells that are found in adults that can differentiate and form a limited number of cells.
Therapeutic cloning	Where an embryo is produced that is genetically identical to the patient so the cells are identical.

Purpose of mistosis:

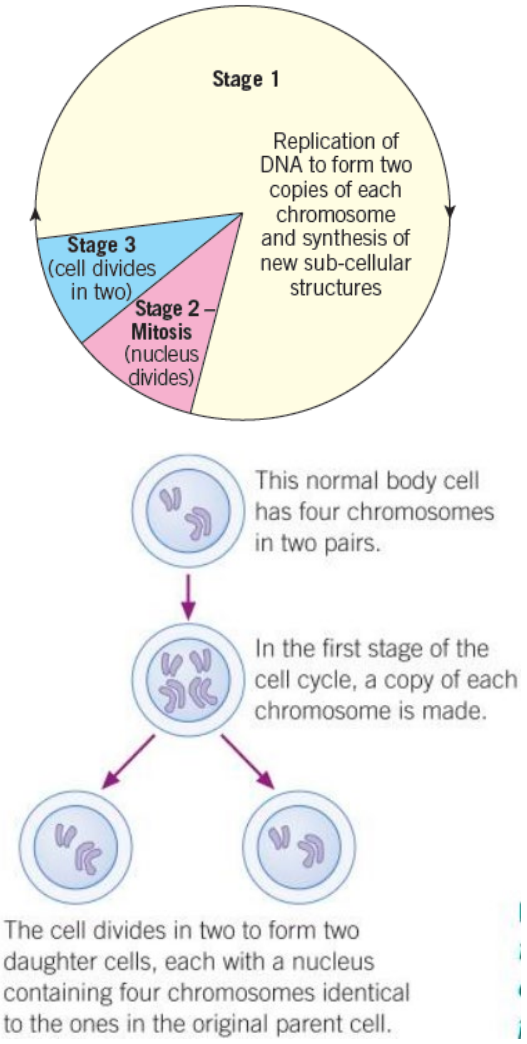
- Produces more cells needed for growth.
- Replace worn out or damaged cells
- Reapir damaged tissue
- Asexual replroduction

The cell cycle

Stage 1: Replication
The longest stage.
Cells grow bigger and increase in mass.
DNA replicates to form two copies of each chromosome.
All of the organelles are also doubled.

Stage 2: Mitosis
The contents of the cell are rearranged.
One set of chromosomes is pulled to each end of the cell and the nucleus divides.

Stage 3: Division
The cytoplasm and cell membranes divide to form **two identical daughter cells.**



Differentiation in animal cells

1. As an embryo, the cells are undifferentiated.
2. Cells are differentiated by turning some of their genes off and some of their genes on.
3. The combination of working or inactive genes decides what organelles the cell has and what the cell does.
4. The cell is now specialised for a particular function (for example, a muscle cell).
5. This does not change once the cell is mature.

Embryonic stem cells (animals)	Adult stem cells (animals)	Plant cells
Found in embryos in the early stages of life before the cells have differentiated. Grow and divide rapidly. Can differentiate into most different types of cells. If used to treat another unrelated person, the cells are less likely to be rejected. Some question the use of a potential human being as a source of cells. Embryo can not give permission so using it is a violation of its human rights. Religious beliefs cannot accept any interference with human reproduction.	Found in the bone marrow mostly and present in every adult. These can grow and replace similar damaged cells. Avoid the controversial use of embryonic stem cells. Adult stem cells might be infected with viruses, and so could transfer the infections to patients. If used to treat another unrelated person, they may trigger an immune response. The patient may need to take immunosuppressant drugs to stop their body rejecting the new cells.	Found in meristems. Are capable of growing into any tissue throughout the life of the plan. Allows plants to grow after they have been cut down.

Differentiation in plant cells

1. Undifferentiated cells are formed at active regions of the roots and shoots (meristems) through a plant's life.
2. These cells then differentiate into specialised cells.
3. This differentiation is not permanent. They are able to re-differentiate.
4. This means it is very easier to clone a plant.

Using stem cells:

- Injecting grown nerve cells into spinal cords to help restore movement in paralysed patients.
- Transplanted embryonic stem cells into eyes of patients with macular degeneration.
- Grow cells that are sensitive to blood sugar levels and produce insulin to help treat people with diabetes.
- Grow whole new organs for transplant.
- Making clones of rare plants to save them from extinction or use them for research.
- Cloning plants in horticulture, producing large numbers of plants such as orchids for sale.
- In agriculture to produce large numbers of identical crop plant with special features, such as disease resistance.

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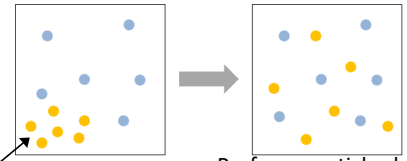
The future:

- Umbilical cord stem cells?
- Growing adult stem cells?
- Therapeutic cloning?

Biology: Exchange of Substances

Diffusion (of gases or liquids)

The **spreading out** of particles from an area of **high concentration** to an area of **low concentration**.



High concentration of perfume particles

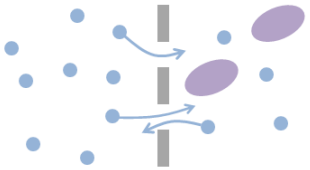
Perfume particles have diffused

The greater the concentration gradient the faster the rate of diffusion. A higher temperature also increase the rate of diffusion as particles have more energy, so move faster.

Osmosis

The movement of **water** particles across a **partially permeable membrane** from a **high concentration** to a **low concentration**.

A partially permeable membrane has very small holes in it, allowing water molecules to pass through but not larger molecules.



Water

Sucrose solution

There is a net (overall) movement of water into the sucrose solution.

Exchange Surfaces

Lungs: oxygen diffuses into the blood from the alveoli. CO_2 moves in the opposite direction. Alveoli have a large surface area, very thin walls, a large blood supply and moist lining to maximise the rate of diffusion.

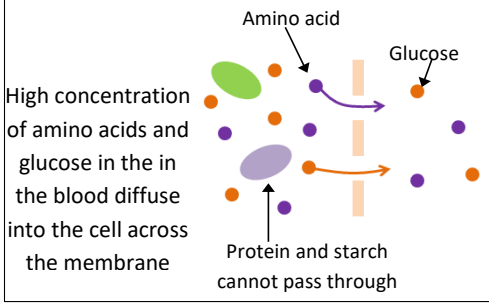
Villi: these increase the surface area of the small intestine. They have a single layer of cells and a large blood supply to maximise the rate of diffusion.

Fish gills: oxygen diffuses from the water into the fish's blood through the gills. Tiny structures called laminae increase the surface area of the gills.

Leaves: CO_2 needs to diffuse into the leaf for photosynthesis, O_2 and water diffuse out through stomata. Leaves are flat to increase the surface area for diffusion. There are also lots of air spaces inside the leaf to increase the area for diffusion to occur.

Diffusion across cell membranes

Cell membranes allow very small substances to diffuse across them (oxygen, glucose, amino acids, water). Large molecules cannot pass (starch, protein).



Diffusion happens both ways but overall particles will move from a high concentration to a low concentration. A larger surface area will increase the rate of diffusion.

Active Transport

A process that moves substances against the concentration gradient (from an area of low concentration to high concentration.

In **root hair cells** there is already a high concentration of **minerals** inside the cell compared to the soil. They take in more minerals by **active transport**.
Active transport require **energy** (from respiration).

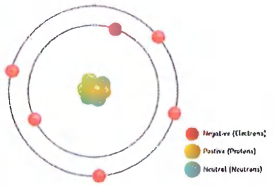
Active transport allows substances (glucose, nutrients) to **move from the gut** (low concentration) **into the blood** (high concentration).

Atomic Structure and the Periodic Table – Foundation and Higher

Atoms

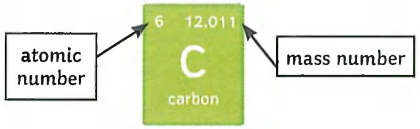
Contained in the nucleus are the **protons** and **neutrons**. Moving around the nucleus are the **electron** shells. They are negatively charged.

Particle	Relative Mass	Charge
proton	1	+1
neutron	1	0
electron	Very small	-1



Overall, atoms have no charge; they have the same number of protons as electrons. An ion is a charged particle - it does not have an equal number of protons to electrons.

Atomic Number and Mass Number



Elements

Elements are made of atoms with the same atomic number. Atoms can be represented as symbols.

N = nitrogen **F** = fluorine **Zn** = zinc **Ca** = calcium

Isotopes – an isotope is an element with the **same number of protons** but a **different number of neutrons**. They have the same atomic number, but different mass number.

Isotope	Protons	Electrons	Neutrons
$^{1}_{1}H$	1	1	1 - 1 = 0
$^{2}_{1}H$	1	1	2 - 1 = 1
$^{3}_{1}H$	1	1	3 - 1 = 2

Compounds – a compound is when two or more elements are chemically joined. Examples of compounds are carbon dioxide and magnesium oxide. Some examples of formulas are CO_2, NaCl, HCl, H_2O, Na_2SO_4. They are held together by chemical bonds and are difficult to separate.

Equations and Maths

To calculate the relative atomic mass, use the following equation:

relative atomic mass (A_r) =

$$\frac{\text{sum of (isotope abundance} \times \text{isotope mass number)}}{\text{sum of abundances of all isotopes}}$$

Balancing Symbol Equations

There must be the same number of atoms on both sides of the equation:

$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$

C = 1

O = 4

H = 4

Chemical Equations

A chemical reaction can be shown by using a **word equation.**

e.g. magnesium + oxygen → magnesium oxide

On the left-hand side are the reactants, and the right-hand side are the products.

They can also be shown by a **symbol equation.**

e.g. $2Mg + O_2 \rightarrow 2MgO$

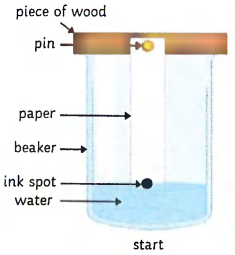
Equations need to be **balanced,** so the same number of atoms are on each side. To do this, numbers are put in front of the compounds.

$CH_4 + \mathbf{2}O_2 \rightarrow \mathbf{2}H_2O + CO_2$

Mixtures, Chromatography and Separation

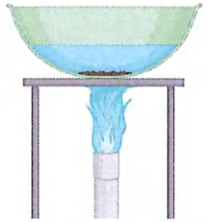
Mixtures – in a mixture there are no chemical bonds, so the elements are easy to separate. Examples of mixtures are air and salt water.

Chromatography – to separate out mixtures.

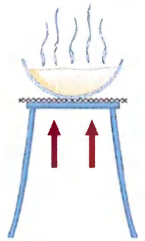


Filtration – to separate solids from liquids.

Evaporation – to separate a soluble salt from a solution; a quick way of separating out the salt.



Crystallisation - to separate a soluble salt from a solution; a slower method of separating out salt.



Separating out salt from rock salt:

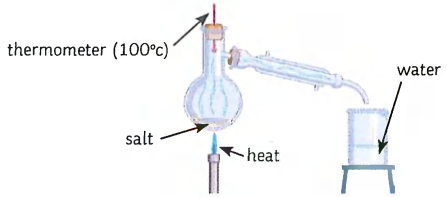
1. Grind the mixture of rock salt.
2. Add water and stir.
3. Filter the mixture, leaving the sand in the filter paper
4. Evaporate the water from the salt, leaving the crystals.

Atomic Structure and the Periodic Table – Foundation and Higher

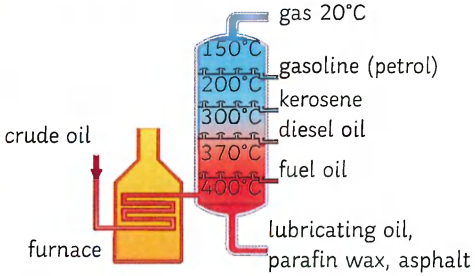
Distillation

To separate out mixtures of liquids.

1. **Simple distillation** – separating a liquid from a solution.



2. **Fractional distillation** – separating out a mixture of liquids. Fractional distillation can be used to separate out crude oil into fractions.



Metals and Non-metals

They are found at the **left** part of the periodic table. Non-metals are at the **right** of the table.

Metals

Are strong, malleable, good conductors of electricity and heat. They bond metallically.

Non-Metals

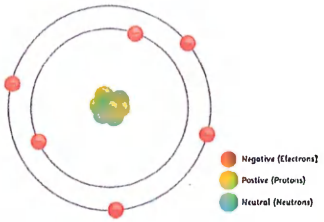
Are dull, brittle, and not always solids at room temperature.

History of the Atom

Scientist	Time	Discovery
John Dalton	start of 19th century	Atoms were first described as solid spheres.
JJ Thomson	1897	Plum pudding model – the atom is a ball of charge with electrons scattered.
Ernest Rutherford	1909	Alpha scattering experiment – mass concentrated at the centre; the nucleus is charged. Most of the mass is in the nucleus. Most atoms are empty space.
Niels Bohr	around 1911	Electrons are in shells orbiting the nucleus.
James Chadwick	around 1940	Discovered that there are neutrons in the nucleus.

Electronic Structure

Electrons are found in shells. A maximum of two in the most inner shell, then eight in the 2nd and 3rd shell. The inner shell is filled first, then the 2nd then the 3rd shell.



Group 7 Elements and Noble Gases

Halogens

The halogens are **non-metals**: fluorine, chlorine, bromine, iodine. As you go down the group they become less reactive. It is harder to gain an extra electron because its outer shell is further away from the nucleus. The melting and boiling points also become higher.

Noble Gases

The **noble gases** (**group 0** elements) include: **helium**, **neon** and **argon**. They are un-reactive as they have full outer shells, which makes them very stable. They are all colourless gases at room temperature.

The boiling points all increase as they go down the group – they have greater intermolecular forces because of the increase in the number of electrons.

Development of the Periodic Table

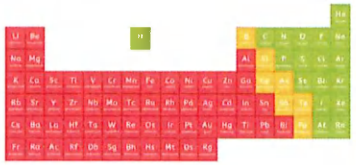
In the early 1800s, elements were arranged by atomic mass. The periodic table was not complete because some of the elements had not been found. Some elements were put in the wrong group.

Dimitri Mendeleev (1869) left gaps in the periodic table. He put them in order of **atomic mass**. The gaps show that he believed there was some undiscovered elements. He was right! Once found, they fitted in the pattern.

The Modern Periodic Table

Elements are in order of **atomic mass/proton number**. It shows where the metals and non-metals are. **Metals** are on the **left** and **non-metals** on the **right**. The **columns** show the **groups**. The **group number** shows the number of **electrons** in the **outer shell**. The rows are **periods** – each period shows another full shell of electrons.

The periodic table can be used to predict the reactivity of elements.



Alkali Metals

The alkali metals (**group 1 elements**) are soft, very reactive metals. They all have **one electron** in their **outer shell**, making them **very reactive**. They are **low density**. As you go down the group, they become more reactive. They get bigger and it is easier to lose an electron that is further away from the nucleus.

They form ionic compounds with non-metals.

They react with water and produce hydrogen.

E.g.

lithium + water → lithium hydroxide + hydrogen

$2Li + 2H_2O \rightarrow 2LiOH + H_2$

They react with chlorine and produce a metal salt.

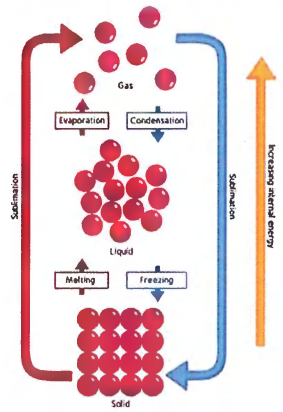
E.g.

lithium + chlorine → lithium chloride

$2Li + Cl_2 \rightarrow 2LiCl$

They react with oxygen to form metal oxides.

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



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

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

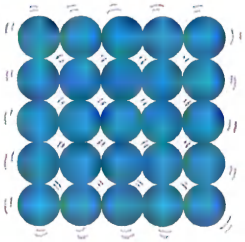
The particles gain energy. This results in the breaking of some of the **attractive forces** between particles during melting.

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

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

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

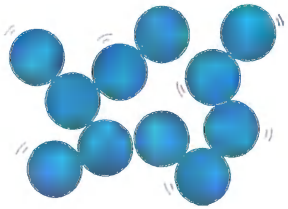
Solid



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

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

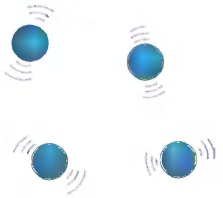
Liquid



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

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

Gas



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

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

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

Limitations of the Particle Model (HT only)

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

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

State Symbols

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

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

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

Identifying the Physical State of a Substance

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

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

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

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

Formation of Ions

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

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

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

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

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

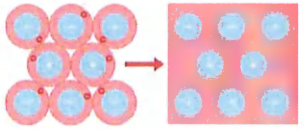
Group	Ions	Element Example
1	+1	$Li \rightarrow Li^+ + e^-$
2	+2	$Ca \rightarrow Ca^{2+} + 2e^-$
6	-2	$Br + e^- \rightarrow Br^-$
7	-1	$O + 2e^- \rightarrow O^{2-}$

Metals and Non-metals

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

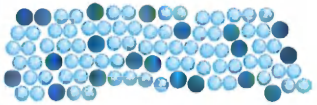
Metallic Bonding

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



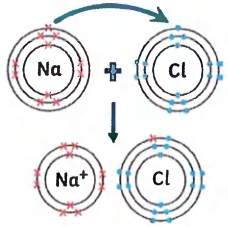
There are strong electrostatic forces of attraction between the positive metal ions and negatively charged electrons.

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



Ionic Bonding

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



Ionic Compounds

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

Properties of Ionic Compounds

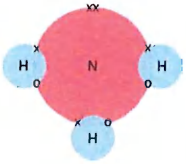
- High melting point – lots of energy needed to overcome the electrostatic forces of attraction.
- High boiling point
- **Cannot conduct electricity** in a **solid** as the ions are not free to move.
- Ionic compounds, when **molten** or in **solution**, can **conduct electricity** as the ions are free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

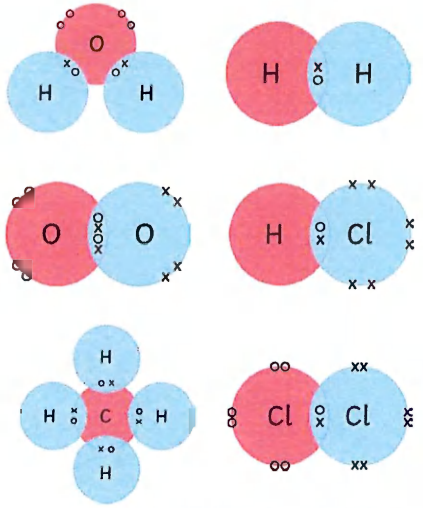
Covalent Bonding

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

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

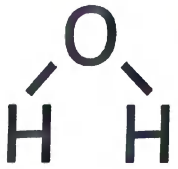
You should be able to draw the dot and cross diagrams for the following simple covalent structures: chlorine, oxygen, nitrogen, water, ammonia, hydrogen chloride and methane.



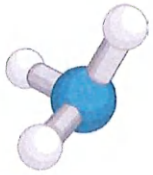


Structural Formulae

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



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



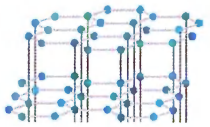
Giant Covalent Structure – Diamond

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

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

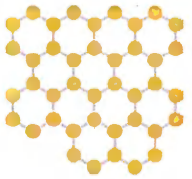
Giant Covalent Structure – Graphite

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



Giant Covalent Structure – Graphene

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



Nanoscience

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

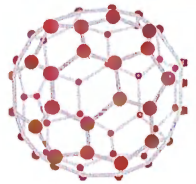
Name of Particle	Diameter
nanoparticle	1–100nm
fine particles ($PM_{2.5}$)	100–2500nm
coarse particles (PM_{10})	2500–10000nm

Polymers

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

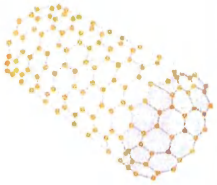
Fullerenes and Nanotubes

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



Buckminsterfullerene has the formula C_{60}

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



Possible Risks of Nanoparticles

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

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

Year 9 Physics – Cycle 2 Knowledge Organiser

AQA Physics (Combined Science) Unit 6.1: Energy

Energy Stores and Systems

Energy Stores	
kinetic	Moving objects have kinetic energy.
thermal	All objects have thermal energy.
chemical	Anything that can release energy during a chemical reaction.
elastic potential	Things that are stretched.
gravitational potential	Anything that is raised.
electrostatic	Charges that attract or repel.
magnetic	Magnets that attract or repel.
nuclear	The nucleus of an atom releases energy.

Energy can be transferred in the following ways:

mechanically – when work is done;

electrically – when moving charge does work;

heating – when energy is transferred from a hotter object to a colder object.

Conservation of Energy

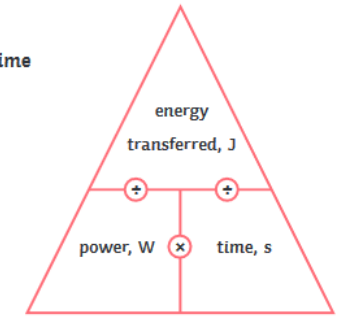
Energy can never be created or destroyed, just transferred from one form to another. Some energy is transferred usefully and some energy gets transferred into the environment. This is mostly wasted energy.

Power

Power is the rate of transfer of energy – the amount of work done in a given time.

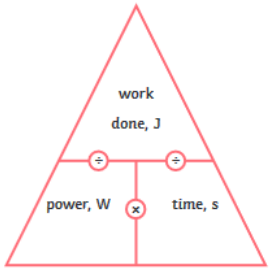
power = energy transferred ÷ time

P (W) = E (J) ÷ t (s)



power = work done ÷ time

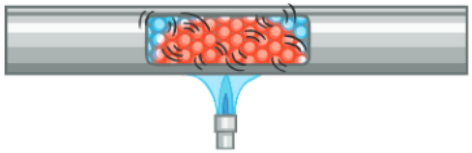
P (W) = W (J) ÷ t (s)



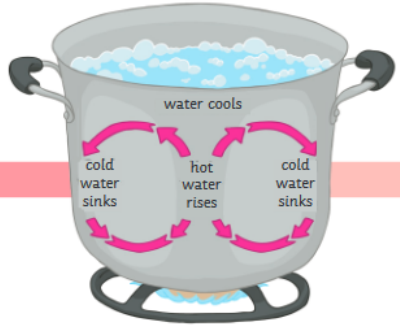
Energy Transfer

Lubrication reduces the amount of friction. When an object moves, there are frictional forces acting. Some energy is lost into the environment. Lubricants, such as oil, can be used to reduce the friction between the surfaces.

Conduction – when a solid is heated, the particles vibrate and collide more, and the energy is transferred.

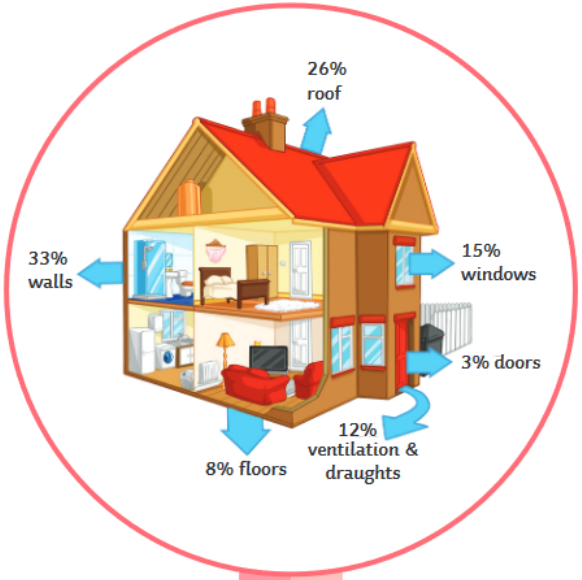


Convection – when a liquid or a gas is heated, the particles move faster. This means the liquid or gas becomes less dense. The denser region will rise above the cooler region. This is a convection current.



Insulation – reduces the amount of heat lost. In your home, you can prevent heat loss in a number of ways:

- thick walls;
- thermal insulation, such as:
- loft insulation (reducing convection);
- cavity walls (reduces conduction and convection);
- double glazing (reduces conduction).



Electricity – Foundation and Higher

Required Practical

Investigating Resistance in a Wire

Independent variable: length of the wire.

Dependent variable: resistance.

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

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

Investigating Series and Parallel Circuits with Resistors

Independent variable: circuit type (series, parallel).

Dependent variable: resistance.

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

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

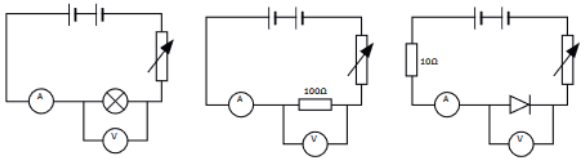
Investigating I-V Relationships in Circuits (Using a filament bulb, ohmic conductor, diode.)

Independent variable: potential difference/volts (V).

Dependent variable: current (A).

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

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



Draw graphs of the results once collected.

Equations and Maths

Equations

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

Maths

1kW = 1000W

0.5kW = 500W

Charge

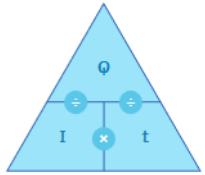
Electric current is the flow of electric charge. It only flows when the circuit is complete.

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

Calculating Charge

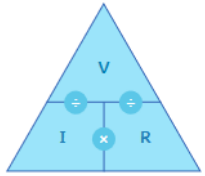
charge flow (C) = current (A) × time (s)

$Q = It$



potential difference = current x resistance

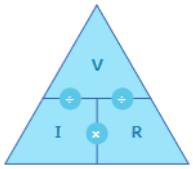
V (V) = I (A) × R (Ω)



Resistance

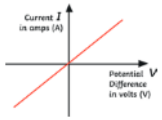
voltage (V) = current (A) × resistance (Ω)

V = IR



Graphs of I-V Characteristics for Components in a Circuit

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



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

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

Current and Circuit Symbols

Current: the flow of electrical charge.

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

Resistance: slows down the flow of electricity.

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