Year 11

Knowledge Organiser

Term 1: 2019

GREENSHAW LEARNING TRUST

'An Inspector Calls' by J.B. Priestley: A Knowledge Organiser

Characters

Inspector Goole	Priestley's mouthpiece; advocates social justice; serves as the Birlings' conscience	Socialist, moralistic, righteous, powerful, intimidating, unconventional, mysterious, imposing, sardonic, omnipotent
Mr. Arthur Birling	Businessman; capitalist; against social equality; a self-made man (new-money)	Capitalist, arrogant, foolish, Panglossian, emasculate, prejudice, ignorant, selfish, stubborn, vainglorious
Mrs. Sybil Birling	Husband's social superior; believes in personal responsibility	Arrogant, cold-hearted, insincere, prejudice, naïve, conformist, bitter, controlling, remorseless
Sheila Birling	Young girl; comes to change views and pities Eva; feels regret	Transformative, remorseful, socialist, pseudo-inspector, sensitive, astute, strong-minded, empowered
Eric Birling	Young man, drinks too much; forces himself on Eva Smith; regrets actions	Rebellious, reckless, immature, insubordinate, compulsive, desperate, disgraced, dualistic, irresponsible
Gerald Croft	Businessman; engaged to Sheila; politically closest to Birling	Aristocratic, evasive, secretive, dishonest, disingenuous, oleaginous, chivalric, privileged, pragmatic
Eva Smith	Unseen in play; comes to stand for victims of social injustice (changes her name to Daisy Renton	Suffragist, victim, emblematic, allegorical, vulnerable, desperate, socialist, moralistic, principled

Theatrical Stagecraft: Dramatic Devices

Dramatic irony	Birling's speeches, Mrs. Birling's witless implication of Eric
Stage directions	Instructions for the actors; often revealing – such as the lighting change when the Inspector arrives: "Pink and intimate then brighter and harder"
Setting	Constant throughout but subtle changes e.g. lighting; characters on/off stage
Tension	Builds up throughout the play ; interrogation of characters, personal relationships, secrecy
Cliff-hanger	Eric's reappearance in Act 3; the ending allows the audience to make up their minds
Foreshadowing	Symbolism (The Titanic), Mr. Birling's "knighthood", war
Time-lapse	Set in 1912, written in 1945; audience in a privileged position.
The 4th Wall	The Inspector's final speech addressed directly to audience.

Social, Historical and Literary Allusions

"the Titanic"	The Titanic sailed from Southampton and sank in the early hours of 15th April 1912. Priestley clearly wants his audience to see his drama play out against a background of real historical events and he has also chosen a moment in time when Birling's comments appear particularly ironic.
"Nobody wants war"	In reality, economic rivalry between the British Empire and the new German Empire was one of the many causes of the First World War.
"Russia"	The irony here suggests that Russia will have progressed further than other European countries by the 1940s.
"Bernard Shaws and H. G. Wellses"	Both the noted Irish playwright George Bernard Shaw (1856-1950) and the father of science-fiction H. G. Wells (1866-1946) were well-known and outspoken socialists.

Plot

Act 1	Set in April 1912, Brumley, Midlands, UK. The Birling family and Gerald Croft are celebrating Sheila Birling's engagement to Gerald with a dinner. Mr Birling lectures his son, Eric Birling, and Gerald about the importance of every man looking out for himself if he wants to get on in life. Edna (the maid) announces that an inspector has arrived. Inspector Goole says that he is investigating the death of a young woman who committed suicide, Eva Smith. Mr Birling is shown a photograph of Eva, after initially denying recognising the woman in the photo, he remembers firing her in 1910 for organising a strike over workers pay. Sheila recalls also having Eva sacked about her manner when served by her in an upmarket department store. The Inspector reveals that Eva Smith changed her name to Daisy Renton. Gerald reveals to Sheila he had an affair with Daisy Renton.
Act 2	Gerald explains to The Inspector that he had an affair with Eva, but hasn't seen her since he ended their relationship back in Autumn 1911. Sheila gives her engagement ring back to Gerald. The Inspector turns his attention to Mrs Sybil Birling, she confesses that she also had contact with Eva, but Eva gave herself a different name to Mrs Birling. Eva approached a charity chaired by Mrs Birling to ask for help. Eva was desperate and pregnant but help was refused by Mrs Birling because she was offended by the girl calling herself 'Mrs Birling'. She tells Eva that the baby's father should be made entirely responsible. She also tells Inspector Goole that the father should be held entirely responsible and should be made an example of.
Act 3	Eric is revealed as the father. He stole money from Mr Birling's office to provide money to Eva. The Inspector delivers his final speech. After he leaves, the family begin to suspect that he was not a genuine police inspector. A phone call to the Chief Constable confirms this. Next, they phone the infirmary to be informed that no suicide case has been brought in. Mr Birling, Mrs Birling and Gerald congratulate themselves that it was all a hoax and they continue can continue as before. This attitude upsets Sheila and Eric. The phone rings. Mr Birling announces to the family that a girl has just died on her way to the infirmary, a police inspector is coming to question them

Key concepts and context: *Think about…*

1912	Set just before WWI and the sinking of the Titanic. A moment of rising international tensions and industrial expansion. End of Victorian era saw the demise of the rigid class system. Labour Party, founded in 1900, gaining momentum. The Russian Revolution began in 1917.
1945	People were recovering from six years of warfare, danger and uncertainty. Class distinctions greatly reduced as a result of two world wars. Women had a more valued place in society. Desire for social change. Following WW2, Labour Party won a landslide victory over Winston Churchill and the Conservatives.
Wealth, Power and Influence	The Birlings and the Crofts are representative of the wealthy upper-class. They all misuse their social influence to benefit themselves. Their actions adversely affect the vulnerable people in society.
Blame and Responsibility	Who is to blame for Eva's death? Each of the Birlings contribute to a chain of events leading to the destruction of Eva Smith. What responsibilities do the characters have to each other? To society?
Public v Private	How do the public lives, the facades, of the Birlings juxtapose their private personas? What are their motivations for this? What are the repercussions, and for who?
Morality and Legality	What are the moral and legal laws of the society depicted in the play? How do they interweave? What actions do the characters undertake that are wrong, morally or legally?
Class Politics	How do the ideologies of capitalism and socialism collide in the play? Which characters are representative of which political allegiance? Is there a correlation between a character's political beliefs and their behaviours?
Prejudice	What are the prejudices held by the Birlings? What are their inherent views regarding class and status? How do they act on these prejudices, and what are the consequences?
Young v Old	What differences are evident between the younger and older generation? They react and behave differently throughout the play – why? What are their attitudes towards each other? What do they learn? Which characters change, and how?

AN INSPECTOR CALLS Quotes - J.B. PRIESTLEY

ACT	Order of the Inspector's Questioning
Act 1	*Sheila and Gerald's engagement is celebrated.*
Act 1	*Birling says there will be no war; references Titanic*
Act 1	*Inspector arrives; a young girl has committed suicide.*
Act 1	*Birling threw her out after strike; Sheila had her fired for laughing.*
Act 2	*Gerald had an affair with Daisy Renton*
Act 2	*Mrs. Birling refused to give charity to Eva; blames father.*
Act 3	*Eric's involvement revealed; possible rape hinted at.*
Act 3	*Inspector leaves. Gerald returns; met policeman, no Inspector G*
Act 3	*Telephone rings; an inspector is coming.*

Key Notes

Priestley asks his audience to examine their **individual** and **collective responsibility** to society. He wants a **welfare state.**

The **hypocrisy** of **middle-class Edwardian** society is uncovered: **appearance** & **reputation** matter more than **reality** & **morality**.

Priestley criticises the selfishness of **capitalism** and wants a fairer, **socialist** future after the horrors of two world wars..

Priestley shows the **older generation** to be set in their ways, while the young are **open to change**.

Eva Smith is the **embodiment** of young, **working-class women** who were **oppressed** by the **middle/upper classes**.

The play demonstrates that when workers do not have **full employment rights** they cannot fight back

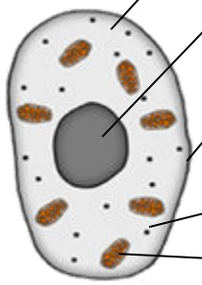
Thematic Quotes

Social responsibility	"We are responsible for each other" *Inspector* "Public men, Mr Birling, have responsibilities" *Inspector* "It's what happened to the girl and what we all did to her that mattered." *Eric*
Capitalism	"These silly capital vs labour agitations." *Birling* "A man has to make his own way" *Birling*
Class	"A girl of that class" *Mrs Birling* "Well, we've several hundred young women there, y'know, and they keep changing." *Birling*
Age	"the famous younger generation" *Birling* "What's the matter with that child?" *Birling* "Just keep quiet, Eric" *Birling*
Gender & attitudes to women	"I hate those *hard-eyed dough-faced women" - Gerald* "And you think young women ought to be protected against unpleasant and disturbing things?" *Inspector* "She had far too much to say, far too much" *Birling*

Character Quotes

Birling's Confidence	''We're in for a time of steadily increasing prosperity'
Birling on society	''The way some of these cranks talk and write now, you'd think everybody has to look after everybody else'
Shelia's recognition	'but these girls aren't cheap labour – they're *people''*
Sheila's regret	'it's the only time I've ever done anything like that, and I'll never, never do it again to anybody'
Sheila on the inspector	'we all started like that – so confident, so pleased with ourselves until he began asking us questions'
Sheila on Eric	''he's been steadily drinking too much for the last two years'
Inspector on guilt	'I think you did something terribly wrong – and that you're going to spend the rest of your life regretting it'
Mrs Birling defends herself	'she was claiming elaborate fine feelings and scruples that were simply absurd in a girl in her position'
Eric explains	'I'm not very clear about it, but afterwards she told me she didn't want me to go in but that – well, I was in that state when a chap easily turns nasty – and I threatened to make a row'
The inspector says	'but each of you helped to kill her. Remember that'
Inspector's message	'there are millions and millions and millions of Eva Smiths and John Smiths still left with us, with their lives, their hopes and fears, their suffering, and chance of happiness, all intertwined with our lives, with what we think and say and do. We don't live alone.'

AQA Cell Structure



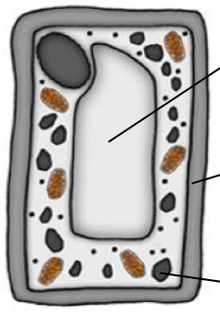
cytoplasm	*site of chemical reactions in the cell*	gel like substance containing enzymes to catalyse the reactions
nucleus	*contains **genetic material***	controls the activities of the cell and codes fro proteins
cell membrane	*semi permeable*	controls the movement of substances in and out of the cell
ribosome	*site of protein synthesis*	mRNA is translated to an amino acid chain
mitochondrion	*site of respiration*	where energy is released for the cell to function

animal cell

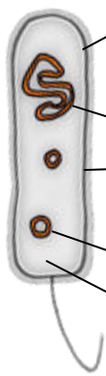
plant cell

Eukaryotes complex organisms

contains all the parts of animal cells plus extras



permanent vacuole	*contains cell sap*	keeps cell turgid, contains sugars and salts in solution
cell wall	*made of cellulose*	supports and strengthens the cell
chloroplast	*site of photosynthesis*	contains chlorophyll, absorbs light energy



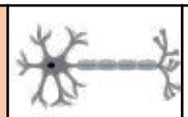
cell membrane	*site of chemical reactions in the cell*	gel like substance containing enzymes to catalyse the reactions
bacterial DNA	*not in nucleus floats in the cytoplasm*	controls the function of the cell
cell wall	***NOT** made of cellulose*	supports and strengthens the cell
plasmid	*small rings of DNA*	contain additional genes
cytoplasm	*semi permeable*	controls the movement of substances in and out of the cell

Bacterial cells are much smaller than plant and animal cells

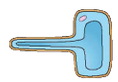
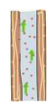
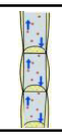
Prokaryotes simpler organisms

Specialised cells

specialised animal cells

nerve		*carry electrical signals*	long branched connections and insulating sheath
sperm		*fertilise an egg*	streamlined with a long tail acrosome containing enzymes large number of mitochondria
muscle		*contract to allow movement*	contains a large number of mitochondria long

specialised plant cells

root hair		*absorb water and minerals from soil*	hair like projections to increase the surface area
xylem		*carry water and minerals*	TRANSPIRATION - dead cells cell walls toughened by lignin flows in one direction
phloem		*carry glucose*	TRANSLOCATION - living cells cells have end plates with holes flows in both directions

Cell differentiation

how a cell changes and becomes **specialised**
Undifferentiated call are called **STEM** cells

animal cell differentiation

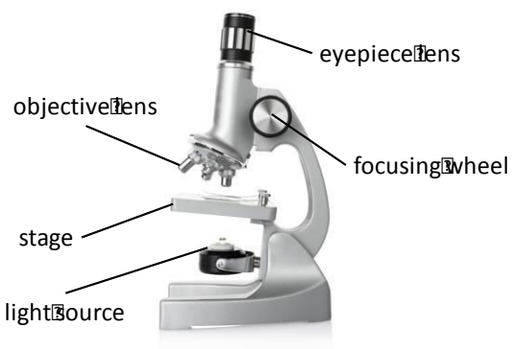
early stages of development
only for repair and replacement

plant cell differentiation

all stages of life cycle the stem cells are grouped together in meristems

Microscopy

magnification $= \frac{\text{size of image}}{\text{real size of the object}}$



Feature	Light (optical) microscope	Electron microscope
Radiation used	Light rays	Electron beams
Max magnification	~ 1500 times	~ 2 000 000 times
Resolution	200nm	0.2nm
Size of microscope	Small and portable	Very large and not portable
Cost	~£100 for a school one	Several £100,000 to £1 million plus

PREFIXES

Prefix	Multiple	Standard form
centi (cm)	1 cm = 0.01 m	x 10^{-2}
milli (mm)	1 mm = 0.001 m	x 10^{-3}
micro (µm)	1 µm = 0.000 001 m	x 10^{-6}
nano (nm)	1nm = 0.000 000 001 m	x 10^{-9}

AQA Cell Biology 2

largest → smallest

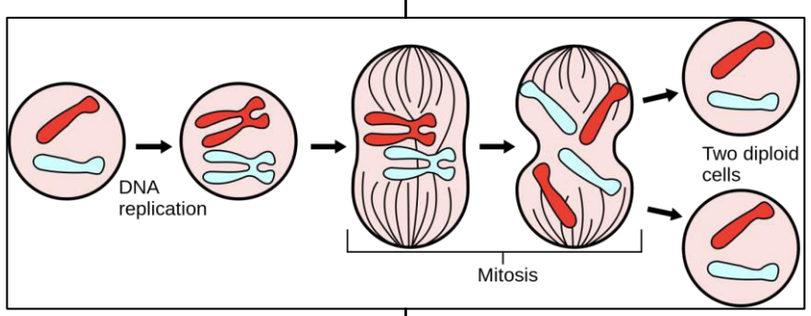
cell	The smallest structural and functional unit of an organism.
nucleus	A structure that contains genetic material and controls the activities of the cell.
chromosome	A thread like structure of coiled DNA found in the nucleus of eukaryotic cells.
DNA	A polymer made up of two strands forming a double helix.
gene	A section of DNA that codes for a specific protein or characteristic.

Cell division

MITOSIS AND THE CELL CYCLE

Cells divide in a series of stages. The genetic material is doubled and then divided into two identical cells.

Stage 1	*Growth*	Increase the number of sub-cellular structures e.g. ribosomes and mitochondria.
Stage 2	*DNA Synthesis*	DNA replicates to form two copies of each chromosome.
Stage 3	*Mitosis*	One set of chromosomes is pulled to each end of the cell and the nucleus divides. Then the cytoplasm and cell membranes divide to form two cells that are identical to the parent cell.



Mitosis occurs during growth, repair, replacement of cells. Asexual reproduction occurs by mitosis in both plants & simple animals.

STEM CELLS

Undifferentiated cell of an organism

Divides to form more cells of the same type, and can differentiate to form many other cell types.

Human Embryonic stem cells	*Can be cloned and made to differentiate into most cell types*	Therapeutic cloning uses same genes so the body does not reject the tissue. Can be a risk of infection
Adult bone marrow stem cells	*Can form many types of human cells e.g. blood cells*	Tissue is matched to avoid rejection, risk of infection. Only a few types of cells can be formed.
Meristems (plants)	*Can differentiate into any plant cell type throughout the life of the pant.*	Used to produce clones quickly and economically, e.g. rare species, crop plants with pest /disease resisitance

Treatment with stem cells may be able to help conditions such as diabetes and paralysis. Some people object to the use of stem cells on ethical or religious grounds

Transport in cells

ADAPTATIONS FOR DIFFUSION

Small intestines	*Villi – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Lungs	*Alveoli– increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Gills in fish	*Gill filaments and lamella – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Roots	*Root hair cells - increase surface area.*
Leaves	*Large surface area, thin leaves for short diffusion path, stomata on the lower surface to let O_2 and CO_2 in and out.*

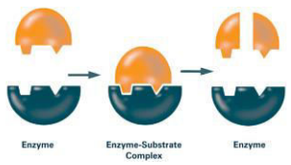
The greater the difference in concentrations the faster the rate of diffusion.

Diffusion ***No*** energy required	*Movement of particles in a solution or gas from a higher to a lower concentration*	E.g. O_2 and CO_2 in gas exchange, urea in kidneys. Factors that affect the rate are concentration, temperature and surface area.
Osmosis ***No*** energy required	*Movement of water from a dilute solution to a more concentrated solution*	E.g. Plants absorb water from the soil by osmosis through their root hair cells. Plants use water for several vital processes including photosynthesis and transporting minerals.
Active transport ***ENERGY*** required	*Movement of particles from a dilute solution to a more concentrated solution*	E.g. movement of mineral ions into roots of plants and the movement of glucose into the small intestines.

AQA GCSE ORGANISATION Part 1

Enzymes catalyse (increase the rate of) specific reactions in living organisms

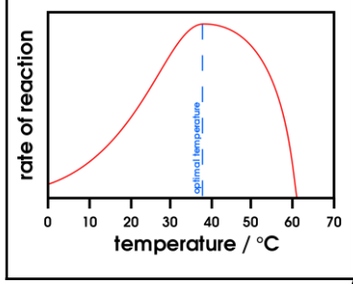
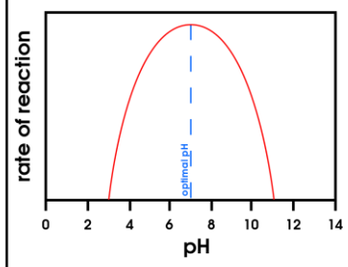
The 'lock and key theory' is a simplified model to explain enzyme action



Enzymes catalyse specific reactions in living organisms due to the shape of their active site

Digestive enzymes speed up the conversion of large insoluble molecules (food) into small soluble molecules that can be absorbed into the bloodstream

The activity of enzymes is affected by changes in temperature and pH

Enzymes activity has an optimum temperature	*Enzyme activity has an optimum pH*
	

Large changes in temperature or pH can stop the enzyme from working (denature)

Temperature too high	*pH too high or too low*
Enzyme changes shape (denatures) the substrate no longer fits the active site.	

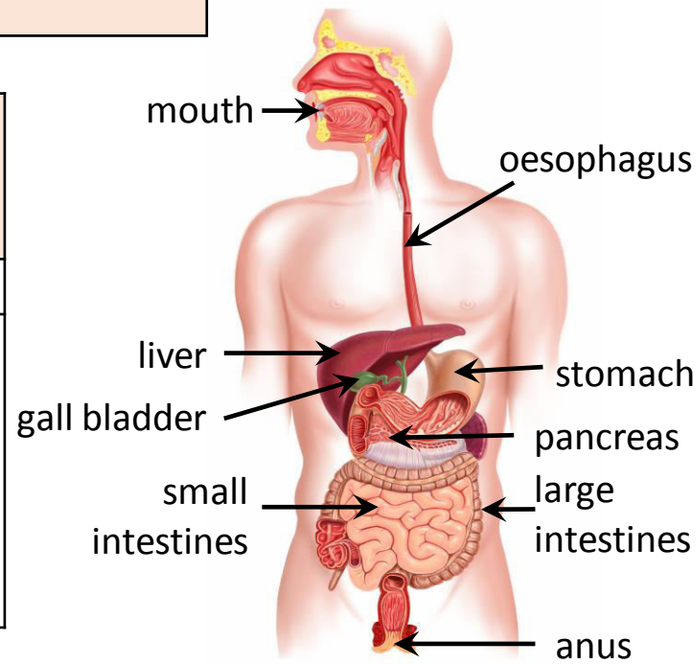
Enzymes in digestion

Carbohydrases (e.g. amylase)		*Made in salivary glands, pancreas, small intestine*	Break down carbohydrates to simple sugar (e.g. amylase breaks down starch to glucose).
Proteases		*Made in stomach, pancreas*	Break down protein to amino acids.
Lipases		*Made in pancreas (works in small intestine)*	Break down lipids (fats) to glycerol and fatty acids).
Bile (not an enzyme)		*Made in liver, stored in gall bladder.*	Emulsifies lipids to increase surface area to increase the rate of lipid break down by lipase. Changes pH to neutral for lipase to work

The products of digestion are used to build new carbohydrates, lipids and proteins. Some glucose is used for respiration.

The human digestive system

An organ system in which organs work together to digest and absorb food.



Non-communicable diseases

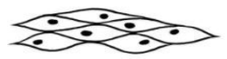
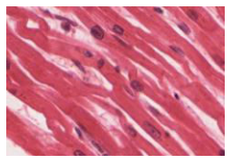
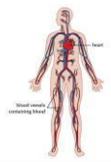
More energy consumed in food and drink than used
obesity
Linked to increased rates of cardiovascular disease and development of diabetes type 2.

Food tests

Sugars (glucose)	*Benedicts' test*	Orange to brick red precipitate.
Starch	*Iodine test*	Turns black.
Biuret	*Biuret reagent*	Mauve or purple solution.

Principles of organisation

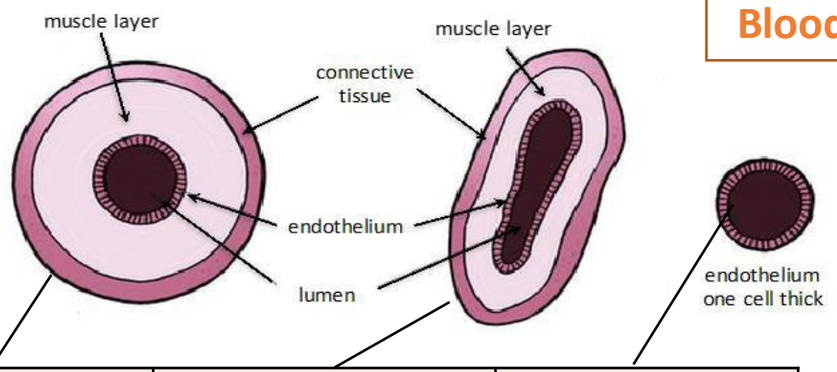
Cells, tissues, organs and systems

Cells		*e.g. muscle cells*	The basic building blocks of all living organisms.
Tissues		*e.g. muscle tissue*	A group of cells with a similar structure and function.
Organs		*e.g. the heart*	Aggregations (working together) of tissues performing a specific function.
Organ systems		*e.g. the circulatory system*	Organs working together to form organ systems, which work together to form an organism.

BHS Science

AQA GCSE ORGANISATION part 2

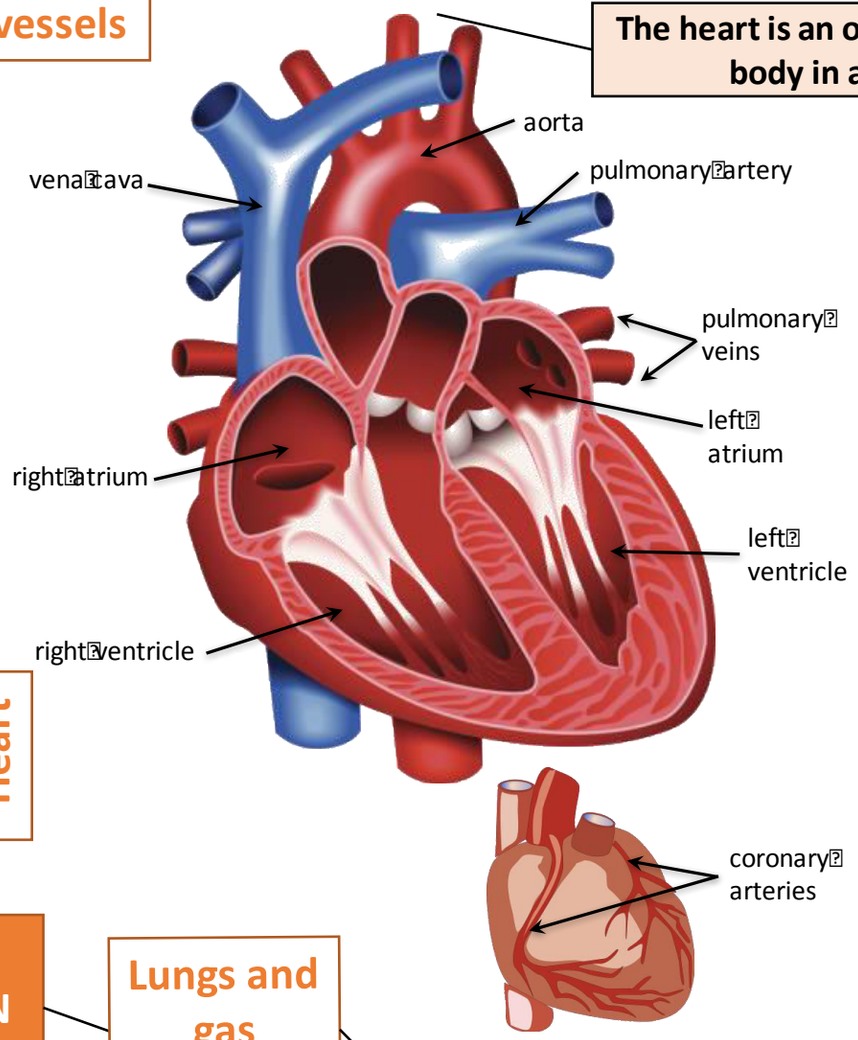
Blood vessels



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

Heart

The heart is an organ that pumps blood around the body in a double circulatory system



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

Blood

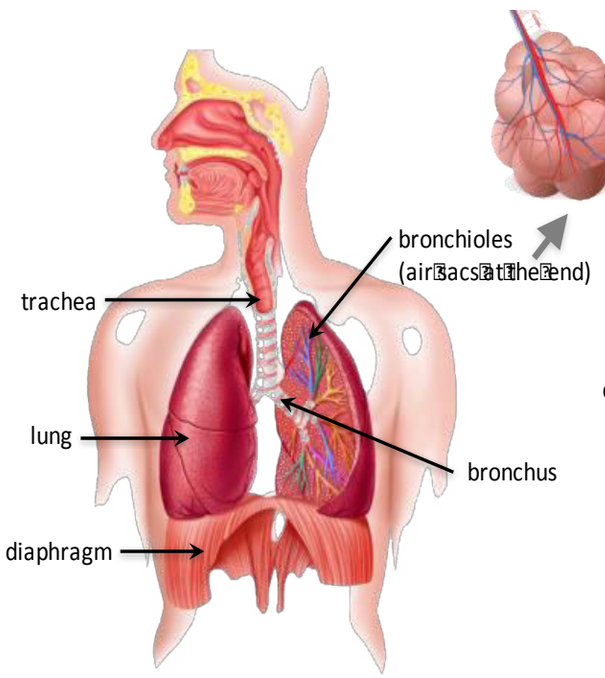
Blood is a tissue consisting of plasma, in which blood cells, white blood cells and platelets are suspended

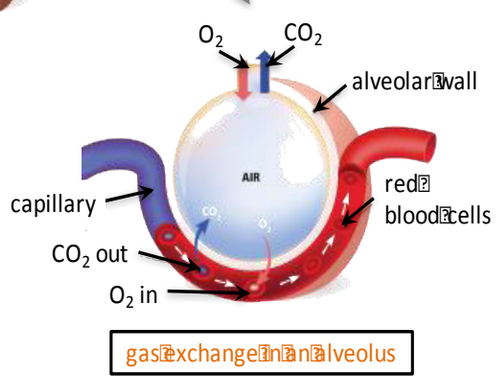
Plasma (55%)	*Pale yellow fluid*	Transports CO_2, hormones and waste.
Red blood cells (45%)	*Carries oxygen*	Large surface area, no nucleus, full of haemoglobin.
White blood cells (<1%)	*Part of the immune system*	Some produce antibodies, others surround and engulf pathogens.
Platelets (<1%)	*Fragments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

Lungs and gas exchange

The heart pumps low oxygen/high carbon dioxide blood to the lungs

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





gas exchange in an alveolus

BHS Science

AQA GCSE ORGANISATION part 3

Heart failure can be treated with a transplant or artificial heart

Disease	*Cause*	Effect	Treatment
Coronary heart disease (CHD)	*A build up for fatty substances in the coronary arteries (atherosclerosis)*	Oxygen-ated blood cannot get to the cardiac muscle.	Stents: inserted into the blocked artery to open it up. Statins: lower harmful cholesterol.
Faulty heart valves	*Valves don't open or close properly*	Blood can leak or flow in the wrong direction	Biological valve transplant or a mechanical valve can be inserted

Cancer

Non-communicable diseases

The result of changes in DNA that lead to uncontrolled growth and division

Benign tumour	Contained in one area of the body (usually by a membrane) – not cancer.
Malignant tumour	Invade tissues and spread to different parts of the body to form secondary tumours.

Some cancers have genetic risk factors.

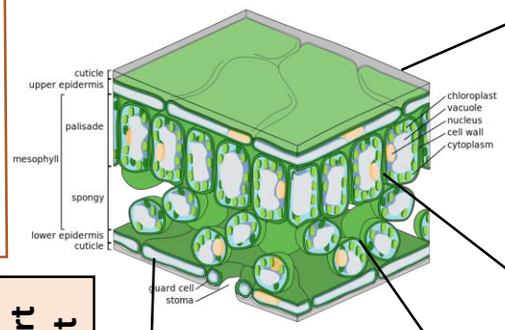
Carcinogens and ionising radiation increase the risk of cancer by changing/ damaging DNA

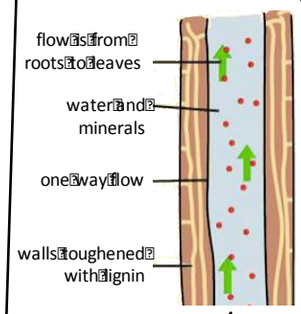
Risk factors for heart/lung disease and certain types of cancer include drinking alcohol, diet, obesity and smoking

These risks factors can also affect the brain, liver and the health of unborn babies

Plant organ systems

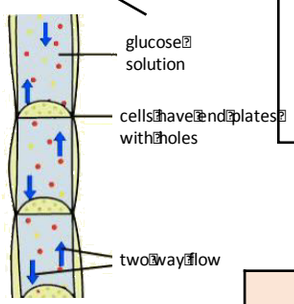
The roots, stem and leaves form a plant organ system for transport of substances around the plant

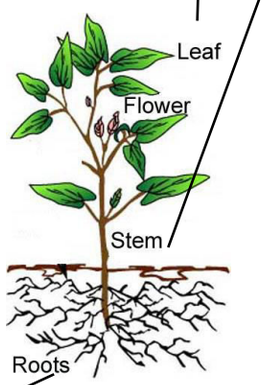


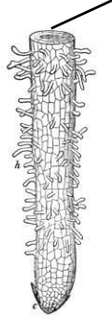


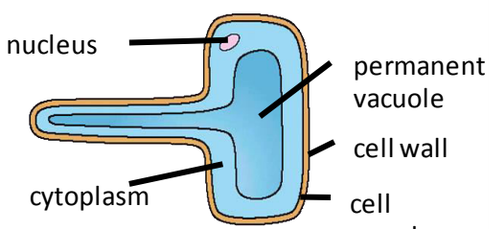
xylem

phloem







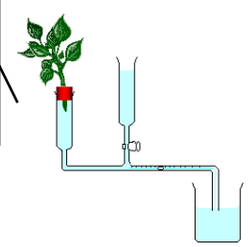


Plant tissues

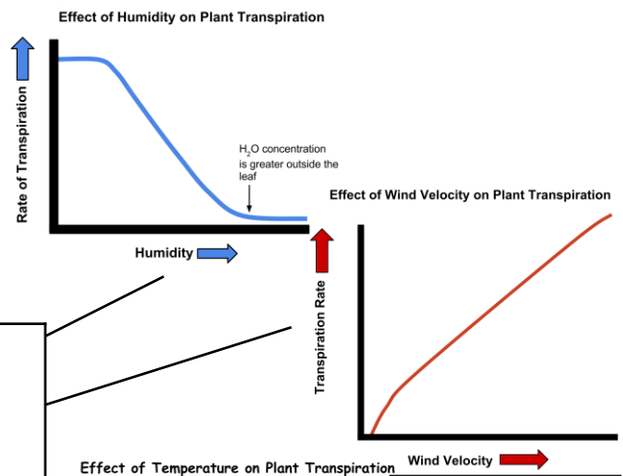
Epidermal tissues	*Waxy cuticle (top layer of the leaf)*	Reduces water loss from the leaf
	Guard cells and stomata	Guard cells open and close the stomata to control water loss and allow for gas exchange (oxygen and carbon dioxide).
Palisade mesophyll	*Palisade cells*	Cells near the top surface of the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

Transpiration

A potometer is used to measure the amount of water lost over time (rate of transpiration)



Transpiration	*The rate at which water is lost from the leaves of a plant. The transpiration stream is the column of water moving through the roots, stem and leaves*	Temperature, humidity, air movement and light intensity affect the rate of transpiration.



The shape of the graph for light intensity is the same for temperature (energy)

BHS Science

AQA GCSE INFECTION AND RESPONSE part 1

Human defence systems

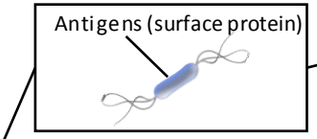
Non-specific defence systems

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

	*Nose*	Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.
	*Trachea and bronchus (respiratory system)*	Lined with mucus to trap dust and pathogens. Cilia move the mucus upwards to be swallowed.
	*Stomach acid*	Stomach acid (pH1) kills most ingested pathogens.
	*Skin*	Hard to penetrate waterproof barrier. Glands secrete oil which kill microbes

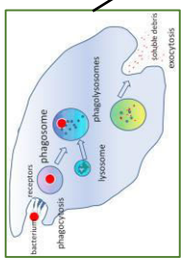
Immune system

White blood cells are part of the immune system



Pathogens are identified by white blood cells by the different proteins on their surfaces **ANTIGENS.**

Phagocytes	*Phagocytosis* — Phagocytes engulf the pathogens and digest them.
Lymphocytes	*Antibody production* — Specific antibodies destroy the pathogen. This takes time so an infection can occur. If a person is infected again by the same pathogen, the lymphocytes make antibodies much faster.
	Antitoxin production — Antitoxin is a type of antibody produced to counteract the toxins produced by bacteria.



Plants have several ways of defending themselves from pathogens and animals

Physical	*Mechanical*
Thick waxy layers, cell walls stop pathogen entry	Thorns, curling up leaves to prevent being eaten
Chemical	
Antibacterial and toxins made by plant	

Detection and identification of plant diseases (bio only)

Detection	**Identification**
Stunted growth	Reference using gardening manual or website, laboratory test for pathogens, testing kit using monoclonal antibodies.
Spots on leaves	
Area of decay	
growths	
Malformed stem/leaves	
Discolouration	
Presence of pests	

Nitrate ions needed for protein synthesis – lack of nitrate = stunted growth.

Magnesium ions needed to make chlorophyll – not enough leads to chlorosis – leaves turn yellow.

Pathogens may infect plants or animals and can be spread by direct contact, water or air

Pathogen	*Disease*	Symptoms	Method of transmission	Control of spread
Virus	*Measles*	Fever, red skin rash.	Droplet infection from sneezes and coughs.	Vaccination as a child.
Virus	*HIV*	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
Virus	*Tobacco mosaic virus*	Mosaic pattern on leaves.	Enters via wounds in epidermis caused by pests.	Remove infected leaves and control pests that damage the leaves.
Bacteria	*Salmonella*	Fever, cramp, vomiting, diarrhoea.	Food prepared in unhygienic conditions or not cooked properly.	Improve food hygiene, wash hands, vaccinate poultry, cook food thoroughly.
Bacteria	*Gonorrhoea*	Green discharge from penis or vagina.	Direct sexual contact or exchange of body fluids.	Use condoms. Treatment using antibiotics.
Protists	*Malaria*	Recurrent fever.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
Fungus	*Rose black spot*	Purple black spots on leaves.	Spores carried via wind or water.	Remove infected leaves. Spray with fungicide.

Communicable diseases

Pathogens

Pathogens are microorganisms that cause infectious disease

Bacteria may produce toxins that damage tissues and make us fell ill

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
e.g. cold, influenza, measles, HIV, tobacco mosaic virus	*e.g. tuberculosis (TB), Salmonella, Gonorrhoea*	*e.g. dysentery, sleeping sickness, malaria*	*e.g. athlete's foot, thrush, rose black spot*
DNA or RNA surrounded by a protein coat	No membrane bound organelles (no chloroplasts, mitochondria or nucleus). Cell wall. Single celled organisms	Membrane bound organelles. Usually single celled.	Membrane bound organelles, cell wall made of chitin. Single celled or multi-cellular

Viruses live and reproduce inside cells causing damage

BHS Science

AQA INFECTION AND RESPONSE

Antibiotics and painkillers

Antibiotics have greatly reduced deaths from infectious bacterial disease

antibiotics	***e.g. penicillin***	Kill infective bacteria inside the body. Specific bacterial infections require specific antibiotics.
Painkillers and other medicines	***e.g. aspirin, paracetamol, ibuprofen***	Drugs that are used to treat the symptoms of a disease. They do not kill pathogens

Antibiotics cannot be use to treat viral pathogens

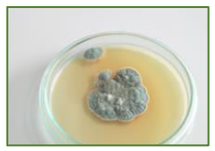
It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

Bacteria can mutate

Sometimes this makes them resistant to antibiotic drugs.

Discovery and drug development

Traditionally drugs were extracted from plants and microorganisms

Digitalis	***Aspirin***	***Penicillin***
Extracted from foxglove plants and used as a heart drug	A painkiller and anti-inflammatory that was first found in willow bark	Discovered by Alexander Fleming from the *Penicillium* mould and used as an antibiotic
		

Most new drugs are synthesised by chemists in the pharmaceutical industry.

Drugs have to be tested and trialled before to check they are safe and effective

New drugs are extensively tested for:		
	Efficacy	Make sure the drug works
	Toxicity	Check that the drug is not poisonous
	Dose	The most suitable amount to take

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

Clinical trials use healthy volunteers and patients

Stage 1	***Stage 2***	***Stage 3***	***Stage 4***
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

Double blind trial: patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias.

A placebo can look identical to the new drug but contain no active ingredients

Vaccination

Used to immunise a large proportion of the population to prevent the spread of a pathogen

Vaccination	***Small amount of dead or inactive form of the pathogen***	***1st infection by pathogen***	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
		Re-infection by the same pathogen	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

A person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented

Created more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.

Monoclonal antibodies (Biology only HT)

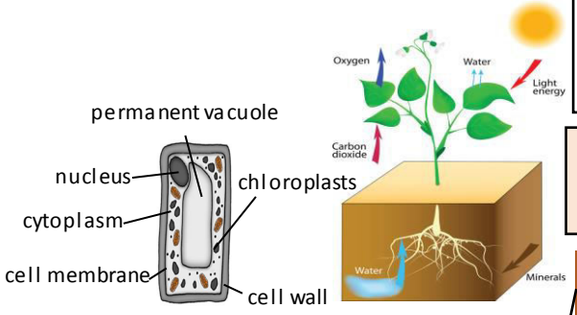
Monoclonal antibodies	***Identical copies of one types of antibody produced in laboratory***	1. A mouse is injected with pathogen
		2. Lymphocytes produce antibodies
		3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells
		4. The new cells are called hybridomas
		5. The hybridomas divide rapidly and release lots of antibodies which are then collected

Specific to one binding site on the antigen. Can target specific chemicals or cells in the body

Monoclonal antibodies can be used in a variety of ways

Diagnosis	***Detecting pathogens***	***Detecting molecules***	***Treatment***
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical Cancer cells are targeted to normal body cells are unharmed

AQA GCSE BIOENERGETICS part 1



Respiration, stored as insoluble starch, fats or oils for storage, cellulose for cell walls, combine with nitrates from the soil to form amino acids for protein synthesis

Plants use the glucose produced in photosynthesis in a variety of ways

Photosynthetic reaction

The plant manufactures glucose from carbon dioxide and water using energy transferred from the environment to the chloroplasts by light

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

Control conditions in greenhouses to reduce limiting factors can improve crop yields

Heating	Used to provide optimum temperatures for maximum plant growth.
Artificial lighting	Enhances the natural sunlight especially overnight and on cloudy days.
Extra carbon dioxide	Gas can be pumped into the air inside the greenhouse.

Growers must balance the economics of additional costs of controlling the conditions to maximise photosynthesis with making a profit.

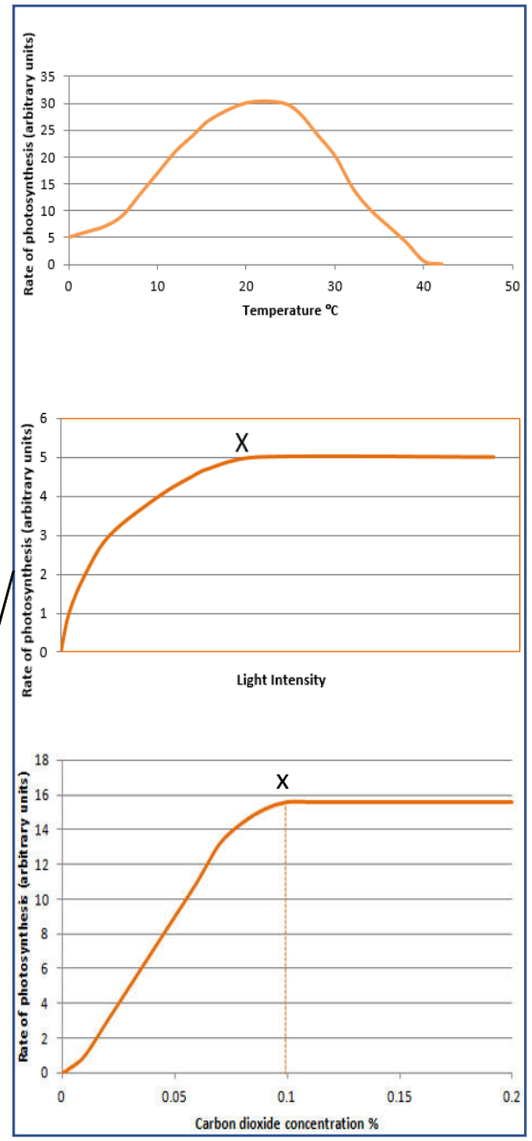
Rate of photosynthesis HT Only

Rate of photosynthesis

The rate of photosynthesis is affected by temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll

Factors affecting the rate of photosynthesis

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



Light intensity obeys the inverse square law. This means that if you double the distance between the plant and the light source you quarter the light intensity

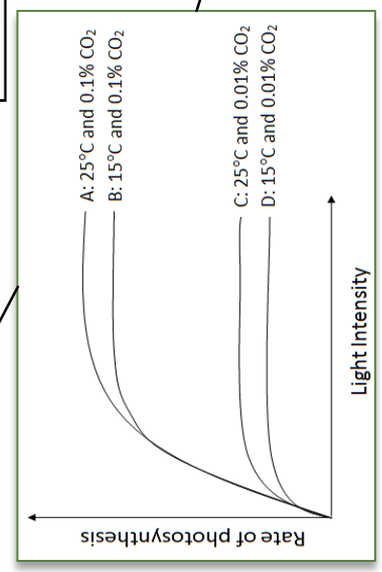
Graph lines C and D: If temperature is increased by 10°C then a slight increase in rate of photosynthesis occurs.

Graph lines A and D: If carbon dioxide concentration and temperature are increased the rate of photosynthesis increases significantly up to a point.

Graph line A: Rate could be limited by temperature and/or amount of chlorophyll. Plant tissue can be damaged when carbon dioxide concentrations exceed 0.1%

Explain graphs of two or three factors and decide which is the limiting factor

Graph Lines A and B: If carbon dioxide concentration is increased from 0.01% to 0.1% then a large increase in rate occurs up to a point.

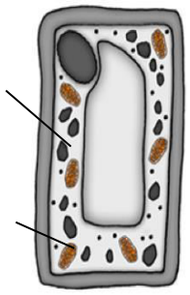


AQA GCSE BIOENERGETICS part 2

Respiration

Cellular respiration is an exothermic reaction which is continuously occurring in all living cells

animal cell



plant cell

Electron micrograph of a mitochondrion

Anaerobic respiration

Respiration when oxygen is in short supply. Occurs during intensive exercise

During hard exercise, muscle cells are respiring so fast that blood cannot transport enough oxygen to meet their needs.

Glucose is partially oxidised to produce lactic acid which builds up in muscle tissue causing them to become painful and fatigued.

glucose → lactic acid

Anaerobic respiration releases a much smaller amount of energy than aerobic respiration.

The incomplete oxidation of glucose causes a build up of lactic acid and creates an oxygen debt

Aerobic respiration

Respiration with oxygen. Occurs inside the mitochondria continuously

Glucose is oxidised by oxygen to transfer the energy the organism needs to perform it's functions.

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

glucose + oxygen → carbon dioxide + water

Aerobic respiration releases a large amount of energy from each glucose molecule

Anaerobic respiration in plant and yeast cells

The end products are ethanol and carbon dioxide. Anaerobic respiration in yeast cells is called fermentation

glucose → ethanol + carbon dioxide

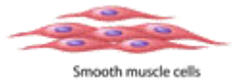
This process is economically important in the manufacture of alcoholic drinks and bread.

Response to exercise

During long periods of vigorous activity muscles become fatigued and stop contracting efficiently

During exercise the human body reacts to increased demand for energy	***Heart rate increases***	Top pump oxygenated blood faster to the muscle tissues and cells.
	Breathing rate and breath volume increase	This increases the amount of oxygen entering the blood stream.

An organism will receive all the energy it needs for living processes as a result of the energy transferred from respiration

For movement	 Smooth muscle cells	To enable muscles to contract in animals.
For keeping warm		To keep a steady body temperature in a cold environment.
For chemical reactions		To build larger molecules from smaller one.

Metabolism

Metabolism is the sum of all the reactions in a cell or the body

Metabolism	***The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism.***	Conversion of glucose to starch, glycogen and cellulose.
		The formation of lipid molecules from a molecule of glycerol and three molecules of fatty acid.
		The use of glucose and nitrate ions to form amino acids which in turn are used to synthesise proteins.
		Respiration
		Breakdown of excess proteins to form urea for excretion.

Response to exercise HT only

The extra amount of oxygen required to remove all lactic acids from cells is called the oxygen debt

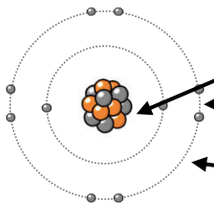
Lactic acid builds up in the muscles cells during exercise → Blood flows through the muscle cells and transports the lactic acid to the liver → The liver oxidises the lactic acid and converts it back to glucose

BHS Science

AQA GCSE Atomic structure and periodic table part 1

Atoms, elements and compounds

Atom	*The smallest part of an element that can exist*	Have a radius of around 0.1 nanometres and have no charge (0).
Element	*Contains only one type of atom*	Around 100 different elements each one is represented by a symbol e.g. O, Na, Br.
Compound	*Two or more elements chemically combined*	Compounds can only be separated into elements by chemical reactions.



Central nucleus	Contains protons and neutrons
Electron shells	Contains electrons

Name of Particle	Relative Charge	Relative Mass
Proton	+1	1
Neutron	0	1
Electron	-1	Very small

Relative electrical charges of subatomic particles

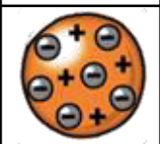
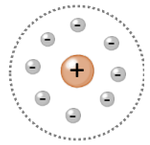
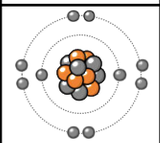
Electronic structures

Electronic shell	Max number of electrons
1	2
2	8
3	8
4	2

7
Li
3

Mass number	*The sum of the protons and neutrons in the nucleus*	
Atomic number	*The number of protons in the atom*	Number of electrons = number of protons

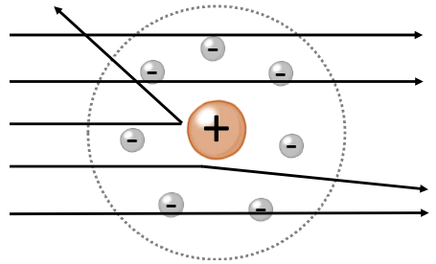
The development of the model of the atom

Pre 1900		*Tiny solid spheres that could not be divided*	Before the discovery of the electron, John Dalton said the solid sphere made up the different elements.
1897 'plum pudding'		*A ball of positive charge with negative electrons embedded in it*	JJ Thompson 's experiments showed that showed that an atom must contain small negative charges (discovery of electrons).
1909 nuclear model		*Positively charge nucleus at the centre surrounded negative electrons*	Ernest Rutherford's alpha particle scattering experiment showed that the mass was concentrated at the centre of the atom.
1913 Bohr model		*Electrons orbit the nucleus at specific distances*	Niels Bohr proposed that electrons orbited in fixed shells; this was supported by experimental observations.

James Chadwick	*Provided the evidence to show the existence of neutrons within the nucleus*

Rutherford's scattering experiment

A beam of alpha particles are directed at a very thin gold foil



Most of the alpha particles passed right through.
A few (+) alpha particles were deflected by the positive nucleus.
A tiny number of particles reflected back from the nucleus.

Mixtures

Mixtures — *Two or more elements or compounds not chemically combined together* — Can be separated by physical processes.

Method	Description	Example
Filtration	*Separating an insoluble solid from a liquid*	To get sand from a mixture of sand, salt and water.
Crystallisation	*To separate a solid from a solution*	To obtain pure crystals of sodium chloride from salt water.
Simple distillation	*To separate a solvent from a solution*	To get pure water from salt water.
Fractional distillation	*Separating a mixture of liquids each with different boiling points*	To separate the different compounds in crude oil.
Chromatography	*Separating substances that move at different rates through a medium*	To separate out the dyes in food colouring.

Chemical equations

Chemical equations — *Show chemical reactions - need reactant(s) and product(s) energy always involves and energy change* — Law of conservation of mass states the total mass of products = the total mass of reactants.

Word equations	*Uses words to show reaction* **reactants → products** magnesium + oxygen → magnesium oxide	Does not show what is happening to the atoms or the number of atoms.
Symbol equations	*Uses symbols to show reaction* **reactants → products** $2Mg + O_2 \rightarrow 2MgO$	Shows the number of atoms and molecules in the reaction, these need to be balanced.

Relative atomic mass

Isotopes	*Atoms of the same element with the same number of protons and different numbers of neutrons*	^{35}Cl (75%) and ^{37}Cl (25%) Relative abundance = (% isotope 1 x mass isotope 1) + (% isotope 2 x mass isotope 2) ÷ 100 **e.g. (25 x 37) + (75x 35) ÷ 100 = 35.5**

AQA GCSE Atomic structure and periodic table part 2

The Periodic table

Elements arranged in order of atomic number	***Elements with similar properties are in columns called groups***	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Development of the Periodic table

Before discovery of protons, neutrons and electrons	***Elements arranged in order of atomic weight***	Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
Mendeleev	***Left gaps for elements that hadn't been discovered yet***	Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

Alkali metals — Halogens — Noble gases — Transition metals

1	2											3	4	5	6	7	0
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	?	?	?						

Metals to the left of this line, non metals to the right

Metals and non metals

Metals	***To the left of the Periodic table***	Form positive ions. Conductors, high melting and boiling points, ductile, malleable.
Non metals	***To the right of the Periodic table***	Form negative ions. Insulators, low melting and boiling points.

Group 7

Halogens

Consist of molecules made of a pair of atoms	Have seven electrons in their outer shell. Form -1 ions.
Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
Reactivity decreases down the group	Increasing proton number means an electron is more easily gained

With metals	**Forms a metal halide**	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	**Forms a hydrogen halide**	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $Cl_2 + H_2 \rightarrow 2HCl$
With aqueous solution of a halide salt	**A more reactive halogen will displace the less reactive halogen from the salt**	Chlorine + potassium bromide → potassium chloride + bromine	e.g. $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Group 0

Noble gases

Unreactive, do not form molecules	This is due to having full outer shells of electrons.
Boiling points increase down the group	Increasing atomic number.

Group 1

Alkali metals

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

With oxygen	**Forms a metal oxide**	Metal + oxygen → metal oxide	e.g. $4Na + O_2 \rightarrow 2Na_2O$
With water	**Forms a metal hydroxide and hydrogen**	Metal + water → metal hydroxide + hydrogen	e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
With chlorine	**Forms a metal chloride**	Metal + chlorine → metal chloride	e.g. $2Na + Cl_2 \rightarrow 2NaCl$

Transition metals (Chemistry only)

Compared to group 1	• ***Less reactive*** • ***Harder*** • ***Denser*** • ***Higher melting points***	• ***Cu^{2+} is blue*** • ***Ni^{2+} is pale green, used in the manufacture of margarine*** • ***Fe^{2+} is green, used in the Haber process*** • ***Fe^{3+} is reddish-brown*** • ***Mn^{2+} is pale pink***
Typical properties	• ***Many have different ion possibilities with different charges*** • ***Used as catalysts*** • ***Form coloured compounds***	

AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 1

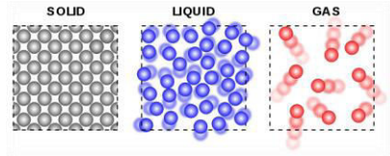
Chemical bonds

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

The three states of matter

Solid, liquid, gas

Melting and freezing happen at melting point, boiling and condensing happen at boiling point.



The amount of energy needed for a state change depends on the strength of forces between particles in the substance.

(HT only)
Limitations of simple model:
- There are no forces in the model
- All particles are shown as spheres
- Spheres are solid

s	solid
l	liquid
g	gas

Properties of ionic compounds

High melting and boiling points	Large amounts of energy needed to break the bonds.
Do not conduct electricity when solid	Ions are held in a fixed position in the lattice and cannot move.
Do conduct electricity when molten or dissolved	Lattice breaks apart and the ions are free to move.

Metals as conductors

Good conductors of electricity	Delocalised electrons carry electrical charge through the metal.
Good conductors of thermal energy	Energy is transferred by the delocalised electrons.

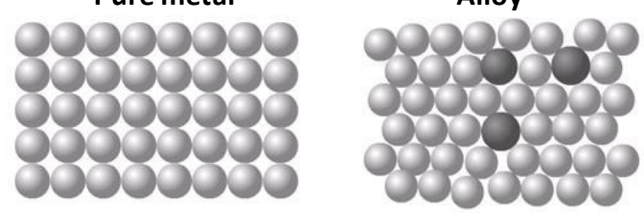
Properties of metals and alloys

High melting and boiling points	This is due to the strong metallic bonds.
Pure metals can be bent and shaped	Atoms are arranged in layers that can slide over each other.

Alloys

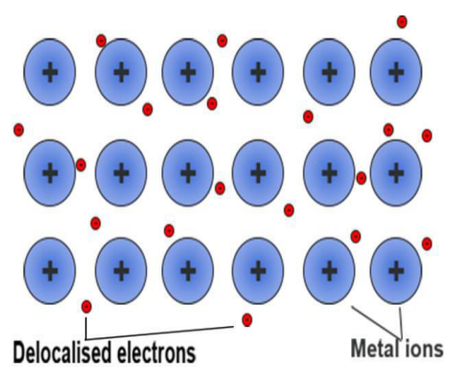
Mixture of two or more elements at least one of which is a metal

Harder than pure metals because atoms of different sizes disrupt the layers so they cannot slide over each other.



Metallic bonding

Giant structure of atoms arranged in a regular pattern

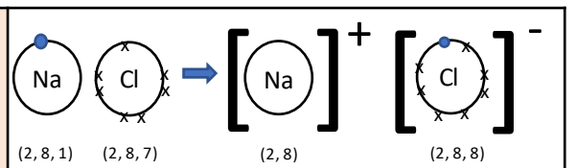
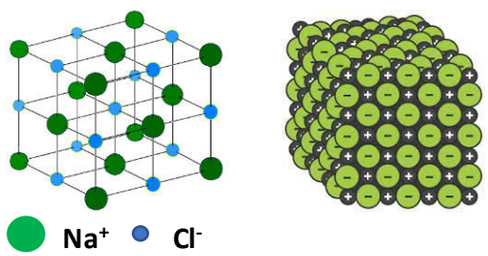


Electrons in the outer shell of metal atoms are delocalised and free to move through the whole structure. This sharing of electrons leads to strong metallic bonds.

Ionic bonding

Electrons are transferred so that all atoms have a noble gas configuration (full outer shells).	*Metal atoms lose electrons and become positively charged ions*	Group 1 metals form +1 ions Group 2 metals form +2 ions
	Non metals atoms gain electrons to become negatively charged ions	Group 6 non metals form -2 ions Group 7 non metals form -1 ions

Ionic compounds

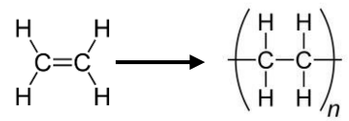
Dot and cross diagram	
Giant structure	

Structure

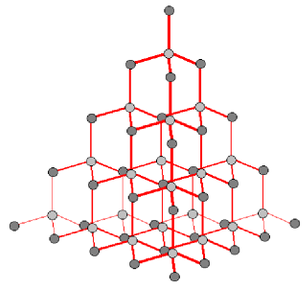
- *Held together by strong electrostatic forces of attraction between oppositely charged ions*
- *Forces act in all directions in the lattice*

AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

Polymers

Very large molecules	*Solids at room temperature*	Atoms are linked by strong covalent bonds.	

Diamond

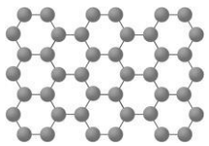
Each carbon atom is bonded to four others		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

Properties of small molecules

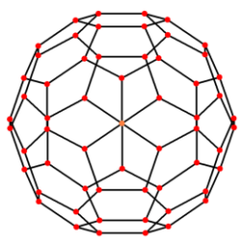
Usually gases or liquids	*Covalent bonds in the molecule are strong but forces between molecules (intermolecular) are weak*	Low melting and boiling points.	Due to having weak intermolecular forces that easily broken.
		Do not conduct electricity.	Due to them molecules not having an overall electrical charge.
		Larger molecules have higher melting and boiling points.	Intermolecular forces increase with the size of the molecules.

Graphene and fullerenes

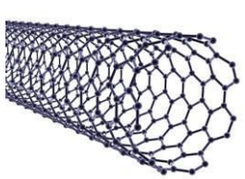
Graphene

 *Single layer of graphite one atom thick*	Excellent conductor.	Contains delocalised electrons.
	Very strong.	Contains strong covalent bonds.

Fullerenes

	Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.

Carbon nanotubes

	*Very thin and long cylindrical fullerenes*	Very conductive.	Used in electronics industry.
		High tensile strength.	Reinforcing composite materials.
		Large surface area to volume ratio.	Catalysts and lubricants.

Size of particles and their properties (Chemistry only)

Nanoparticles

Between 1 and 100 nanometres (nm) in size	1 nanometre (1 nm) = 1 x 10^{-9} metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

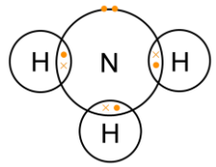
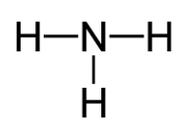
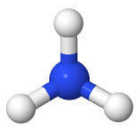
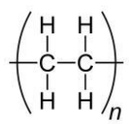
Healthcare, cosmetics, sun cream, catalysts, deodorants, electronics.	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.

Giant covalent structures

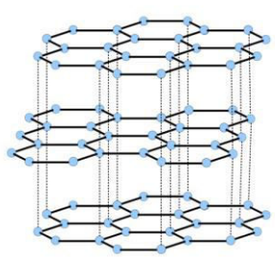
Diamond, graphite, silicon dioxide	*Very high melting points*	Lots of energy needed to break strong, covalent bonds.

Covalent bonding

Atoms share pairs of electrons

Can be small molecules e.g. ammonia	 Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical  2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°  3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°
Can be giant covalent structures e.g. polymers	

Graphite

Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.
		Does conduct electricity.	Delocalised electrons between layers.

AQA GCSE QUANTITATIVE CHEMISTRY 1

Relative formula mass (M_r)

M_r	*The sum of the relative atomic masses of the atoms in the numbers shown in the formula*	The sum of the M_r of the reactants in the quantities shown equals the sum of the M_r of the products in the quantities shown.	$2Mg + O_2 \rightarrow 2MgO$ $48g + 32g = 80g$ $80g = 80g$

Limiting reactants (HT only)

The reactant that is completely used up	*Limits the amount of product that is made*	Less moles of product are made.

Chemical measurements

Whenever a measurement is taken, there is always some uncertainty about the result obtained	*Can determine whether the mean value falls within the range of uncertainty of the result*	1. Calculate the mean 2. Calculate the range of the results 3. Estimate of uncertainty in mean would be half the range

Example:
1. Mean value is 46.5s
2. Range of results is 44s to 49s = 5s
3. Time taken was 46.5s ±2.5s

Mass changes when a reactant or product is a gas

Mass appears to increase during a reaction	*One of the reactants is a gas*	Magnesium + oxygen → magnesium oxide
Mass appears to decrease during a reaction	*One of the products is a gas and has escaped*	Calcium carbonate → carbon dioxide + calcium oxide

Conservation of mass and balanced symbol equations

Conservation of mass	*No atoms are lost or made during a chemical reaction*	Mass of the products equals the mass of the reactants.

Balanced symbol equations

Represent chemical reactions and have the same number of atoms of each element on both sides of the equation	$H_2 + Cl_2 \rightarrow 2HCl$ Subscript — Normal script Subscript numbers show the number of atoms of the element to its left. Normal script numbers show the number of molecules.

Moles (HT only)

Chemical amounts are measured in moles (mol)	*Mass of one mole of a substance in grams = relative formula mass*	One mole of H_2O = 18g (1 + 1 + 16) One mole of Mg = 24g

Avogadro constant

Avogadro constant	*One mole of any substance will contain the same number of particles, atoms, molecules or ions.*	6.02×10^{23} per mole One mole of H_2O will contain 6.02×10^{23} molecules One mole of NaCl will contain 6.02×10^{23} Na^+ ions

Number of moles = $\frac{\text{mass (g)}}{A_r}$ or $\frac{\text{mass (g)}}{M_r}$

How many moles of sulfuric acid molecules are there in 4.7g of sulfuric acid (H_2SO_4)?
Give your answer to 1 significant figure.

$\frac{4.7}{98} = 0.05$ mol ← (M_r of H_2SO_4)

Amounts of substances in equations (HT only)

The balancing numbers in a symbol equation can be calculated from the masses of reactants and products	*Convert the masses in grams to amounts in moles and convert the number of moles to simple whole number ratios.*

Using moles to balance equations (HT only)

Chemical equations show the number of moles reacting and the number of moles made	*$Mg + 2HCl \rightarrow MgCl_2 + H_2$* *One mole of magnesium reacts with two moles of hydrochloric acid to make one mole of magnesium chloride and one mole of hydrogen*	If you have a 60g of Mg, what mass of HCl do you need to convert it to $MgCl_2$? A_r : Mg =24 so mass of 1 mole of Mg = 24g M_r : HCl (1 + 35.5) so mass of 1 mole of HCl = 36.5g So 60g of Mg is 60/24 = 2.5 moles Balanced symbol equation tells us that for every one mole of Mg, you need two moles of HCl to react with it. So you need 2.5x2 = 5 moles of HCl You will need 5 x 36.5g of HCl= 182.5g

Concentration of solutions

Measured in mass per given volume of solution (g/dm³)	*Conc. = mass (g) / volume (dm^3)*	HT only Greater mass = higher concentration. Greater volume = lower concentration.

AQA QUANTITATIVE CHEMISTRY 2

Atom economy

A measure of the amount of starting materials that end up as useful products

Atom economy = $\frac{\text{Relative formula mass of desired product from equation}}{\text{Sum of relative formula mass of all reactants from equation}} \times 100$

High atom economy is important or sustainable development and economic reasons

Calculate the atom economy for making hydrogen by reacting zinc with hydrochloric acid:

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

M_r of H_2 = 1 + 1 = 2
M_r of Zn + 2HCl = 65 + 1 + 1 + 35.5 + 35.5 = 138

Atom economy = $^2/_{138} \times 100$
= $^2/_{138} \times 100$ = 1.45%

This method is unlikely to be chosen as it has a low atom economy.

Using concentrations of solutions in mol/dm³ (HT only, chemistry only)

Concentration of a solution is the amount of solute per volume of solution

Concentration (mol/dm³) = $\frac{\text{amount (mol)}}{\text{volume (dm}^3\text{)}}$

What is the concentration of a solution that has 35.0g of solute in 0.5dm³ of solution?

35/0.5 = 70 g/dm³

Titration

If the volumes of two solutions that react completely are known and the concentrations of one solution is known, the concentration of the other solution can be calculated.

$2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

It takes 12.20cm³ of sulfuric acid to neutralise 24.00cm³ of sodium hydroxide solution, which has a concentration of 0.50mol/dm³.

Calculate the concentration of the sulfuric acid in mol/dm³:

0.5 mol/dm³ x (24/1000) dm³ = 0.012 mol of NaOH
The equation shows that 2 mol of NaOH reacts with 1 mol of H_2SO_4, so the number of moles in 12.20cm³ of sulfuric acid is (0.012/2) = 0.006 mol of sulfuric acid

Calculate the concentration of sulfuric acid in mol/ dm³
0.006 mol x (1000/12.2) dm³ =0.49mol/dm³

Calculate the concentration of sulfuric acid in g/ dm³:
H_2SO_4 = (2x1) + 32 + (4x16) = 98g
0.49 x 98g = 48.2g/dm³

Use of amount of substance in relation to volumes of gases (HT only, chemistry only)

Equal amounts of moles or gases occupy the same volume under the same conditions of temperature and pressure

The volume of one mole of any gas at room temperature and pressure (20°C and 1 atmospheric pressure) is 24 dm³

No. of moles of gas = $\frac{\text{vol of gas (dm}^3\text{)}}{24\text{dm}^3}$

What is the volume of 11.6 g of butane (C_4H_{10}) gas at RTP?

M_r: (4 x 12) + (10 x 1) = 58

11.6/58 = 0.20 mol

Volume = 0.20 x 24 = 4.8 dm³

6g of a hydrocarbon gas had a volume of 4.8 dm³. Calculate its molecular mass.

1 mole = 24 dm³, so 4.8/24 = 0.2 mol

M_r = 6 / 0.2 = 30

If 6g = 0.2 mol, 1 mol equals 30 g

Percentage yield

HT only:
200g of calcium carbonate is heated. It decomposes to make calcium oxide and carbon dioxide. *Calculate the theoretical mass of calcium oxide made.*

$CaCO_3 \rightarrow CaO + CO_2$
M_r of $CaCO_3$ = 40 + 12 + (16x3) = 100
M_r of CaO = 40 + 16 = 56
100g of $CaCO_3$ would make 56 g of CaO
So 200g would make 112g

Yield is the amount of product obtained

It is not always possible to obtain the calculated amount of a product

The reaction may not go to completion because it is reversible.

Some of the product may be lost when it is separated from the reaction mixture.

Some of the reactants may react in ways different to the expected reaction.

Percentage yield is comparing the amount of product obtained as a percentage of the maximum theoretical amount

% Yield = $\frac{\text{Mass of product made x 100}}{\text{Max. theoretical mass}}$

A piece of sodium metal is heated in chlorine gas. A maximum theoretical mass of 10g for sodium chloride was calculated, but the actual yield was only 8g.
Calculate the percentage yield.

Percentage yield = 8/10 x 100 =80%

AQA Chemical Changes 1

Oxidation **I**s **L**oss (of electrons) **R**eduction **I**s **G**ain (of electrons)

Oxidation and reduction in terms of electrons (HT ONLY)

Ionic half equations (HT only)		
For displacement reactions	***Ionic half equations show what happens to each of the reactants during reactions***	For example: The ionic equation for the reaction between iron and copper (II) ions is: **$Fe + Cu^{2+} \rightarrow Fe^{2+} + Cu$** The half-equation for iron (II) is: **$Fe \rightarrow Fe^{2+} + 2e^-$** The half-equation for copper (II) ions is: **$Cu^{2+} + 2e^- \rightarrow Cu$**

Neutralisation of acids and salt production

Acid name	Salt name
Hydrochloric acid	Chloride
Sulfuric acid	Sulfate
Nitric acid	Nitrate

sodium hydroxide + hydrochloric acid → sodium chloride + water

calcium carbonate + sulfuric acid → calcium sulfate, + carbon dioxide + water

Neutralisation	***Acids can be neutralised by alkalis and bases***	An **alkali** is a soluble base e.g. metal hydroxide. A **base** is a substance that neutralises an acid e.g. a soluble metal hydroxide or a metal oxide.

Reactions of acids

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

Reactions with acids	***metal + acid → metal salt + hydrogen***	**magnesium + hydrochloric acid → magnesium chloride + hydrogen** **zinc + sulfuric acid → zinc sulfate + hydrogen**

Acids react with some metals to produce salts and hydrogen.

Reactions of acids and metals

Extraction of metals and reduction

Extraction using carbon	
Metals less reactive than carbon can be extracted from their oxides by reduction.	For example: **zinc oxide + carbon → zinc + carbon dioxide**

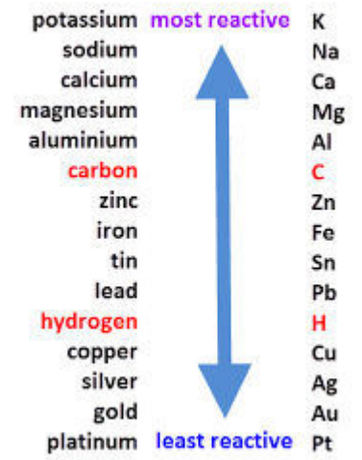
Unreactive metals, such as gold, are found in the Earth as the metal itself. They can be mined from the ground.

Reactivity of metals

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

The reactivity series

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



Metal oxides

Metals and oxygen	***Metals react with oxygen to form metal oxides***	**magnesium + oxygen → magnesium oxide** $2Mg + O_2 \rightarrow 2MgO$
Reduction	***This is when oxygen is removed from a compound during a reaction***	e.g. metal oxides reacting with hydrogen, extracting low reactivity metals
Oxidation	***This is when oxygen is gained by a compound during a reaction***	e.g. metals reacting with oxygen, rusting of iron

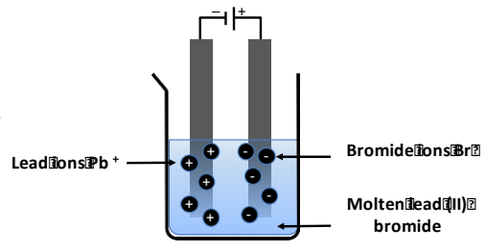
AQA Chemical Changes 2

Electrolysis

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

Extracting metals using electrolysis

- ***Metals can be extracted from molten compounds using electrolysis.***
- ***This process is used when the metal is too reactive to be extracted by reduction with carbon.***
- ***The process is expensive due to large amounts of energy needed to produce the electrical current. Example: aluminium is extracted in this way.***



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

Electrolysis of aqueous solutions

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

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

Reactions of acids

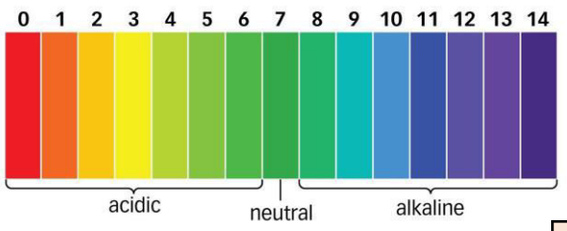
Strong and weak acids (HT ONLY)

Strong acids	***Completely ionised in aqueous solutions e.g. hydrochloric, nitric and sulfuric acids.***
Weak acids	***Only partially ionised in aqueous solutions e.g. ethanoic acid, citric acid.***
Hydrogen ion concentration	***As the pH decreases by one unit (becoming a stronger acid), the hydrogen ion concentration increases by a factor of 10.***

Soluble salts

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

The pH scale and neutralisation



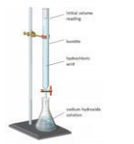
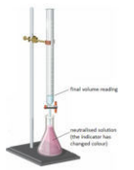
You can use universal indicator or a pH probe to measure the acidity or alkalinity of a solution against the pH scale.

Acids	***Acids produce hydrogen ions (H^+) in aqueous solutions.***
Alkalis	***Aqueous solutions of alkalis contain hydroxide ions (OH^-).***

In neutralisation reactions, hydrogen ions react with hydroxide ions to produce water:
$H^+ + OH^- \rightarrow H_2O$

Titrations (Chemistry only)

Titrations are used to work out the precise volumes of acid and alkali solutions that react with each other.

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

Calculating the chemical quantities in titrations involving concentrations in mol/dm^3 and in g/dm^3 (HT ONLY):

$2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

It takes 12.20cm^3 of sulfuric acid to neutralise 24.00cm^3 of sodium hydroxide solution, which has a concentration of 0.50mol/dm^3.

Calculate the concentration of the sulfuric acid in g/dm^3

0.5 mol/dm^3 x (24/1000) dm^3 = 0.012 mol of NaOH

The equation shows that 2 mol of NaOH reacts with 1 mol of H_2SO_4, so the number of moles in 12.20cm^3 of sulfuric acid is **(0.012/2) = 0.006 mol of sulfuric acid**

Calculate the concentration of sulfuric acid in mol/dm^3

0.006 mol x (1000/12.2) dm^3 =0.49mol/dm^3

Calculate the concentration of sulfuric acid in g/dm^3

H_2SO_4 = (2x1) + 32 + (4x16) = 98g
0.49 x 98g = 48.2g/dm^3

AQA GCSE Energy changes

Types of reaction

Endothermic	*Energy is taken in from the surroundings so the temperature of the surroundings decreases*	• Thermal decomposition • Sports injury packs
Exothermic	*Energy is transferred to the surroundings so the temperature of the surroundings increases*	• Combustion • Hand warmers • Neutralisation

Reaction profiles	*Show the overall energy change of a reaction*

The energy change of reactions (HT only)

Breaking bonds in reactants	*Endothermic process*
Making bonds in products	*Exothermic process*

Overall energy change of a reaction		
	Exothermic	Energy released making new bonds is greater than the energy taken in breaking existing bonds.
	Endothermic	Energy needed to break existing bonds is greater than the energy released making new bonds.

Bond energy calculation

Calculate the overall energy change for the forward reaction

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

Bond energies (in kJ/mol): H-H 436, H-N 391, N≡N 945

Bond breaking: 945 + (3 x 436) = 945 + 1308 = 2253 kJ/mol

Bond making: 6 x 391 = 2346 kJ/mol

Overall energy change = 2253 - 2346 = -93kJ/mol

Therefore reaction is exothermic overall.

Cells and batteries (Chemistry only)

Simple cell	*Make a simple cell by connecting two different metals in contact with an electrolyte*	Increase the voltage by increasing the reactivity difference between the two metals.
Batteries	*Consist of two or more cells connected together in series to provide a greater voltage.*	

Non-rechargeable cells	*Stop when one of the reactants has been used up*	Alkaline batteries
Rechargeable cells	*Can be recharged because the chemical reactions are reversed when an external electrical current is supplied*	Rechargeable batteries

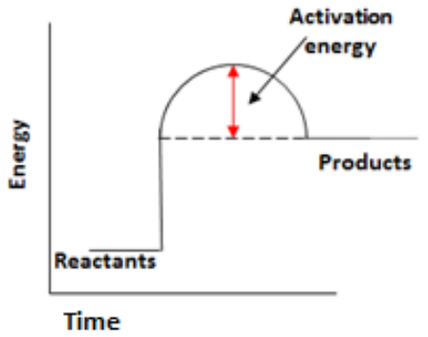
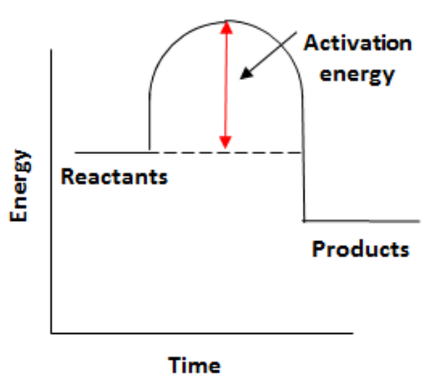
Fuel cells (Chemistry only)

Ionic half equations		
	Negative electrode: $2H_2 (g) + 4OH^- (aq) \rightarrow 4H_2O (l) + 4e^-$	Positive electrode: $O_2 (g) + 2H_2O (l) + 4e^- \rightarrow 4OH^- (aq)$

Hydrogen fuel cells		
	Word equation: *hydrogen + oxygen → water*	Symbol equation: $2H_2 + O_2 \rightarrow 2H_2O$
	Advantages: • No pollutants produced • Can be a range of sizes	Disadvantages: • Hydrogen is highly flammable • Hydrogen is difficult to store

Reaction profiles

Activation energy		
	Chemical reactions only happen when particles collide with sufficient energy	The minimum amount of energy that colliding particles must have in order to react is called the activation energy.

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

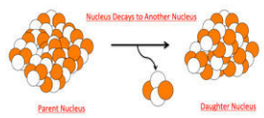
AQA ATOMIC STRUCTURE

Atom structure

Radius of an atom 1×10^{-10}m

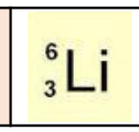
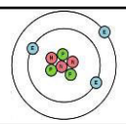
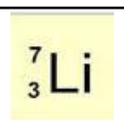
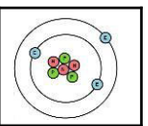
Electrons gained → Negative ion

Electrons lost → Positive ion



Atom	*Same number of protons and electrons*
Ion	*Unequal number of electrons to protons*
Mass number	*Number of protons and neutrons*
Atomic number	*Number of protons*

Particle	Charge	Size	Found
Neutron	None	1	In the nucleus
Proton	+	1	
Electron	-	Tiny	Orbits the nucleus

Isotope				
Different forms of an element with the same number of protons but different number of neutrons				

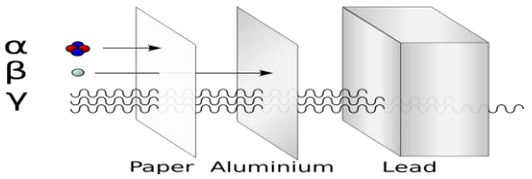
Discovery of the nucleus

Democritus	Suggested idea of atoms as small spheres that cannot be cut.
J J Thomson (1897)	Discovered electrons–emitted from surface of hot metal. Showed electrons are negatively charged and that they are much less massive than atoms.
Thomson (1904)	Proposed *'plum pudding'* model–atoms are a ball of positive charge with negative electrons embedded in it.
Geiger and Marsden (1909)	Directed beam of alpha particles (He^{2+}) at a thin sheet of gold foil. Found some travelled through, some were deflected, some bounced back.
Rutherford (1911)	Used above evidence to suggest alpha particles deflected due to electrostatic interaction between the very small charged nucleus, nucleus was massive. Proposed mass and positive charge contained in nucleus while electrons found outside the nucleus which cancel the positive charge exactly.
Bohr (1913)	Suggested modern model of atom – electrons in circular orbits around nucleus, electrons can change orbits by emitting or absorbing electromagnetic radiation. His research led to the idea of some particles within the nucleus having positive charge; these were named protons.
Chadwick (1932)	Discovered neutrons in nucleus – enabling other scientists to account for mass of atom.

Atoms and Isotopes

Atoms and Nuclear Radiation

Decay	Range in air	Ionising power	Penetration power
Alpha	Few cm	Very strong	Stopped by paper
Beta	Few m	Medium	Stopped by Aluminium
Gamma	Great distances	Weak	Stopped by thick lead



Radioactive decay	*Unstable atoms randomly emit radiation to become stable*
Detecting	*Use Geiger Muller tube*
Unit	*Becquerel*
Ionisation	*All radiation ionises*

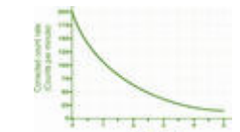
Decay	Emitted from nucleus	Changes in mass number	Changes in atomic number
Alpha (α)	*Helium nuclei (^4_2He)*	-4	-2
Beta (β)	*Electron ($^0_{-1}e$)*	0	+1
Gamma (γ)	*Electromagnetic wave*	0	0
Neutron	*Neutron*	-1	0

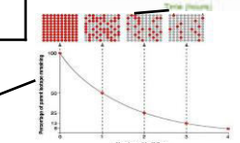
$^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$

$^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$

$^{99}_{43}Tc \rightarrow {}^{99}_{43}Tc + \gamma$

Contamination	*Unwanted presence of radioactive atoms*
Irradiation	*Person is in exposed to radioactive source*





PHYSICS ONLY: Hazards and uses of Radioactive emissions and of background radiation

Half life	*The time taken to lose half of its initial radioactivity*

Sievert	*Unit measuring dose of radiation*
Background	*Constant low level environmental radiation, e.g. from nuclear testing, nuclear power, waste*

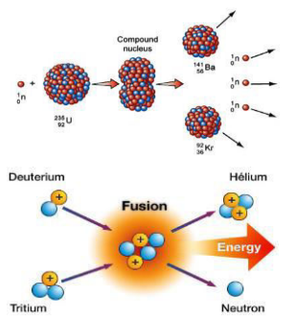
Uses	*Different isotopes have different half lives*	Short half-lives used in high doses, long half lives used in low doses.
Tracers	*Used within body*	Isotope with short half life injected, allowed to circulate and collect in damaged areas. PET scanner used to detect emitting radiation. Must be beta or gamma as alpha does not penetrate the body.
Radiation therapy	*Used to treat illnesses e.g. cancer*	Cancer cells killed by gamma rays. High dose used to kill cells. Damage to healthy cells prevented by focussed gamma ray gun.

Nuclear fission and fusion

PHYSICS ONLY: Nuclear energy

Fuel rods	Made of U-238, 'enriched' with U-235 (3%). Long and thin to allow neutrons to escape, hitting nuclei.
Control rods	Made of Boron. Controls the rate of reaction. Boron absorbs excess neutrons.
Concrete	Neutrons hazardous to humans – thick concreate shield protects workers.

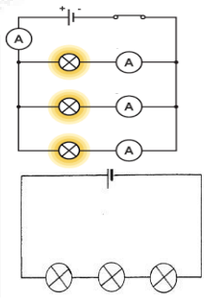
Nuclear fission	*One large unstable nucleus splits to make two smaller nuclei*	Neutron hits U-235 nucleus, nucleus absorbs neutron, splits emitting two or three neutrons and two smaller nuclei. Process also releases energy.	Process repeats, chain reaction formed Used in nuclear power stations
Nuclear fusion	*Two small nuclei join to make one larger nucleus*	Difficult to do on Earth – huge amounts of pressure and temperature needed.	Occurs in stars



Electrons carry current. Electrons are free to move in metal.

Cell	Battery	Switch	Lamp	Ammeter	Volt meter
Store of chemical energy	*Two or more cells in series*	*Breaks circuit, turning current off*	*Lights when current flows*	*Measures current*	*Measures potential difference*

Diode	LED	LDR	Fuse	Resistor	Variable resistor	Thermistor
Current flows one way	*Emits light when current flows*	*Resistance low in bright light*	*Melts when current is too high*	*Affects the size of current flowing*	*Allows current to be varied*	*Resistance low at high temp*



Circuit symbols

Current, potential difference and resistance

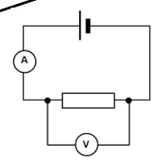
Current and Charge

Current	*Flow of electrical charge*	Ampere (A)
Potential difference (p.d.)	*How much electrical work is done by a cell*	Volts (V)
Charge	*Amount of electricity travelling in a circuit*	Coulombs (C)

Charge = Current X time — Q = I X t

Controlling current

Changing current	*Change the p.d. of the cells*
	Add more components



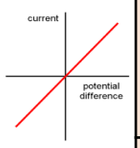
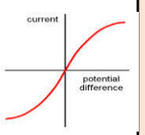
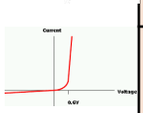
R = V ÷ I

Resistance = Potential difference ÷ Current

Ammeter	*Set up in series with components*
Voltmeter	*Set up parallel to components*

Resistance (Ω)	*A measurement of how much current flow is reduced*
The higher the resistance, the more difficult it is for current to flow.	
Increasing resistance, reduces current.	
Increasing voltage, increases current.	

Current – Potential difference graphs

	Ohmic conductor	*At a constant temperature, current is directly proportional to the p.d. across the resistor.*
	Filament lamp	*As current increases, the resistance increases. The temperature increases as current flows.*
	Diode	*Current flows when p.d. flows forward. Very high resistance in reverse.*

Thermistor	LDR
Resistance varies with temperature	*Resistance varies with light intensity*
Resistance decreases as temperature increases.	Resistance decreases as light increases.

Alternating current	Direct current
p.d. switches direction many times a second, current switches direction	*p.d. remains in one direction, current flows the same direction*
Generator.	Cell or battery.

‘Earthing’ a safety device; Earth wire joins the metal case.

Mains supply
Frequency 50Hz, 230V

3 pin plug			
	Live - Brown	Carries p.d from mains supply.	p.d between live and earth = 230V
	Neutral - Blue	Completes the circuit.	p.d. = OV
	Earth – Green and Yellow stripes	Only carries current if there is a fault.	p.d. = 0V

Series and parallel circuits

Series circuit	Current is the same in all components.	Total p.d. from battery is shared between all the components.	Total resistance is the sum of each component’s resistance.
Parallel circuit	Total current is the sum of each component’s current.	p.d. across all components is the same.	Total resistance is less than the resistance value of the smallest individual resistor.

Series	Parallel
A circuit with one loop	*A circuit with two or more loops*

Total p.d	
	If cells are joined in series, add up individual cell values

AQA Electricity

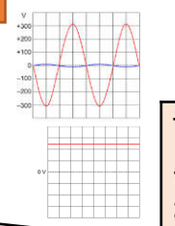
Energy transfers

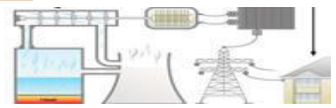
Work is done when charge flowing.

Power (W) = potential difference X current — R = V X I

Power = (current)^2 X resistance — P = I^2 X R

Energy transferred = Power X time — E = P X t





National Grid	*Distributes electricity generated in power stations around UK*

Step-up transformers	Step-down transformers
Increase voltage, decrease current	*Decrease voltage, increase current*
Increases efficiency, reduces heat loss.	Makes safer for houses.

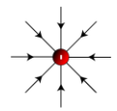
Domestic uses and safety

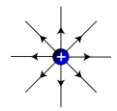
Static electricity

PHYSICS only

Static electricity	*Electrical charge is stationary*	When two insulating material are rubbed together, electrons move from one material to the other.

Like charges	*Repel*
Unlike charges	*Attract*





Shocks	Walking on carpet causes friction. Electrons move to the person and charge builds up. When the person touches a metal object, the electrons conduct away, making a spark.

Electric fields	Charged objects create electric fields around them. Strongest closest to the object. The field direction is the direction of force on a positive charge. Add more charge increases field strength.

BHS Science

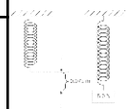
AQA ENERGY – part 1

Energy stores and changes

Mechanical	*Force acts upon an object*
Electrical	*Electric current flow*
Heat	*Temperature difference between objects*
Radiation	*Electromagnetic waves or sound*

Energy pathways

Kinetic energy	*Energy stored by a moving object*	½ X mass X (speed)^2 ½ mv^2
Elastic Potential energy	*Energy stored in a stretched spring, elastic band*	½ X spring constant X (extension)^2 ½ ke^2 (Assuming the limit of proportionality has not been exceeded)
Gravitational Potential energy	*Energy gained by an object raised above the ground*	Mass X gravitational field strength X height mgh



System	*An object or group of objects that interact together*	EG: Kettle boiling water.
Energy stores	*Kinetic, chemical, internal (thermal), gravitational potential, elastic potential, magnetic, electrostatic, nuclear*	Energy is gained or lost from the object or device.
Ways to transfer energy	*Light, sound, electricity, thermal, kinetic are ways to transfer from one store to another store of energy.*	EG: electrical energy transfers chemical energy into thermal energy to heat water up.
Unit	*Joules (J)*	

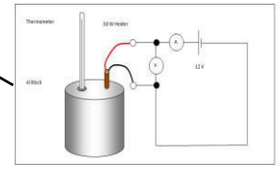
Work	*Doing work transfers energy from one store to another*	By applying a force to move an object the energy store is changed.	Work done = Force X distance moved W = Fs
Power	*The rate of energy transfer*	1 Joule of energy per second = 1 watt of power	Power = energy transfer ÷ time P = E ÷ t Power = work done ÷ time, P = W ÷ t

	Units
Specific Heat Capacity	*Joules per Kilogram degree Celsius (J/Kg°C)*
Temperature change	*Degrees Celsius (°C)*
Work done	*Joules (J)*
Force	*Newton (N)*
Distance moved	*Metre (m)*
Power	*Watts (W)*
Time	*Seconds (s)*

Change in thermal energy = mass **X** specific heat capacity **X** temperature change

ΔE= m **X c X** Δθ

Specific Heat Capacity	*Energy needed to raise 1kg of substance by 1°C*	Depends on: mass of substance, what the substance is and energy put into the system.

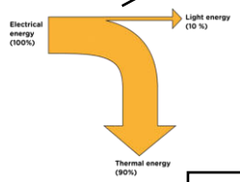


HIGHER: efficiency can be increased using machines.

Efficiency = Useful power output / Total power input

Efficiency = Useful output energy transfer / Total input energy transfer

Efficiency	*How much energy is usefully transferred*



Useful energy	*Energy transferred and used*
Wasted energy	*Dissipated energy, stored less usefully*

Prefix	*Multiple*	Standard form
Kilo	*1000*	10^3
Mega	*1000 000*	10^6
Giga	*100 000 000*	10^9

Energy Conservation and Dissipation

Dissipate	*To scatter in all directions or to use wastefully*	When energy is 'wasted', it dissipates into the surroundings as internal (thermal) energy.

Ways to reduce 'wasted' energy	*Energy transferred usefully*	Insulation, streamline design, lubrication of moving parts.

Principle of conservation of energy	*The amount of energy always stays the same.*	Energy cannot be created or destroyed, only changed from one store to another.

	Units
Energy (KE, EPE, GPE, thermal)	*Joules (J)*
Velocity	*Metres per second (m/s)*
Spring constant	*Newton per metre (N/m)*
Extension	*Metres (m)*
Mass	*Kilogram (Kg)*
Gravitational field strength	*Newton per kilogram (N/Kg)*
Height	*Metres (m)*

HIGHER: When an object is moved, energy is transferred by doing work.

Work done = Force X distance moved

Frictional forces cause energy to be transferred as thermal energy. This is wasted.

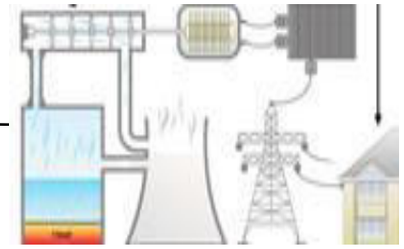
Reducing friction - using wheels, applying lubrication. Reducing air resistance – travelling slowly, streamlining.

Closed system	*No change in total energy in system*
Open system	*Energy can dissipate*

Global Energy Resources

AQA ENERGY – part 2

National Grid



Power station – NB: You need to understand the principle behind generating electricity. An energy resource is burnt to make steam to drive a turbine which drives the generator.

Power station	***Generates electricity***	Fuel burnt releasing thermal energy →	Water boils into steam →	Steam turns turbine →	Turbine turns generator →	Generator induces voltage
National Grid	***Transports electricity across UK***	Power station →	Step-up transformer →	Pylons →	Step-down transformer →	House, factory

Using fuels

Transport	***Petrol, diesel, kerosene produced from oil***	Used in cars, trains and planes.
Heating	***Gas and electricity***	Used in buildings.
Electricity	***Most generated by fossil fuels***	Used to power most devices.

Using renewable energy will need to increase to meet demand.

Renewable energy makes up about 20% of energy consumption.

Fossil fuel reserves are running out.

Energy demand is increasing as population increases.

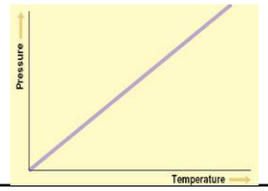
Energy resources

Non-renewable energy resource	***These will run out. It is a finite reserve. It cannot be replenished.***	e.g. Fossil fuels (coal, oil and gas) and nuclear fuels.
Renewable energy resource	***These will never run out. It is an infinite reserve. It can be replenished.***	e.g. Solar, Tides, Waves, Wind, Geothermal, Biomass, Hydroelectric

Energy resource	***How it works***	Uses	Positive	Negative
Fossil Fuels (coal, oil and gas)	***Burnt to release thermal energy used to turn water into steam to turn turbines***	Generating electricity, heating and transport	Provides most of the UK energy. Large reserves. Cheap to extract. Used in transport, heating and making electricity. Easy to transport.	Non-renewable. Burning coal and oil releases sulfur dioxide. When mixed with rain makes acid rain. Acid rain damages building and kills plants. Burning fossil fuels releases carbon dioxide which contributes to global warming. Serious environmental damage if oil spilt.
Nuclear	***Nuclear fission process***	Generating electricity	No greenhouse gases produced. Lots of energy produced from small amounts of fuel.	Non-renewable. Dangers of radioactive materials being released into air or water. Nuclear sites need high levels of security. Start up costs and decommission costs very expensive. Toxic waste needs careful storing.
Biofuel	***Plant matter burnt to release thermal energy***	Transport and generating electricity	Renewable. As plants grow, they remove carbon dioxide. They are 'carbon neutral'.	Large areas of land needed to grow fuel crops. Habitats destroyed and food not grown. Emits carbon dioxide when burnt thus adding to greenhouse gases and global warming.
Tides	***Every day tides rise and fall, so generation of electricity can be predicted***	Generating electricity	Renewable. Predictable due to consistency of tides. No greenhouse gases produced.	Expensive to set up. A dam like structure is built across an estuary, altering habitats and causing problems for ships and boats.
Waves	***Up and down motion turns turbines***	Generating electricity	Renewable. No waste products.	Can be unreliable depends on wave output as large waves can stop the pistons working.
Hydroelectric	***Falling water spins a turbine***	Generating electricity	Renewable. No waste products.	Habitats destroyed when dam is built.
Wind	***Movement causes turbine to spin which turns a generator***	Generating electricity	Renewable. No waste products.	Unreliable – wind varies. Visual and noise pollution. Dangerous to migrating birds.
Solar	***Directly heats objects in solar panels or sunlight captured in photovoltaic cells***	Generating electricity and some heating	Renewable. No waste products.	Making and installing solar panels expensive. Unreliable due to light intensity.
Geothermal	***Hot rocks under the ground heats water to produce steam to turn turbine***	Generating electricity and heating	Renewable. Clean. No greenhouse gases produced.	Limited to a small number of countries. Geothermal power stations can cause earthquake tremors.

AQA PARTICLE MODEL OF MATTER

Particle model



Pressure of a fixed volume of gas increases as temperature increases (temperature increases, speed increases, collisions occur more frequently and with more force so pressure increases).

State	*Particle arrangement*	Properties
Solid	*Packed in a regular structure. Strong forces hold in place so cannot move.*	Difficult to change shape.
Liquid	*Close together, forces keep contact but can move about.*	Can change shape but difficult to compress.
Gas	*Separated by large distances. Weak forces so constantly randomly moving.*	Can expand to fill a space, easy to compress.

Kinetic theory of gases

Temperature of gas is linked to the average kinetic energy of the particles.

If kinetic energy increases so does the temperature of gas.

No kinetic energy is lost when gas particles collide with each other or the container.

Gas particles are in a constant state of random motion.

P = m ÷ V

Density = mass ÷ volume.

Density	*Mass of a substance in a given volume*

	Units
Density	*Kilograms per metre cubed (kg/m^3)*
Mass	*Kilograms (kg)*
Volume	*Metres cubed (m^3)*
Energy needed	*Joules (J)*
Specific latent heat	*Joule per kilogram (J/kg)*
Change in thermal energy	*Joules (J)*
Specific heat capacity	*Joule per kilogram degrees Celsius (J/kg°C)*
Temperature change	*Degrees Celsius (°C)*
Pressure	*Pascals (Pa)*

Pressure

PHYSICS ONLY: when you do work the temperature increases e.g. pump air quickly into a ball, the air gets hot because as the piston in the pump moves the particles bounce off increasing kinetic energy, which causes a temperature rise.

Reducing the volume of a fixed mass of gas increases the pressure.	PV = constant.
Halving the volume doubles the pressure.	$P_1V_1 = P_2V_2$

Internal energy and energy transfers

Specific Heat Capacity	*Energy needed to raise 1kg of substance by 1°C*	Depends on: • Mass of substance • What the substance is • Energy put into the system.

Change in thermal energy = mass **X** specific heat capacity **X** temperature change.

$\Delta E = m \times c \times \Delta\theta$

Internal energy	*Energy stored inside a system by particles*	Internal energy is the total kinetic and potential energy of all the particles (atoms and molecules) in a system.
	Heating changes the energy stored within a system	Heating causes a change in state. As particles separate, potential energy stored increases. Heating increases the temperature of a system. Particles move faster so kinetic energy of particles increases.

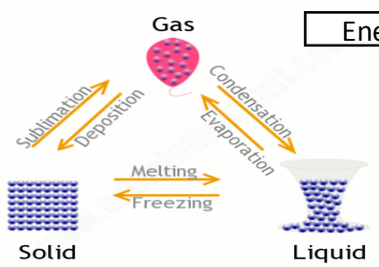
Change of state

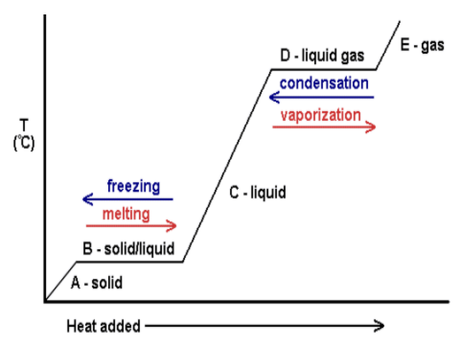
Freezing	Liquid turns to a solid. Internal energy decreases.
Melting	Solid turns to a liquid. Internal energy increases.
Boiling / Evaporating	Liquid turns to a gas. Internal energy increases.
Condensation	Gas turns to a liquid. Internal energy decreases.
Sublimation	Solid turns directly into a gas. Internal energy increases.
Conservation of mass	When substances change state, mass is conserved.
Physical change	No new substance is made, process can be reversed.

Specific Latent Heat	*Energy needed to change 1kg of a substance's state*
Specific Latent Heat of Fusion	*Energy needed to change 1kg of solid into 1 kg of liquid at the same temperature*
Specific Latent Heat of Vaporisation	*Energy needed to change 1kg of liquid into 1 kg of gas at the same temperature*

Energy needed = mass **X** specific latent heat.

$\Delta E = m \times L$





BHS Science

Drama Knowledge Organiser – BTEC Component 1

Learning Aims: To examine professional practitioners' performance work. To explore the interrelationships between constituent features of existing performance material.

Key Skills	Definition
Facial Expression	Using your face to communicate emotion
Body Language	Using your body and movement to communicate attitudes and feelings
Gesture	A movement of part of the body, especially a hand or the head, to express an idea or meaning.
Voice	Speaking in a way that is suitable to your character and changing your voice to communicate emotion.

Performance styles	Definition
Epic Theatre	Epic theatre is theatre that has the intention to communicate a political message rather than provoke an emotional response. In Epic theatre, techniques are used to remind the audience that they are watching a play. These techniques include music, representational props and costume, exaggerated acting style, placards or projections, multi-roling.
Physical Theatre	Physical theatre is theatre in which the body is used either as much as or more than dialogue to tell the story.
Book Musical	A book musical is one with traditional musical with a story that drives the music and characters.
Naturalism	Naturalism is a style of theatre where real life is created on stage. The acting mirrors real emotions and the stories are based in reality.
Theatre of Cruelty	Theatre of cruelty is theatre that physically and mentally pushes the audience and the performers to the limit.

Practitioners	Skills, roles and responsibilities
Actor	Rehearsing, performing, physical and vocal skills, responding to feedback, following direction, refining skills, managing self.
Director	Running rehearsals, creating performance material, refining performance material, managing self and others, liaising with actors, chorographers or designers, organising rehearsals and performances.
Lighting Designer	Designing the lighting, liaising with the director, interpreting director's vison and ideas, managing self, creativity, organising

	lighting, taking part in technical rehearsal.
Set Designer	Designing the set, liaising with the director, interpreting director's vison and ideas, managing self, creativity, organising set, taking part in technical rehearsal.
Costume Designer	Designing the costumes, liaising with the director, interpreting director's vison and ideas, managing self, creativity, organising costumes, taking part in technical rehearsal, running fittings with actors, helping actors with changes during performances.
Composer	. Creating performance material, refining performance material, liaising with producer or director, interpreting others visions and ideas, managing self, creativity, taking part in band call,.

Processes uses in performance	Techniques and approaches used in performance
Responding to stimulus, exploring and developing ideas, discussion with performers, setting tasks for performers, sharing ideas and intentions, teaching material to performers, developing performance materials, organising and running rehearsals, refining an adjusting material to make improvements, providing notes and feedback on improvements.	Rehearsal, production, technical rehearsal, dress rehearsal, performance, post-performance evaluation/review.

Creative Intentions	Creative purpose
Theme, issue, response to stimulus, style/genre, contextual influences, collaboration with other practitioners, influences by other practitioners.	To educate, to inform, to entertain, to provoke, to challenge view points, to raise awareness, to celebrate.

GCSE History Knowledge Organiser 2A Britain: Health and the People

KPI1: Medieval Medicine

The ideas of the famous doctors from the **Ancient World**, **Hippocrates** and **Galen** were passed on and were important to Medieval doctors. Doctors followed the Ancient method of observing patients to reach a **diagnosis**. Medieval doctors focused on: the pulse and the colour, smell and taste of urine. They would **prescribe** natural medicines. **Bloodletting** was a common treatment. This meant opening veins or using **leeches** to get blood out. Remedies were combined with the supernatural, such as prayers and **astrology**. Doctors based their cures on the Ancient Greek idea of the **four humours** in the body. They believed illness was caused by these humours being out of balance.

Medieval doctors trained at university and could qualify without ever seeing a patient. Only the rich would see a university trained doctor. They learned the work of **Hippocrates** and **Galen** as well as Muslim, Indian and Chinese ideas. They used textbooks such as Gilbert Eagles, *Compendium Medicine* (c1230). Ordinary people would turn to wise women and **barber surgeons** and mainly use **herbal remedies**. Christianity was central to life so many turned to local **monasteries** and priests. People believed illnesses were sent by God.

KPI2: Medical progress

Christianity was the only main religion in Medieval Europe. The Church was powerful and it both **helped** and **hindered** medical **progress**. Christians followed the teachings of Jesus and helped the sick. They set up hospitals. They believed that illness was from God so focused on caring rather than curing, which would be against God's will. Prayer was the most important treatment. People went on **pilgrimages** for help with illness. The Church also respected ideas from the **Ancient World**. Monks copied out ancient works on medicine.

Between 1000 and 1500 700+ hospitals were built in England. They were mainly run by **priests** and **monks**. They were funded by rich **patrons** and the church. Different types included hospitals for the mentally ill and 'lazar houses' that dealt with **leprosy**, which was **contagious.** Many were set up by **crusading orders** to treat crusaders who caught it in the Middle East.

Universities were controlled by the Church and medicine was studied after religion. Doctors were trained to make old ideas clear, not to discover new ideas. The Church approved of **Galen** because he believed in one God. His ideas fit with church **orthodoxy**. Doctors were meant to predict the symptoms of an illness and find reasons why God had sent it, not to heal it.

The early medieval period after the fall of the Roman Empire was known as the Dark Ages in Europe. At this time Islam emerged as a religion in the **Middle East** and North Africa. During the height of Islamic Empires, c750-1050 Islamic doctors contributed to medical knowledge. The Empire was ruled by a **Caliph**. Greek **manuscripts** were translated in to **Arabic** and kept in the 'House of Wisdom' library in Baghdad. This included works of Hippocrates and Galen which had been lost to Europe.

Doctors were encouraged to find cures. Islamic hospitals saw patients as unfortunate and not as being punished by God. In 805 Caliph al-Rashid set up a **bimartistan** (hospital) that was also a school and library: they treated patients not just cared for them. **Rhazes** and **Avicenna** influenced Western Medicine. **Avicenna**'s *Canon of Medicine* was translated in to Latin and influenced Europe. Islamic ideas were spread in Europe by **merchants**.

Surgery was dangerous, doctors did not have knowledge that dirt causes disease. Most surgeons were also barbers, they learned by copying. The most common surgery was **bloodletting**. As was **amputation** and **trepanning**. Surgery usually took place on battlefields. Mandrake root, opium and hemlock was used as an **anaesthetic** but mostly people were awake. **Cauterisation** was used to stop the flow of blood. Surgery was **pioneered** in this time by

- **Albucasis**, the father of modern surgery, who wrote *Al Tasrif* in 1000. He used **ligatures** and **cauterisation**.
- **De Chauliac**, author of *Great Surgery* (1363). He was influenced by **Galen** and **Avicenna.**
- **John of Arderne**, also influenced by Greeks and Arabs, used **anaesthetics** to dull pain and treated knights in the Hundred Years war.
- **Hugh** and **Theodoric of Lucca**, used wine to prevent infection but their ideas not accepted as it challenged **Hippocrates**.

KPI1 and 2 VOCABULARY

Ancient World	Period when Greek and Roman **civilisations** were at their height, 700BC-500AD
Arabic	Language of Islamic Empire
Amputation	Act of cutting off a limb (arm or leg)
Anaesthetic	Substance that removes pain
Astrology	Study of the stars and planet
Baghdad	Capital city of Islamic Empire
Barber-Surgeons	Medieval barber who practiced surgery
Bloodletting	Medieval treatment of removing blood
Caliph	Ruler of the Islamic Empire
Cauterisation	Using a heated iron to stop a wound
Church (The)	Entire organised hierarchy of Christianity
Civilisations	Society and culture of a particular area and time
Contagious	Spreadable
Crusading Orders	Military **monks** who fought **in Middle East**
Dark Ages	Period of European history between the Ancient World and Medieval period, 500-1000AD
Diagnosis	Identification of a disease
Disease	Something wrong with the body
Four Humours	Ancient World theory of how the body worked
Helped	To make easier
Herbal Remedies	Medication made from plants
Hindered	To make difficult
Islam	Muslim religion begun in Middle East, c700
Leeches	Blood-sucking worm like insect
Leprosy	Contagious disease that eats away at body
Ligature	Thread used to tightly tie up a bleeding artery
Manuscripts	A book written by hand
Medieval	Period of history between 1000-1500AD
Merchants	People who trade and sell goods
Middle East	Area to east of Europe where Islam developed
Monasteries	Building where monks live
Monk	Member of religious group that has taken vows
Orthodoxy	Accepted and authorised view
Patrons	Supporter or sponsor
Pilgrimages	Journey to visit a holy place
Pioneer	A person who is the first to explore an idea
Prescribe	Medical advise, permission to use
Priest	Member of the Church
Progress	Forward development to an improved condition
Surgery	Treatment of injury or disease involving tools that cut in to the body
Symptoms	A sign that someone has a particular disease
Trepanning	Drilling holes in the head

KPI3: Public Health in the Middle Ages

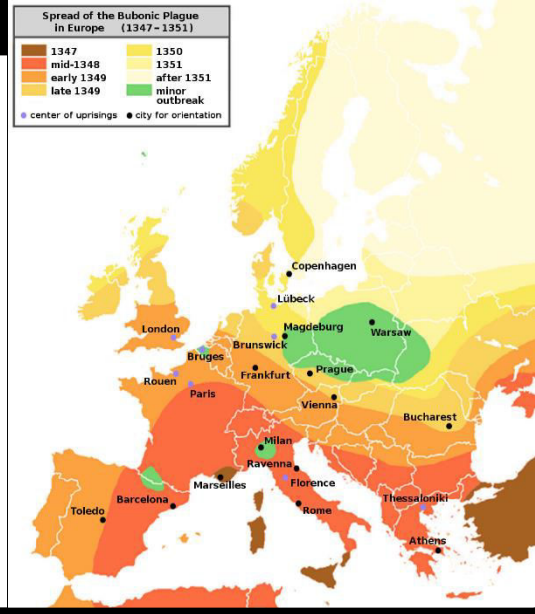
Most towns were built near rivers. Rivers were used for drinking, transport and waste removal. Some towns had Roman sewage systems. Most towns had **privies** and **cesspits** to collect sewage. **Cesspits** were dug out by **gong farmers.** Towns were dirty. Between 1250 and 1530 towns grew as the population rose. Town mayors did not want to raise tax to pay for improved sanitation. There was also a lack of knowledge that germs caused disease and infection. They believed it was caused by miasma (bad air). Towns did try to stop businesses polluting rivers. For example in 1371 London banned killing large animals within the city walls, to stop blood reaching the river. In 1388 Parliament fined people £20 for throwing waste into rivers.

Health was better in **monasteries**. **Monasteries** were based in isolated places near rivers. They had washing facilities called **lavatoriums.** They had clean running water and toilets. Monks kept clean as it was a sign of piety. Monasteries were wealthy. People gave money to them in return for prayers. They also owned lots of land. Monks were educated and disciplined and had access to medical manuscripts including Roman ideas of healthy routines and need for good sanitation. They believed that 'cleanliness was next to godliness.' Isolation meant they were safer from **epidemics**.

The Black Death combined the **bubonic** and **pneumonic** plagues. **Bubonic** was spread by fleas and buboes grew on groins, necks and armpits. **Pneumonic** infected lungs and spread by contact with breath or blood. Doctors did not understand how infections or diseases spread. They blamed it on the stars and planets, miasma, and Jews poisoning wells. Many believed it was a punishment from God.

It was actually caused by **bacteria**, *Yersinia pestis*, in fleas stomachs. Food shortages weakened people's **immunity.** It spread quickly in ports and crowded towns. People did not know about contagiousness. Bodies were buried in large pits and rats bred in filthy streets. Laws were simple and not well **enforced**. Some local councils tried to **quarantine** infected places. By the end of 1350 it has **subsided** but not died out completely.

Between 1348 and 1350 it killed a third of the population. Food rotted in the fields and whole villages were wiped out. Lords turned to sheep farming due to lack of peasants to grow food: this led to increased prices of food. Peasants demanded higher wages. The **feudal system** was challenged. The Catholic Church was seen as cowardly and many clergy died.



KPI4: The impact of the Renaissance on Britain

The **Renaissance** ('Rebirth') was a period in the late c14th. It **bridges** the **Middle Ages** and **Early Modern period**. It began in Florence, Italy. Rich traders became interested in Ancient Greeks and Romans. Scholars translated Ancient books and this inspired people to ask questions and find knowledge for themselves. The belief **flourished** that art, education and science could make life better. Rather than accept what the Church said scientists experimented. In 1451 the printing press was invented and new ideas could be spreads more quickly than before.

- **Andreas Vesalius** (1514-64) was a Belgian professor of surgery in Padua, Italy. He **dissected** bodies to discover best places for bloodletting and discovered mistakes in Galen's ideas of **anatomy**. He observed that Galen based his ideas on animal, not human, **dissection**. He shared his knowledge in *The Fabric of Human Body* (1543). This **anatomy** book was **accurate**. Yet Vesalius was criticised for saying that Galen was wrong. Copies of Vesalius' book were popular in England. He used the **Renaissance** approach to share new knowledge of **anatomy**. It was the **basis** for the future.
- **Ambroise Paré** (1510-90) was a surgeon to French kings. Guns were a new invention so surgeons were not used to treating gunshot wounds. They were treated by pouring hot oil on them. In 1537 on a battlefield he ran out of oil and **improvised** using a cream to soothe the wound. He also used **ligatures** rather than **cauterisation** to stop bleeding. Paré learned from Vesalius. He translated him in to French and helped his ideas on anatomy spread widely. His *Works on Surgery* (1575) was read in England, William Clowes, Elizabeth I's surgeon admired Paré.
- **William Harvey** (1578-1657) developed the theory that the heart pumped blood around the body. Galen said that blood was made in the liver. Harvey read other doctors' works and built on his knowledge with dissections and experiments. In 1628 he published *De Motu Cordis* (*On the Motion of the Heart*). He was criticised and ignored for **contradicting** Galen and called a '**quack**'. His theory later became accepted and impacted medicine in the c20th, for example blood transfusions and heart surgery.

Key historical concept: change

The **Renaissance** was a period of massive change. As communication and technology developed scientists increasingly challenged the view of the Church which stated that Galen's theories were all correct. These challenges were not accepted immediately but became accepted over time.

KPI3 and 4 VOCABULARY

Accurate	Correct and exact
Anatomy	Science of understanding the internal organs of body
Bacteria	Microorganisms that can cause disease
Basis	Underlying support of an idea or argument
Bridges	Links or connects
Bubonic Plague	Plague spread by flea bites; buboes are lumps
Cesspit	Pit for disposal of sewage waste
Contradict	Deny the truth by asserting the opposite
Dissection	Methodical cutting up of a body to study its internal parts
Early Modern Period	Roughly period from late c15th to late c18th
Enforced	Cause with force; compulsory
Epidemic	Spread of disease to a large number of people
Feudal System	Medieval system of land owning, work and service
Flourished	Grow and develop in a healthy way
Gong farmers	Person who cleaned out **privies** and **cesspits**
Immunity	Body's ability to resist infection
Improvised	Create without preparing before
Lavatorium	Communal washing area for monks
Middle Ages	Period from c5th to the c15th enc
Pneumonic Plague	Spread by breathing in germs from infected lungs
Privies	Toilets located in small shed outside of houses
Quack	Person pretending to have medical ability and fake cures
Quarantine	Confining or stopping people from going in or out
Renaissance	'rebirth' of European art inspired by Greeks and Romans
Subsided	Become less intense or severe

KPI5: Dealing with disease

Many doctors **persisted** with unscientific beliefs such as the **four humours**. As in **medieval** times people got medical advice from **barber-surgeons, apothecaries**, wise women and **quacks**. **Bloodletting** was still common. People believed the royal touch from the king could cure scrofula. **Herbal remedies** were used and some worked, for example honey kills bacteria. Nicholas Culpepper collected remedies in *The complete herbal* (1653). **Quack** medicine **flourished**. Explorers brought back new medicine, such as quinine from Cinchona bark from South America which cured malaria. Thomas Sydenham (1624-89) criticised **quack** medicine and used observation to diagnose disease, but he also ignored Harvey's discovery.

In 1665 100,000 died in London from the Great Plague. As with the c14th people believed bad air (**miasma**), **astrology** and God caused disease. There was still no cure but people recognised that more people died in dirty areas. Local **authorities** did more to identify plague sufferers and **quarantine** them and the dead were removed at night. Fires were lit to "clean" the air, streets were swept and animals were not allowed on infected streets. Large crowds were banned. After 1666 **quarantine** laws prevented **epidemic diseases** coming in from ships.

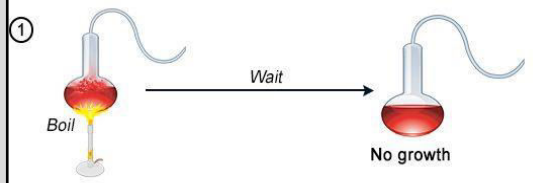
Henry VIII closed **monasteries** in the 1530s. He then gave money to set up hospitals such as St Bartholomew's. This is where Harvey later investigated blood circulation. Until c17th hospitals were seen as placed for rest. In c18th the idea of the modern hospital began. Wealthy **patrons** funded hospitals. Hospitals now trained doctors. **Four humours** and bleeding was still used but medicine was also **dispensed**. Hospitals became more **specialised**, for example St Lukes and Bethlem treated mental illness; Lock Hospital treated **venereal** disease; the British hospital for Mothers and Babies was set up in 1749. Child **mortality rates** were high. Thomas Coram started the Foundling hospital in 1741. It cared for **orphaned** children and gave them a clean environment, clothes and education. It was a popular **charity**. There was a huge increase in hospitals. They were **motivated** by religion and focused on both care and cure. People began to **abandon** the idea that disease was caused by **sin**.

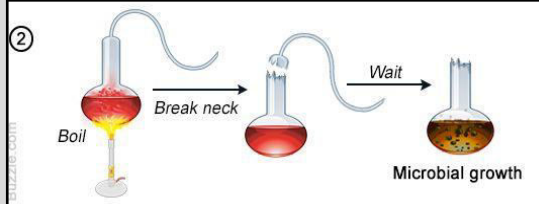
John Hunter (1728-93) was an army surgeon. In 1768 he joined the Company of Surgeons and trained others. His books were based on observation, **dissection** and experiments. His book *blood inflammation and gunshot wounds* ended the idea that gunshot wounds were poisonous. He even infected himself with gonorrhoea and syphilis as part of an experiment. In 1785 he saved a man from a leg **amputation** by using **ligatures** to stop blood flow around an **aneurysm**.

KPI6: Prevention of disease

In Medieval China people used **inoculation** to prevent smallpox, an infectious **virus** that killed or left people scarred. **Inoculation** means giving a person a mild dose of the disease so they build up **immunity** to the stronger, killer form. In 1721 Lady Montagu **inoculated** her children after observing it in Turkey. By the 1770s **inoculation** was popular and **profitable** for doctors. Some argued it was against God's will to cure infections; people did were **sceptical** that a mild dose could prevent a serious dose of a disease. Some still caught it. An **inoculated** person was still **contagious**.

In Gloucestershire in 1796 Edward Jenner heard that milkmaids who caught cowpox did not go on to get the more deadly smallpox **virus**. He gave an 8 year old boy cowpox and then a smallpox inoculation. The boy did not develop smallpox. Jenner called this **vaccination** (*Vacca* means cow in Latin). By giving people cowpox they did not catch smallpox. But Jenner could not explain how **vaccination** worked. Doctors who made money from **inoculation** attacked him. William Woodville carried out tests using **contaminated** equipment and a patient died: vaccines were blamed. However, by 1800s vaccines were used and in 1853 was made **compulsory** by the British government.





KPI7.1: Advances in medical science in nineteenth-century Britain

At the start of the c19th surgeons had no way of controlling pain during an operation. In medieval times alcohol, mandrake, opium and hashish were used to dull pain. It was difficult to judge the dose and it could be lethal. Alcohol thinned blood. Surgeons had to work quickly to minimise pain.

In 1795 Bristol doctor Thomas Beddoes experimented with nitrous oxide (laughing gas). It was not until 1844 that American doctor Horace Wells used it as an **anaesthetic**. In January 1842 William Clark, another US dentist used **ether** during a tooth **extraction**. In December 1842 English surgeon Robert Liston used **ether** during a leg **amputation**. **Ether** caused vomiting and was **flammable**: a problem when many people had surgery at home in front of an open fire.

In 1847 Scottish doctor James Simpson discovered chloroform, a safer and more effective **anaesthetic**. There was opposition: in 1848 Hannah Greener died from a chloroform overdose during an operation to remove a toe nail. However in 1853 Queen Victoria used **chloroform** during childbirth. This **popularised** the use of **anaesthetics**. **Anaesthetics** were a step forward but people still died from infections.

People believed sepsis (poison) began inside the wound. In 1677 the first microscope was invented, for the first time people saw **microbes**. But no link was made between them and disease. In 1699 Francesco Redi sealed boiled liquid and concluded that microbes came from the outside. In 1748 John Needham repeated Redi's experiment but with dirty equipment and microbes appeared. Many believed in **spontaneous generation**- the idea that microbes appeared as if by magic. In the c19th some began to believe in **specificity**- that not all **microbes** are the same and that specific ones cause specific diseases.

Anti-contagionists argued that dirty environments caused **epidemics**. James Simpson argued that hospitals should be moved out of cities. This debate linked to the idea of **miasma**, 'bad air' spreading disease. On the other hand, **contagionists** believe contact with an infected person caused disease. They believed in **quarantine**.

KPI5 and 6 VOCABULARY

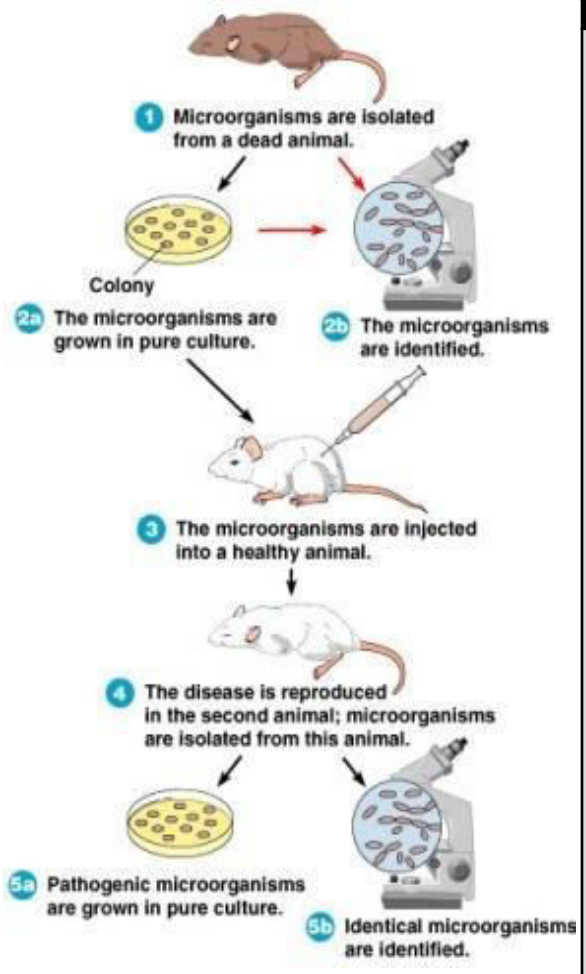
Abandon	Cease to support
Aneurysm	Swelling in an artery
Apothecaries	People who prepare and sell medicines
Authorities	Organisation with power of administration and control
Charity	Organisation which raises money and gives help
Compulsory	Required by law
Contaminated	Made impure by mixing with poisoned substance
Dispensed	Distribute or provide
Epidemic	Spread of disease to a large number
Inoculation	Using weakened but live germs of a disease to build up immunity (resistance) against stronger form
Miasma	'infectious mist' caused by rotting animals and waste; believed to cause disease
Mortality Rates	Number of deaths at a given period of time
Motivated	A reason for doing something
Orphaned	When a child's parents have died
Profitable	Money-making
Sceptical	Not easily convinced
Sin	An immoral act against divine (God's) law
Specialised	Concentrate on expertise in one particular skill
Vaccination	Using dead germs to build up immunity
Venereal	A sexually transmitted disease

KPI7.2: Advances in medical science in nineteenth-century Britain

Between 1857-60 French scientist Louis Pasteur proved that **bacteria** (germs) caused disease. This was **Germ Theory**. In the late 1860s this was **popularised** in England by Lister. Lister realised surgery was successful when wounds were kept infection free. He thought infection was caused by bacteria getting in to wounds. In 1865 he reset Jamie Greenlees' broken leg and covered the wound in bandages soaked in carbolic acid. Lister then used carbolic acid on surgical equipment. This was the antiseptic approach: creating a **chemical** barrier to stop infection.

Lister said **microbes** in the air cause infection and that **spontaneous generation** was wrong. Yet in 1868 Professor John Bennett argued dying cells led to infection. **Germ Theory** was not fully accepted, carbolic acid was not popular and even Lister did not scrub his hands or change his clothes for an operation, causing infection.

By the 1890s surgeons **developed** Lister's **antiseptic** methods in to **aseptic** surgery. Microbes were excluded. Surgeons wore gowns and gloves and used **sterilised** equipment. Pasteur's ideas had not been immediately accepted. In 1866 there was an outbreak of cattle plague. People realised only quarantine and slaughtering the cows stopped the spread. Lionel Beale identified that the plague was caused by a specific **microbe**, which further proved **anti-contagionists** wrong.



KPI8 Further impact of Germ Theory in Britain

Louis Pasteur's 1861 discovery was **momentous**, but Robert Koch applied it to humans. Koch was a German army surgeon and is known as the founder of modern **bacteriology.** In 1876 Koch discovered the specific anthrax microbe. He also discovered the germs causing cholera and tuberculosis (TB) Koch developed techniques to grow microbes and stain them using dyes so they would stand out under a microscope. Scientists in England **promoted** Koch and Pasteur's work. In 1879 William Cheyne **translated** Koch in to English. By the 1880s **Germ Theory** was accepted. Microbes in the body could not be killed but **vaccines** were developed once specific **microbes** were identified. Pasteur and Koch were rivals. These factors led to the **breakthroughs** of the 1880s and 90s:

1. War: France and Germany fought in 1871. Nations were interested in defeating disease so less soldiers would die.

2. Government and Finance: Both men were funded by their governments

3. Individual character: Pasteur was **spurred** on by Koch's 1876 discovery of the anthrax germ. This led to him developing a vaccine. Koch discovered the TB and cholera germs.

4. Luck: In 1879 Pasteur's assistant Charles Chamberland used an old sample of chicken cholera left out by mistake. Chickens infected with the old germs survived. They were also **immune** to the full **strain** of the disease. This proved how vaccines worked.

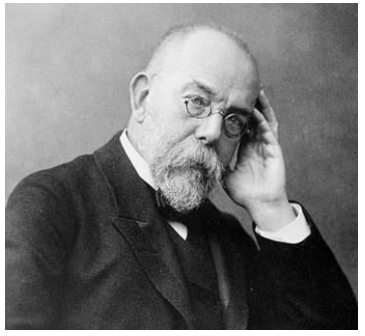
5 Communication: Pasteur developed a vaccine against anthrax and demonstrated it in 1881. News spread quickly using the electric **telegraph**.

6. Teamwork: Both men worked with teams of scientists to develop vaccine. In 1909 Paul Ehrlich, one of Koch's team, discovered that chemical Salvarsan 606 cured syphilis. This was the first chemical cure, termed a '**magic bullet**'

KPI7 and 8 VOCABULARY

Advances	A forward movement; progress
Anaesthetic	Substance that removes pain
Anti-contagionist	Belief that infection was caused by matter interacting with the environment
Antiseptic	Chemical applied to a wound and surgical equipment to prevent microbes growing
Aseptic	State of being completely free of microbes; **sterile**
Bacteria	Microorganisms that can cause disease
Bacteriology	Study of **bacteria**
Breakthrough	A sudden, dramatic and important discovery
Chemical	Artificially made substance
Contagionist	Belief that infection is caused by contact with infected person or germ
Ether	An **anaesthetic** liquid
Extraction	Removing something through force
Flammable	Easily set on fire
Germ Theory	Theory that **bacteria** (germs) cause disease
Magic Bullet	A medicine capable of destroying a bacteria or curing a disease
Microbes	Living organisms such as **bacteria**
Momentous	Of great importance or significance
Persisted	Continued in spite of opposition
Popularised	Caused something to become liked
Promoted	Support or actively encourage
Specificity	Theory that specific germs cause specific diseases
Spontaneous Generation	Theory that microbes appear as if by magic
Spurred	To prompt and encourage
Sterilised	To make free of bacteria
Telegraph	A system of transmitting messages a great distance along a wire
Translated	Change in to another language

Louis Pasteur



Robert Koch

KPI9: Improvements in public health

Despite improvements in medical knowledge health in general was worse in the 1800s. Britain's towns and cities grew quickly in the early 1800s. Sheffield grew from 12,000 in 1750 to 150,000 in 1850. Factories had been built in northern towns and people **flocked** to work in cloth, pottery and iron **industries.** Back-to-back housing was quickly built to house workers. Often 5+ lived in a room. Few houses had toilets. There was no rubbish collection, sewers or fresh running water. **Typhoid**, **Tuberculosis** and **Cholera** were common.

Disease spread quickly in overcrowded towns. Pasteur had started to make the connection between **germs** and disease. But in **slums** peoples' lives continued as usual. In 1831 **Cholera** killed 50,000 people. Victims had violent **diarrhoea**. Many believed it was caused by **miasma**.

In 1839 the government set up an **inquiry** in to living conditions in Britain. It was run by Edwin Chadwick. His report found that streets and water needed to be cleaner. It challenged the **laissez-faire** belief that people should be left alone: the government needed to act. Some MPs made money from owning properties in **slums** so action was slow. Yet **persistent cholera epidemics** led to change. In 1848 the **Public Health Act** was passed. It meant local councils had the power to clean towns but it was not compulsory. A Central Health Board was set up which could set up local councils to check on housing and food. Some towns acted, others did not. By 1854 the central board of health was closed because of **resentment** at **government interference.**

In 1848 60,000 died from cholera. In 1854 20,000 died. In 1854 Dr John Snow proved the link between water supply and **cholera**. In Soho, London, he observed that cholera victims used the same water pump: the Broad Street pump. He removed the pump handle and the deaths stopped. He discovered that the water was **contaminated**. He proved **the miasma theory** wrong. **Contagion** caused **cholera**. Evidence proved that dirty conditions caused disease. But the government did not **initially** act.

In 1858 a heat wave caused the River Thames to smell so bad that **politicians** in the **Houses of Parliament** (next to the river) demanded to meet somewhere else. This was called 'The Great Stink.' MPs appointed Joseph Bazalgette to build a sewer system. Waste would flow down river to pumping stations and then taken out to sea. Bazalgette was given £3 million. He built 83 miles of sewers using 318 million bricks. The system was finished in 1866 and cholera never returned to London. Government now acted and **life expectancy improved**.

In 1867 **Working class** men in towns gained the right to vote. Political parties offered to improve public health to gain their votes. The **Conservative Party** won in 1874 and introduced **Public Health** Acts.

*Ann engraving from 1866 called 'The Death Dispensary' from a **satirical** magazine commenting on London's polluted water supply*

TIMELINE OF PUBLIC HEALTH REFORM
1842 Chadwick Report
1848 First **Public Health Act**
1853 **Compulsory Vaccination**
1858 Work on London Sewer System Begins
1866 Sanitary **Act**: local councils responsible for sewers, water and clean streets
1875 Housing **Act**
1875 Second **Public Health Act**: local councils forced to appoint Medical Officers
1875 Sale of Food and Drugs Act

KPI9 VOCABULARY

Act	A written law passed by a government
Back-to-Back	Houses built in a **terrace** that back on to other **terraced** housing
Cholera	Disease caused by water infected with bacteria; symptoms: vomiting and **diarrhoea**
Conservative Party	Right-wing British political party that believes in property-owning and private business
Contagion	Spreading of disease
Diarrhoea	Frequent discharge of liquid faeces (solid human waste)
Flocked	Move together in a crowd
Initially	At first
Houses of Parliament	The British parliament; made up of two parts: House of Commons and House of Lords
Interference	Act of interfering
Improved	Been made better
Laissez-Faire	Policy of leaving alone without **interference; *government leaving business alone***
Life expectancy	The average period a person may expect to live
MPs	Members of Parliament; elected to represent people from a given area
Persistent	Continuing firmly in spite of opposition
Politicians	A person involved in government: **MPs**
Public Health	Health of the population as a whole
Resentment	Feeling bitter at having been treated unfairly
Satirical	Using humour to make a serious, usually political, point
Tuberculosis	Infectious lung disease
Typhoid	Infectious fever; symptoms: red spots and stomach pain
Working Class	Social group who are employed for a wage (pay); typically in industrial and manual work

KPI10.1: Modern treatment of disease

Pasteur's Germ Theory identified bacteria as the cause of many diseases (not God or miasma). Koch identified specific bacteria causing specific diseases. Doctors began using weak germs to build up immunity to the disease. Jenner had tried this in 1796 but did not understand how it worked. Vaccines had become common.

Koch's assistant Paul Ehrlich identified a chemical that could kill bacteria. This was known as a 'magic bullet.' He discovered the first chemical cure in 1909 which killed syphilis. More magic bullets were discovered to cure or control diseases like meningitis and pneumonia.

One drug that had not been defeated by a magic bullet was Staphylococcus. It caused food and blood poisoning. Since the 1870s scientists knew that **mould** could kill germs. A **bacteriologist** Alexander Fleming observed during World War One many soldiers whose wounds became **infected** with **Staphylococcus** and that **antiseptics** did not treat it.

In 1928 Fleming went on holiday. He had left some germs out. When he came back he **observed** that **mould** had grown on one **germ** plate and that **staphylococcus** had been killed! **Spores** from a **penicillin mould** in the room below had floated up to his **laboratory** and killed the germ. Fleming stated **penicillin** was an **antiseptic**. This was wrong. Fleming's discovery was not seen as important at the time.

In the 1930s Howard Florey and Ernst Chain were given £25 by the British government to research Fleming's findings on penicillin. They tested penicillin on mice. They then produced enough penicillin to test on a human. It was proven to cure infection.

World War Two was vital in the development of penicillin. In June 1941 Florey and Chain met the US government. The government gave money to companies to produce huge amounts of penicillin. By 1943 there was enough to treat 1,000 soldiers, by 1944 40,000. By 1945 250,000 soldiers were being treated with penicillin. The need to make penicillin led to the growth of the **pharmaceutical industry**. 15% of wounded soldiers would have died without penicillin. After the war it was classed as an **antibiotic** and saved the lives of millions.

FACTORS IN DEVELOPMENT OF PENICILLIN

1. Government & finance: US government invested money in producing penicillin to treat wounded soldiers during war. Later pharmaceutical companies developed which financed research and production
2. Key Individuals: Florey and Chain developed Fleming's initial findings.
3. Luck: Fleming discovered that penicillin spores kill staphylococcus by accident
4. Science and Technology: penicillin was produced
5 War: Fleming researched infection during World War One and US government motivated to invest in penicillin research by World War Two.

FACTORS IN DEVELOPMENT OF DRUGS AND TREATMENT IN THE LATE C20TH

1. Science and Technology: New technology such as MRI scanners and keyhole surgery help doctors. Discoveries like DNA help gene research to find genetic causes of disease.

2. War: two world wars meant governments spent money to research drugs and surgery for wounded soldiers.

3. Government and Finance: government spends money on research and screening programmes to identify disease before it develops. End in **laissez-faire** attitudes means government has 'Healthy Eating Standards' for example

4. Communication: television, media and internet allow new ideas to spread rapidly. Advertising used to promote public health: people aware of dangers of smoking and drinking.

5. Key Individuals: e.g. Crick and Watson discovering DNA

TIMELINE OF DRUGS AND TREATMENT SINCE 1945

1948 Free Tuberculosis vaccine

1950 first open heart surgery

1952 first hearing aid produced; first kidney transplant

1953 Francis Crick and James Watson discover **DNA**

1955 Polio Vaccine

1958 First **pacemaker** fitted

1964 Free measles vaccine

1967 First heart transplant

1973 CAT scanner invented which uses X-ray to show 3D image of inside body

1975 Endoscopes develop- allow doctors to see inside body using only a small cut

1978 IVF developed; first 'test tube' baby

1980 Smallpox is officially **eradicated**

1984 First skin graft

1987 MRI scanner (brain monitor) invented

1990 Human Genome Project launched

1996 First cloned animal, Dolly the sheep

2007 Prosthetic eye produced

2008 First face transplant

KPI10 and 11 VOCABULARY

Alternative medicine	Any way of treating an illness that does not rely on scientifically proven medicine.
Antibiotic	Medicine used to cure and sometimes prevent a bacterial infection
Catalyst	A person or thing that causes a sudden or sped up change
Cloned	Make an exact genetic copy
Diet	Food a person eats
Diphtheria	Contagious bacterial disease
DNA	Molecules that **genes** are made from
Eradicated	Destroyed completely
Evacuation	Moving a person to a new place
Financed	Provide funding (money) for
Gene	A unit of **DNA** that is passed on from parents to offspring
Human Genome Project	International project to decode and identify human **genes**
Invested	Put money in to something
Large-scale	Involving a large number of people over a large area
Mass	A large number of people or objects crowded together
Mould	Type of fungus that grows in warm conditions
Pacemaker	A device that controls a person's heartbeat
Pharmaceutical Industry	Businesses that develop and produce drugs
Pioneer	A person who is the first to explore something
Positive Health	Focus on prevention of an illness rather than a cause
Proposed	Put forward a plan
Prosthetic	An artificial body part
Psychological	Affecting the mind
Radiation	A dangerous form of energy
Resistant	Not easily broken down; unaffected by
Shellshock	**Psychological** condition caused by involvement in war
Skin graft	Surgery where healthy skin is **transplanted**
Splint	Hard material used to support a broken bone when it is set
Spores	Cell that can grow in to a new organism
Staphylococcus	A group of harmful **bacteria**
Transfusion	Act of transferring donated blood to a person

KPI10.2 Modern Treatment of disease

Antibiotics can fail. They have been overused and germs have evolved. MRSA is an antibiotic - resistant **bacteria**. Some diseases such as AIDs and the common cold do not have cures. Some people turn to **alternative medicine** (medicine that has no evidence to say that it actually works!) **Alternative medicines**, sometimes called complementary medicine, include: Aromatherapy; hypnotherapy; acupuncture and homeopathy.

There is also a focus on **positive health** which focuses on prevention not cure. Exercise and healthy eating are better understood as means to stay healthy and screening is used to find early signs of disease.

KPI11: The impact of war and technology on surgery

World War One, 1914-1918

War is a major **catalyst** for medical progress. Medicines develop quicker as governments want their soldiers to be "fighting fit." 10 million died in World War One.

Survivors suffered **shellshock**, a **psychological** condition that was not understood at the start of war but was later known as post-traumatic stress disorder (PTSD).

In 1914 doctors worked out how to store blood safely for **transfusion**.

In 1895 X-ray was discovered and in WW1 X-ray machines were used near battlefields.

Harold Gillies developed plastic surgery in WW1 and used **skin grafts** to treat soldiers with facial injuries. By 1921 he had treated 5,000.

Doctors used saline (a salty liquid) to soak wounds at risk of infection.

The Army Leg **Splint** was developed to treat broken bones.

World War Two, 1939-1945

The British blood **transfusion** service opened in 1938 and blood banks were used in WW2.

Archibald McIndoe used **penicillin** to prevent infection when treating patients with facial injuries.

Diet improved as government encouraged people to grow own food

In 1942 William Beveridge **proposed** a national health service.

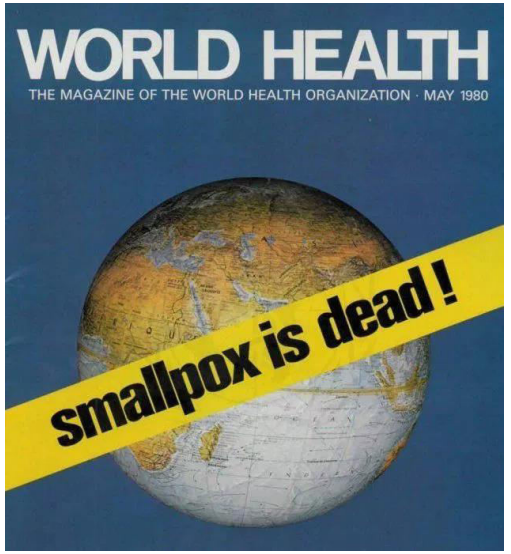
Government produced posters encouraging British to keep 'fighting fit.' They also **immunised** against **diphtheria**.

Penicillin was recognised as a 'wonder drug' and by 1944 was in **mass** development.

Evacuation of urban children highlighted the **large scale** problem of **poverty** and ill health.

After the war surgery continued to develop: **anaesthetics**; **antiseptics**; drugs which limited chance a body would 'reject' a transplanted organ; keyhole surgery and microsurgery all developed. **Radiation** therapy and laser surgery has also developed.

Harold Gillies pioneered the use of plastic surgery to treat soldiers with serious facial injuries from World War One. This evidence of war, key individuals, science and technology and government interacting to create progress



*In 1980 the World Heath Organisation announced that Smallpox had been officially **eradicated**. It is the first and only disease that has ever been destroyed by humans. It is evidence of the growing role of governments in improving **public health**.*

KPI12: Modern Public Health

In 1899 a **large-scale** army **recruitment** campaign **sought** to find men to fight in the **Boer** War. 40% of men were unfit to fight. Charles Booth wrote a report which stated that 30% of Londoners were too poor to eat properly. Seebohm Rowntree's report in York found that 28% did not have enough money to live at some point in life. This **fuelled** fear unhealthy lives of British workers would damage Britain.

Liberal politicians like David Lloyd George argued that government should look after people and should directly improve **public health** and **welfare**. They were also worried about the **Labour Party** (created in 1900) gaining popularity. In 1906 the **Liberal Party** won the election and introduced the Liberal **Reforms**:

1906 School Meals **Act**

1907 School Medical **Service**

1908 Children and Young Person's **Act**

1908 Old Age **Pension Act**

1911 **National Insurance Act**

Back-to-Back housing was banned and in 1918 local councils had to provide **health visitors**, clinics for pregnant women and day nurseries. By 1930 there were **large-scale slum** clearance projects.

Gradually over the c20th **infant mortality rates** fell. Today pregnant mothers receive free treatment and advice. Children get a free education and dental and eye care. In 2015 the **infant mortality rate** was 4.2 per 1000.

Before the c20th people in need relied on charity or the church. Those in absolute poverty went to a **workhouse**. From 1906, after the **Boer** War, the **government** introduced some help, such as free school meals and the '**dole**.' This increased on a much **larger scale** after WW2.

WW2 **impacted** on **attitudes**. The British public suffered bombing and food shortages. Many wanted a better life after the war. **Middle-classes** were also shocked at levels of poverty some **evacuated** children suffered. In 1942 the Beveridge Report identified five giants

Disease

Want (need)

Ignorance

Idleness

Squalor (poor living conditions)

The report said that the government should take care of people "from cradle to grave." After WW2 the electorate replaced Winston Churchill with a **Labour** government led by Clement Atlee. **Labour** set up:

The National Health Service (NHS) in 1948: all healthcare was now free for all who needed it.

A weekly family allowance to help with childcare costs

'Benefits' for the very poor

A higher school leaving age of 15 and more university places

A programme of **slum** clearances. Twelve new towns were created and by 1948 280,000 **council** homes were built a year.

Aneurin Bevin was the Minister for Health. Before 1948 8 million people had never seen a doctor because of the cost. Now it was free. **Life expectancy** has risen from 66 (women) and 64 (men) to 83 (women) and 79 (men). Today, wealth still **affects life expectancy**: the richer live longer. The main issue today is cost and funding of the NHS. The NHS also shows the role of **government** in health: in 2005 tobacco advertising was banned and in 2007 smoking indoors was banned too. **Screening**, health eating campaigns and the 2016 'sugar tax' are examples of this.

KPI12 VOCABULARY

Attitudes	A settled way of thinking about something
Boer	A group of Dutch people who settled in South Africa in the c17th
Dole	Benefit paid by the government to the unemployed
Fuelled	Give a boost to
Gradually	To act in a slow way
Health visitors	Qualified nurse or midwife with training in **public health**
Impacted	Strongly affected by something
Infant Mortality Rate	Number of children under age of 1 who die
Labour Party	Left-wing political party which wants government involvement to improve lives
Liberal	Political ideology that promotes idea of individual freedom
Liberal Party	Political party that provided welfare and promoted more freedom
Middle class	Social group between the **working class** and upper class; professional, business
Recruitment	Getting new people to join the army
Slum	Squalid and overcrowded urban area
Sought	Attempt to find
Welfare State	System whereby government protects health and wellbeing of people
Workhouse	Public building where the poor received food in return for working

SEVEN FACTORS OF DEVELOPMENT FROM c.1000 TO THE PRESENT DAY
RELIGION & SUPERSTITION: In the medieval period religion was the main way people understood health and disease; it both **helped** and **hindered progress**.
WAR: from the medieval period onward has led to progress and a greater understanding of **anatomy** and **surgery**.
SCIENCE & TECHNOLOGY: Greater understanding and technology over time has improved health
COMMUNICATION: Has led to the easier dissemination (spreading) of new ideas
KEY INDIVIDUALS: Actions of people like scientists have both helped and hindered progress
LUCK: discoveries and breakthroughs have occurred as a result of luck and chance.
GOVERNMENT & FINANCE: since the c19th government has increasingly taken an active role in promoting good health

TIMELINE OF MODERN PROGRESS
1798 Edward Jenner develops cowpox as protection a gainst smallpox
1847 James Simpson uses chloroform as an **anaesthetic**
1848 First **Public Health Act** introduced
1858 Joseph Bazalgette begins building London sewers
1867 Joseph Lister publishes use of **carbolic antiseptic surgery**
1882 Robert Koch's work on identifying tuberculosis publicised in Britain
1906 **Liberal Reforms** begin
1948 National Health Service (NHS) founded
1953 Francis Crick and James Watson discover **DNA**
2003 **Human Genome Project** completed

Types of technology in sport and activity

Clothing

What is aerodynamic clothing - Aerodynamics refers to the resistance built up by passing through the air. Aerodynamic clothing is specially designed clothing that is purpose built to save energy and optimise performance.

Benefits of aerodynamic clothing - Reduces wind resistance/drag**;** Preserves energy**;** Increases speed / reduces time

Compression clothing - Compression garments are pieces of clothing that fit tightly around the skin.

Benefits of compression clothing - Keeping the muscles warm to prevent muscle strain**;** Wicking sweat away from the body to prevent chafing and rashes**;** Helping relieve pain from muscle stiffness and soreness

Moisture Control Clothing - Moisture control clothing is specifically designed to provide moisture control for an athlete's skin. They move perspiration away from the body to the fabric's outer surface where it can evaporate.

Benefits of moisture control clothing - Keep skin dry and comfortable**;** Absorb the moisture**;** Limit the bacteria build up**;** Retains the moisture

Perceived Psychological Edge

This refers to sports people wearing certain types of clothing that apparently gives them an edge over their opponents or improves their performance in some way.

Benefits of perceived psychological edge - Gives the performer confidence and raises self-belief; Makes them feel comfortable; Reduces anxiety

Footwear

Changes in materials - Materials have changed from leather to canvas.

Changes in studs - These have changed from metal, to aluminium to carbon.

Advancement in waterproof and breathable technology - These allow the feet to breathe, reducing the likelihood of odour and becoming damp.

Protection

There are three ways we can protect performers: Cricket Helmets; Mouth Guards and Landing mats

Cameras, computers and software

Hawkeye - Hawk-eye is the name of a line-calling system which traces a ball's trajectory and sends it to a virtual-reality machine.

Goal-line technology - In football, goal-line technology is the use of electronic aid to determine if a goal has been scored or not.

Match analysis

Match analysis it is divided into two categories:

1. Video analysis
2. Statistical analysis

Action cameras - These are used to capture immediate footage and provide instant replay.

GPS - This can pick up your location and provide statistical data.

Smartwatches and apps - Are used to record and plan a training session.

Benefits of technology on the performer

Marginal gains - The doctrine of marginal gains is all about small incremental improvements in any process adding up to a significant improvement when they are all added together, sometimes finding the 1% improvement that could improve performance.

Skill analysis of the musculoskeletal system - The musculoskeletal system is how our bodies move and work. Made up of the muscle of the body and our skeleton, it focuses on how they both work together.

Aerodynamic and drag - Aerodynamics is the study of how air flows over objects and the forces that the air and objects exert on each other. Drag is the force of wind or air resistance pushing in the opposite direction to the motion of the object.

GPS and the impact on cardiorespiratory system training zones - A GPS device sends and records data of effort levels and can inform the performer if they need to increase work ethic.

Prosthetics and the musculoskeletal system - The device, which is called a prosthesis, can help you to perform daily activities such as walking, eating, or dressing.
Biomechanical needs and footwear - Specific footwear is now designed to improve the biomechanical needs of the performer. Biomechanical needs refer to the analysis of the individual and how specific technology can aid the performer.

Benefits of technology for the coach/manager

Video analysis to assess cardiorespiratory effort - Video analysis, a commonly used tool in modern sports, can provide a training boost for individual and team competitions.
Action camera footage and musculoskeletal technique - Action camera footage is commonly used by coaches/managers to analyse musculoskeletal technique.
GPS technology and cardiorespiratory effort - This is helpful for a coach/manager as it provides statistical data that could inform tactics and team selection.
Apps and mood rates to determine training activities - A new type of technology has been developed that can rate sports performer's moods. This can now inform coaches/managers of the state of mind of their players.

Benefits of technology on officials

Moisture control clothing and thermoregulation - This will regulate the body temperature and keep the body thermoregulated.
Smartwatches and cardiorespiratory effort - As well as timing the match, their watches are now smartwatches; the officials are now tracked via this type of technology. The data that is recorded is fed back to the match officials departments and could impact if the official is suitable to referee in the near future.

Limitations of technology on the performer

Data from technology - Due to the emergence of technology such as GPS vests, players have nowhere to hide. Their every move is monitored and this could be harmful to their team selection.
Technology comparing performers - Data can be used to compare performers and this could limit their performance. For
Data and injury assessment - Sports performers are often the best person to ask if they are able to compete or not. They know their body best, and know what they can and cannot do. Therefore, when data states otherwise, it may limit the individual.

Limitations of technology on the coach/manager

Time consuming technology -
Coaches/managers have to be familiar with such technology so they can provide the best for their team. However, by using this technology, it takes time.
Technology and coach/managers responsibility - As with any technology, it is always updating. To get the benefits from technology, a coach/manager must keep up to date with developments. If they do not, they are not proving the best service to their athlete/players.
Cost of advanced technology - The cost of advanced technology within sport is excessive.

Limitations of technology on the official

Harmful effect of technology on the game - Using this technology can have a harmful effect, such as slowing the game down (when having to review decisions), disrupts the flow of the game (leaving the players/performers' heart rate to drop) or causes an atmosphere in the stands (where spectators are not kept informed).

YR 11 HOSPITALITY AND CATERING Level 1/2 *KNOWLEDGE ORGANISER*

Terms 1.1 and 1.2 - In Catering you are assessed on everything you do in class. There are 2 assessment objectives.

Assessment one (L01 + L02 + L03 + L04 Unit one) Recall and Revise previous topics

- **Understand the environment in which hospitality and catering providers operate**
- **Understand how Hospitality and catering provision operates**
- **Understand how hospitality and catering provision meets health and safety requirements**
- **Know how food can cause ill health**

Assessment two (L03 Unit two) Be able to cook high skilled dishes safely and hygienically which are suitable for a given brief. You will be practicing and presenting appropriate dishes suitable for your final practical exam. You will explain the suitability of the recipes chosen.

KEYWORDS AND KEY TERMS

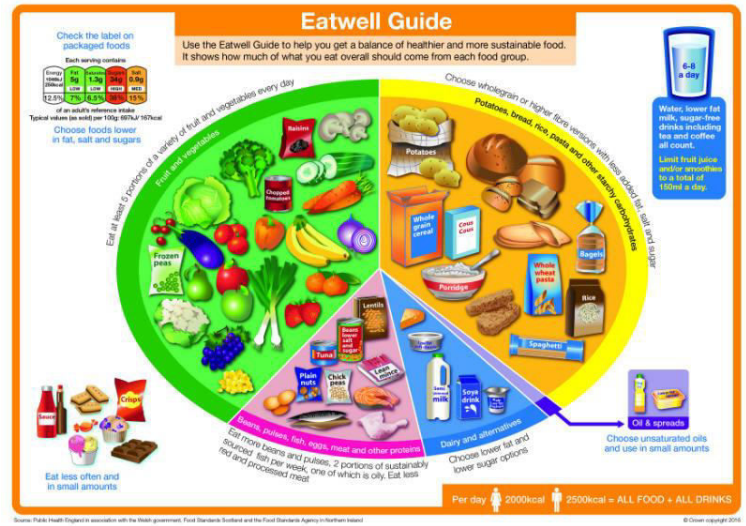
- ❑ Accompaniments
- ❑ Healthy guidelines
- ❑ High risk foods
- ❑ High skilled dishes
- ❑ Nutritional needs
- ❑ Medical needs
- ❑ Food allergies
- ❑ Food intolerances
- ❑ Religious beliefs
- ❑ Activity levels
- ❑ Poaching
- ❑ Filleting
- ❑ Roux
- ❑ Bechamel
- ❑ Piping
- ❑ Meat,
- ❑ Poultry
- ❑ Fish,
- ❑ Vegetarian alternatives
- ❑ Dairy produce
- ❑ Cereals and pasta
- ❑ Fruit & vegetables
- ❑ Hotels
- ❑ Restaurants
- ❑ Food suppliers
- ❑ Event services
- ❑ Commercial
- ❑ Non-Commercial
- ❑ Gross Profit
- ❑ Net profit
- ❑ Food costs
- ❑ Variable costs
- ❑ Food costs
- ❑ Sustainable food
- ❑ Food Safety
- ❑ Food safety Legislation
- ❑ Environmental Health officers

Recipes:

Seasonal soup
Chicken chasseur & Kiev
Sweet & Sour chicken
Shortcrust pastry – Lemon meringue pie & Quiche Lorraine
Puff pastry – bacon & cheese turnover
Choux pastry – profiteroles
Flapjacks
Swiss roll
Victoria sandwich
Yeast doughs - Calzone
Sauces – Macaroni cheese

Useful websites to embed learning

- https://www.eduqas.co.uk/qualifications/hospitality-and-catering/WJEC-Level-1-2-Award-in-Hospitality-and-Catering-Unit-2-iSAM%20%20from%202016.pdf?language_id=1
- https://www.jamieoliver.com/recipes/
- https://www.bbc.co.uk/food/recipes
- http://www.maryberry.co.uk/recipes/



YR 10 HOSPITALITY AND CATERING Level 1/2 *KNOWLEDGE ORGANISER*

Terms 1.1 and 1.2 - In Catering you are assessed on everything you do in class. There are 2 assessment objectives.

Assessment one (L01 Unit one) Understand the environment in which hospitality and catering providers operate.

You will be looking at the structure of the Hospitality and Catering industry; Analyse job requirements; Describe the working conditions of different jobs across the industry and explain the factors affecting the success of hospitality and catering providers.

Assessment two (L03 Unit two) Be able to cook dishes safely and hygienically

You will apply your knowledge of Personal, Food and Kitchen hygiene and safety to create dishes of high quality. You will use appropriate techniques, choose the correct equipment and be able to modify recipes in response to differing dietary and customer needs.
You will use sensory words to describe appearance, aroma, texture and taste.

KEYWORDS AND KEY TERMS

- ❑ Food safety
- ❑ Personal Hygiene
- ❑ Food Hygiene
- ❑ Kitchen hygiene
- ❑ Ill-health
- ❑ High risk foods
- ❑ Food poisoning
- ❑ Hazards- HACCP
- ❑ Control measures
- ❑ Food safety regulations
- ❑ Starter
- ❑ Main course
- ❑ Desserts
- ❑ Dietary needs
- ❑ Coeliac
- ❑ Lactose intolerant
- ❑ Commodities
- ❑ Functions of nutrients
- ❑ Balanced diet
- ❑ Eatwell guide
- ❑ Nutritional needs
- ❑ Lanning menus
- ❑ Environmental issues
- ❑ Cake making methods
- ❑ Shortcrust pastry
- ❑ Choux pastry
- ❑ Rough puff pastry
- ❑ Laminating
- ❑ Boning
- ❑ Jointing
- ❑ Piping
- ❑ Melting
- ❑ Whisking
- ❑ Time plan
- ❑ Dove-tail
- ❑ Consumers

Recipes:

Seasonal soup
Chicken chasseur & Kiev
Sweet & Sour chicken
Shortcrust pastry – Lemon meringue pie & Quiche Lorraine
Puff pastry – bacon & cheese turnover
Choux pastry – profiteroles
Flapjacks
Swiss roll
Victoria sandwich
Yeast doughs - Calzone
Sauces – Macaroni cheese

Useful websites to embed learning

- https://www.eduqas.co.uk/qualifications/hospitality-and-catering/WJEC-Level-1-2-Award-in-Hospitality-and-Catering-Unit-2-iSAM%20%20from%202016.pdf?language_id=1
- https://www.jamieoliver.com/recipes/
- https://www.bbc.co.uk/food/recipes
- http://www.maryberry.co.uk/recipes/

LEVEL 1 / 2 AWARD IN HOSPITALITY AND CATERING unit 1

AO1
Understand the environment in which hospitality and catering providers operate

What are the styles of food service?

- Be able to state a variety of styles of service
- Explain the main features of each style of service
- Be able to compare suitability of styles of service for different establishments

What is the structure of the Hospitality and catering industry ?

- Identify at least 5 different establishments
- Explain 2 establishments in detail.
- Compare establishments explaining their similarities and differences

Where do Hospitality and Catering establishments buy their supplies?

- Be able to state different types of suppliers
- Explain the different types of suppliers
- Be able to explain the advantages and disadvantages of different types of suppliers

What are job roles in Hospitality?

- Be able to state a variety of job roles
- Explain the main requirements of each job
- Be able to explain the qualities and training for each job

How are establishments rated and reviewed?

- Be able to state different methods of ratings
- Explain the differences between different methods of ratings
- Be able to explain the advantages and disadvantages of different types of ratings

What makes an establishment successful ?

- Be able to state some of the factors
- Explain how the factors can affect the success of the establishment
- Consider reasons affecting success or failure and identify ways of dealing with them

The learner can:	Assessment Criteria	Content unit 1
LO1 Understand the environment in which hospitality and catering providers operate	AC1.1 Describe the structure of the hospitality and catering industry	**Hospitality and catering industry** • Types of provider • Types of service • Commercial/non-commercial establishment • Services provided • Suppliers • Where hospitality is provided at non-catering venues • Standards and ratings • Job roles within the industry
	AC1.2 Analyse job requirements within the hospitality and Catering industry	**Requirements** • Supply and demand • Jobs for specific needs • Rates of pay • Qualifications and experience, training • Personal attributes
	AC1.3 Describe working conditions of different job roles across the hospitality and catering industry	**Working conditions** • Different types of contract • Working hours • Rates of pay • Holiday entitlement, remuneration
	AC1.4 Explain factors affecting the success of hospitality and catering providers	**Factors** • Costs, profit, Economy • Environment • Emerging cooking techniques, technology • Customer demographics/lifestyle and expectations • Customer service • Competition • Trends, media, political factors

OVERVIEW – coastal processes

Processes	Types
Weathering (These are sub aerial processes)	Mechanical, Chemical, Biological
Mass movement	Sliding, Slumping, Rock falls
Erosion	Hydraulic power, Abrasion, Attrition
Transportation	Longshore drift
Deposition	

What is Deposition?

When the sea or river loses energy, it drops the sand, rock particles and pebbles it has been carrying. This is called deposition. Heaviest material is deposited first.

Deposition is likely to occur:-

•waves enter an area of shallow water.
•waves enter a sheltered area, eg a cove or bay.
•there is little wind.
•there is a good supply of material.

Case Study; Lyme Regis Coastal Management

Reasons for management

Much of the town has been built on unstable land
The coastline is eroding more rapidly than any in Europe due to the powerful waves from the south west. Many properties have been destroyed or damaged, and there has been considerable erosion of the foreshore. The sea walls have been breached many times

Management strategy - what did they do?

Extra sand and shingle on the beach to absorb wave energy
Drainage pipes built into the cliff side to reduce the risk of landslips
Extension of the rock armour on the Cobb to break up power of waves and reduce erosion
Soil nailing and piling means unstable ground is pinned to stable ground to reduce landslips
New sea wall and promenade built to reduce erosion of the cliffs behind

Resulting Effects

The new sea wall may interfere with coastal processes and affect neighbouring stretches of coastline, causing conflicts elsewhere
The new defences have stood up to recent stormy winters

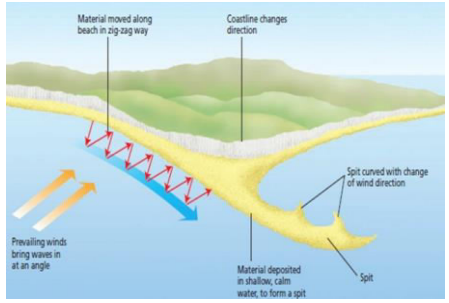
Conflicts

Some people think the new defences have spoilt the natural coastal landscape
Increased visitor numbers have led to conflicts with locals about traffic

Type of Transportation

A natural process by which eroded material is carried/transported.

1) **Swash moves up the beach at the angle of the prevailing wind.**
2) **Backwash moves down the beach at 90° to coastline, due to gravity.**
3) **Zigzag movement (Longshore Drift) transports material along beach.**
4) **Deposition causes beach to extend, until reaching a river estuary.**
5) **Change in prevailing wind direction forms a hook.**
6) **Sheltered area behind spit encourages deposition, salt marsh forms.**



Types of Erosion

The break down and transport of rocks – smooth, round and sorted.

Attrition	Rocks that bash together to become smooth/smaller.
Solution	A chemical reaction that dissolves rocks.
Abrasion	Rocks hurled at the base of a cliff to break pieces apart or scraped against the banks and bed of a river.
Hydraulic Action/ power	Water enters cracks in the cliff, or river bank, air compresses, causing the crack to expand.

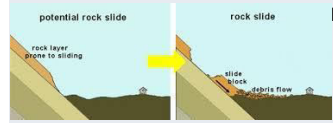
Types of Weathering

Weathering is the breakdown of rocks where they are.

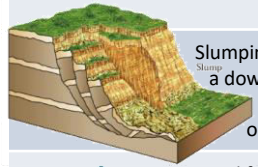
Biological	Breakdown of rock by plants and animals e.g. roots pushing rocks apart.
Mechanical	Breakdown of rock without changing its chemical composition e.g. freeze thaw
Chemical	Breakdown of rock by acids and chemicals in the sea

Mass Movement

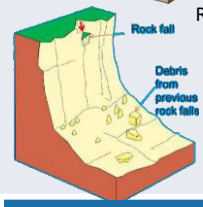
A large movement of soil and rock debris that moves down slopes in response to the pull of gravity in a vertical direction.



Rock slides occur when there is a failure along the bedding plane.

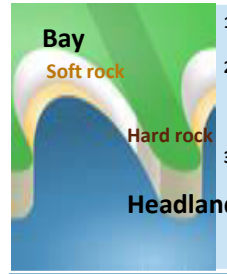


Slumping occurs when there is a downward rotation of sections of cliff. Often occur after heavy rain.



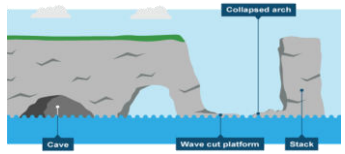
Rockfall is the rapid free fall of rock from a steep cliff face because of gravity.

Formation of Bays and Headlands



1) **Waves attack the coastline.**
2) **Softer rock is eroded by the sea quicker forming a bay, calm area cases deposition.**
3) **More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.**

Formation of Coastal Stack



Example: Old Harry Rocks, Dorset

1) **Hydraulic action widens cracks in the cliff face over time.**
2) **Abrasion forms a wave cut notch between high tide and low tide.**
3) **Further abrasion widens the wave cut notch to from a cave.**
4) **Caves from both sides of the headland break through to form an arch.**
5) **Weathering (such as mechanical) above/erosion below –arch collapses leaving stack.**
6) **Further weathering (chemical) and erosion eaves a stump.**

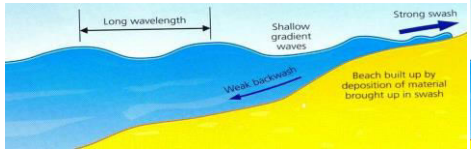
Unit 1c

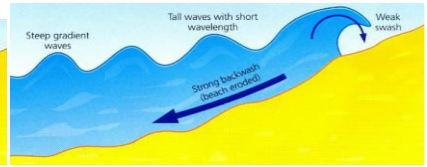
Coastal Landscapes in the UK

AQA

Types of Waves

Constructive Waves	Destructive Waves
This wave has a **swash that is stronger** than the backwash. This therefore builds up the coast.	This wave has a **backwash that is stronger** than the swash. This therefore erodes the coast.



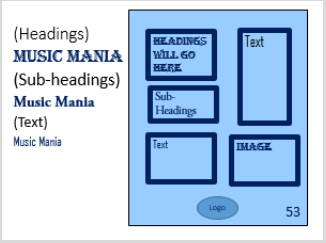
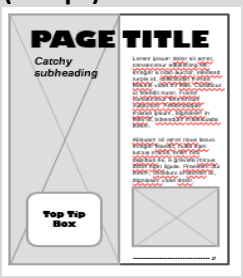
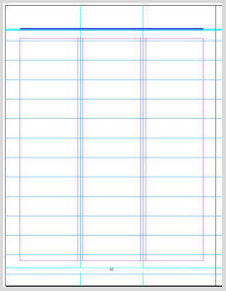


Technique	How it protects the coast	Advantage (benefit)	Disadvantage (cost)
Groynes (hard)	Groynes are wooden barriers constructed at right angles to the beach to retain material and stop longshore drift. Groynes encourage a wide beach which helps absorb energy from waves, reducing the rate of cliff erosion.	Cheap, retain wide sandy beaches and do not affect access to the beach.	Beaches to the south of the defences are starved of beach material due to their effect on long shore drift.
Sea walls (hard)	Sea walls are usually built along the front of cliffs, often to protect settlements. They are often recurved which means waves are reflected back on themselves. Wave power in reduced	Provide excellent defence where wave energy is high, reassures the public and long life span.	Expensive, can affect beach access, recurved sea walls can increase the erosion of beach mate
Rock armour (hard)	These are often large boulders placed along the base of a cliff to absorb energy from waves.	Cheap and efficient	Unattractive, dangerous access to beach, costs increase when rock is imported.
Gabions (hard)	This is where rocks and boulders are encased in wired mesh. They absorb the energy from waves.	Cheap and efficient.	Shorter life span than a sea wall. Visually unattractive.
Beach nourishment (soft)	Beaches are made higher and wider by importing sand and shingle to an area affected by longshore drift.	Cheap, retains the natural appearance of the beach and preserves the natural appearance of the beach.	Off shore dredging of sand and shingle increases erosion in other areas and affects the ecosystem. Large storms will require beach replenishment, increasing costs.
Managed retreat (soft)	This is when areas of coast are allowed to erode. This is usually in areas where the land is of low value. Areas are allowed to flood, marshes are often created	Managed retreat retains the natural balance of the coastal system. Eroded material encourages the development of beaches and salt marshes.	People lose their livelihood e.g. farmers. These people will need to be compensated.
Beach re-profiling (Soft)	The sediment is redistributed from the lower part of the beach to the upper part of the beach to change the shape of the beach and reduce erosion	Cheap and simple Reduces the energy of the waves.	Only works when wave energy is low. Needs to be repeated continuously.
Dune regeneration (soft)	Marram grass planted on sand dunes stabilises the dunes and helps to trap sand to build them up.	Relatively cheap. Maintains a natural-looking coastline	Can be damaged by storm waves. Areas have to be zoned off from the public, which is unpopular.

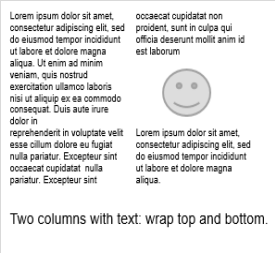
Coastal Management Strategies

Year 11 BTEC Creative Media Production — Term 1.1 and 1.2

Component 2: Publishing

Keyword	Definition	Keyword	Definition
Mood boards 	Mood boards visually illustrate the direction a new idea or concept can take and give a feel for the mood or atmosphere of the final product. What mood are you aiming for (e.g. fun, quirky, serious)? They are NOT just a collection of random images relating to the topic. Mood boards can include: images similar to those you would use, fonts, similar magazine layouts, colour schemes.	**House style** 	House style is the style that magazine publishers use to create a 'corporate image' so that we recognise their magazine and identify with the brand. House style includes the use of: • fonts • colours • logos and their position on the page • graphics, pictures, page numbers and their position on the page.
Thumbnails 	Thumbnails are sketches that give a quick impression of the layout of a page, cover or double-page spread. An X represents an image, lines indicate text	**Comprehensive layouts (comps)** 	**Comprehensive layouts** are detailed layouts of a page, cover or double-page spread, showing where all the final information will be placed. These can be produced by hand, using parallel lines to indicate text, or on a computer using **lorem ipsum** (dummy text).
The grid structure 	Many designers employ the grid system regularly because it is *so* effective at organizing information. The best layout is one which provides no distraction from the content. Thanks to its mathematical precision, the grid system is a great example of this kind of layout.	**Dynamic** 	Characterised by constant change, new ideas, progress, change, new energy. Why should the layout of a magazine be dynamic? To stand out, avoid boredom, spark interest, stay current. To ensure a dynamic layout: Use a grid structure to keep page elements in order. have one main focal point, use big, blocky sans serif fonts for headlines and sub-headings, make sure all type is easy to read, limit the colours used - use one strong colour to draw attention, don't have too much going on – keep it simple and use white space or empty background areas to give space to the elements.

Component 2: Publishing

Logo design 	A logo is an image or symbol that represents a company or product, allowing the audience to identify it. Good logos are: **simple** (basic shapes, limited colours), **memorable**, **appropriate** to the context.	**Planning photographs** 	Before taking the photos for your music magazine, think about the composition. **The rule of thirds** allows you to add balance and interest. Imagine a 3 x 3 grid. Have the focal points of your picture along the lines, or where they cross. Consider the **shot type** and **angle**. If you are photographing a musician performing, do you want a close-up to capture their expression? Or a mid shot of them on stage, shot from a slightly low angle so that the reader literally 'looks up' to them?
Typography 	The style and appearance of printed matter. Use **appropriate fonts** to get your message across, e.g. Serif *italic*, Sans Serif, **bold** Script. Do not use too many different fonts on a page. Do you want text to align left … or right? … or centred? Think about how many columns you will have and how text will interact with images. Will text be above and below a picture or wrap around it?	**You must create a portfolio showing your experimentation and development of media production skills and techniques, including:**	Detailed planning for the visual style, content and structure of your magazine spreads, a wide range of skills and techniques for creating content for publishing products, e.g. how you created the photographs, logos and copy. How you have skilfully and creatively experimented with production and post-production skills, e.g. assembling the final spread, experimenting with typography, colour and layout.
Colour 	What will colours suggest to the audience? Will red suggest anger, love or danger? Think about which colours go together. Try out swatches of your final colour scheme so you know what they look like next to each other.	**Reviewing project**	Elements to include in the review, including: development of skills and techniques, responding to audience/user feedback, identifying strengths and areas for development, and actions and targets for future production work, reference to professional working practice.

l'accueil (m) welcome
l'aéroport (m) airport
l'Afrique (f)/ africain Africa/ African
l'agence de voyages (f) travel agency
L'aire de jeux (f) play area
l'Algérie (f) algérien Algeria/ Algerian
l'Allemagne (f) allemand Germany/ German
l'Angleterre (f)/ anglais England/ English
l'arrivée (f) arrival
l'ascenseur (m) lift
l'auberge de jeunesse (f) youth hostel
l'auto (f) car
l'autobus (m) bus
l'autoroute (f) motorway
l'aventure (f) adventure
l'avion (m) plane
les bagages (m) luggage
le bateau boat
la Belgique/ belge Belgium/ Belgian
le bord de la mer seaside
le car coach
la carte map
la carte postale postcard
la chambre de famille family room
la chambre d'hôte bed and breakfast
le chemin way, path
le chemin de fer railway
la Chine/ chinois China/ Chinese
la clé key
la climatisation air conditioning
la colonie de vacances holiday/summer camp
la crème solaire sun cream
le départ departure
le dortoir dormitory
Douvres Dover
l' échange (m) exchange

l'Écosse (f) / écossais Scotland/ Scottish
l'Espagne (f)/ espagnol Spain/ Spanish
l'essence (f) petrol
l'emplacement pitch (tent)
les États-Unis (m) USA
à l'étranger abroad
l'étranger (m) stranger/ foreigner
l' l'Écosse (f) / écossais Scotland/ Scottish
l'Espagne (f)/ espagnol Spain/ Spanish
l'essence (f) petrol
l'événement (m) event
la foire fair
la frontière border, frontier
la Grande Bretagne/ britannique GB/ British
l'herbe grass
l'horaire (m) timetable
l'île (f) island
inconnu unknown
le jardin zoologique zoo
jumelé twinned
le lac lake
le lavabo wash basin
lentement slowly
le lit bed
les lits superposés bunk beds
la location de voitures car rental
le logement accommodation
Londres London
les lunettes de soleil sun glasses
le maillot de bain swimming costume
la Manche English Channel
le Maroc/ marocain Morocco/ Moroccan
la Mediterranée Mediterranean
le monde world
la montagne mountain
la moto motor bike

Yr 11 FRENCH
Travel and tourism

le parc d'attractions theme park
le Pays de Galles/ gallois Wales/ Welsh
la pièce d'identité identification card
la plage beach
le plan de ville town plan
la plongée sous-marine deep-sea diving
le projet plan
le/la propriétaire owner
la randonnée walk, hike
le rendez-vous meeting
les renseignements (m) information
le retour return
la rivière river
la route road, way
la salle de séjour lounge
le sable sand
le sac de couchage sleeping bag
le séjour stay, visit
le spectacle show
la station balnéaire seaside resort
la Suisse/ suisse Switzerland/ Swiss
La tour tower, tour
le tourisme tourism
Le trajet journey
La traverse crossing
la Tunisie/ tunisien Tunisia/ Tunisian
les vacances (f) holidays
la valise suitcase
la visite (guidée) (guided) visit
la voiture car
le vol flight
la vue de mer sea view

Key verbs

attendre to wait
atterrir to land
se baigner to bath, swim
bronzer sunbathing
chercher to look for
conduire to drive
se coucher to go to bed
décoller to take off
déranger to disturb
durer to last
faire la connaissance to get to know
faire du camping to go camping
se garer to park
laisser to leave
laver to wash
se laver to get washed
lever to lift
se lever to get up
loger to stay, lodge
louer to hire, rent
manquer to miss
marcher to walk
se mettre en route to set off
monter to go up/ ascend
nager to swim
partir to leave
se promener to go for a walk
remercier to thank
réserver to book/ reserve
rester to stay
retourner to return
se reveiller to wake up
revenir to come back
voler to fly
voyager to travel

Year 11
Study and Employment

Life at school

bien équipé well equipped
le bulletin scolaire school report
la calculette calculator
le car de ramassage school bus
le collège secondary school
le couloir corridor
le diplôme qualification
le directeur/ la directrice head teacher
doué gifted
le droit right
l' école primaire/ secondaire primary, secondary school
L'élève pupil
l'emploi du temps (m) timetable
en seconde in year 11
l' étudiant (m) student
l'examen (m) examination
l'injure insult
les incivilitiés (f) rudeness
la leçon lesson
la lecture reading
mal équipé badly equipped
le maquillage make up
la maternelle nursery school
la pause break
la pression pressure
La récréation break
la règle rule
le règlement school rules
la rentrée return to school
la retenue detention
la salle de classe classroom
le tableau board
le terrain de sport sports ground
le trimestre term

My studies

la chimie chemistry
le cours lesson
la couture sewing
le dessin art
les devoirs (m) homework
l'EPS (f) PE
les études studies
le français French
l'informatique (f) IT
l'instruction civique (f) citizenship
l'instituteur primary teacher (male)
l'institutrice primary teacher (female)
la langue language
les langues vivantes modern languages
la matière subject
la note mark
la physique physics
le professeur teacher
le proviseur head teacher

Education Post-16

l'année sabbatique (f) gap year
l'apprenti(e) apprentice
le bac(calauréat) A Level(s)
le conseiller d'orientation careers advisor
l' épreuve (f) test
l' établissement (m) establishment
la faculté university, faculty
en première in year 12
en terminale in year 13
la liberté freedom
la licence degree
le lycée 6th form college
le résultat result

Jobs, careers and ambitions

l'agent de police police officer
l'avocat lawyer
l'avenir future
le boucher butcher
le boulanger baket
le boulot job
le candidat candidate
le coiffeur hairdresser
le comptable accountant
le débouché job opportunity
disponible available
l'employé (e) employee
l'employeur employer
l'entreprise (f) firm, enterprise
l'entretien interview
le facteur postman
le fermier farmer
l'infirmier nurse
l'informaticien IT worker
l'ingénieur engineer
le journal newspaper
la livre pound (sterling)
le maçon builder
le mécanicien mechanic
le patron/ la patronne boss
le petit job part-time job
le plombier plumber
le policier policeman
le rêve dream
varié varied
le vétérinaire vet

Key verbs

apprendre to learn
avoir envie de to want to
avoir l'intention de to intend (to)
comprendre to understand
compter (sur) to count (on)
demander to ask
discuter to discuss
distribuer to give out
échouer to fail
enseigner to teach
espérer to hope
étudier to study
faire attention to pay attention
former to train
gagner to earn
laisser tomber to drop
lire to read
mettre de l'argent de côté to save money
oublier to forget
penser to think
permettre to allow, permit
porter to wear
rêver to dream
recevoir to receive
redoubler to repeat the year
répéter to repear
réussir dans un examen to pass an exam
savoir to know
trouver to find

Present tense verb endings			
	-er	**-ir**	**-re**
	regard**er**	fin**ir**	vend**re**
Je	regard**e**	fin**is**	vend**s**
Tu	regard**es**	fin**is**	vend**s**
Il	regard**e**	fin**it**	vend
Elle	regard**e**	fin**it**	vend
On	regard**e**	fin**it**	vend
Nous	regard**ons**	fin**issons**	vend**ons**
Vous	regard**ez**	fin**issez**	vend**ez**
Ils	regard**ent**	fin**issent**	vend**ent**
Elles	regard**ent**	fin**issent**	vend**ent**

Adjective endings

Adjectives usually come after the noun and agree with it in gender and number.

un garçon bavard — une fille bavard**e**
des garçons bavard**s** — des filles bavard**es**

Adjectives such as joli, grand, petit, vieux come before the noun
e.g. un grand terrain de sport

Intensifiers and conjunctions

assez *quite*
un peu *a bit*
si *so*

très *very*
trop *too*
vraiment *really*
toujours *always*

car *because*
donc *so, therefore*
en revanche *on the other hand*
parce que *because*
par contre *however*
pourtant however
puisque *as,since*
quand *when*
qui *who*

Direct Object Pronouns

The words **le, la** and **les** mean 'the' when they are in front of a noun, but when they come **before** a verb they change meaning

le = it, him	le - l'	Before vowel
la = it, her	la – l'	
les = them		

Je le trouve difficile – I find it difficult.
Je l'adore – I love it.

Future time frames	
Je vais…I am going…	all**er** to buy
Je voudrais…I would like..	étudi**er** to study
J'aimerais…I would like…	êt**re** to be
J'ai l'intention de.. I intend	deveni**r** to become
J'espère… I hope	fai**re** to do

J'espère aller au lycee I *hope to go to college.*
Je vais étudier les maths *I'm going to study maths*.

Modal verbs

devoir – to have to; pouvoir – to be able to; vouloir – to want.
These verbs are followed by another verb in the infinitive

devoir	**pouvoir**	**Vouloir**
Je dois	Je peux	Je veux
Tu dois	Tu peux	Tu veux
Il/elle/on doit	Il/elle/on peut	Il/elle/on veut
Nous devons	Nous pouvons	Nous voulons
Vous devez	Vous pouvez	Vous voulez
Ils/elles doivent	Ils/elles peuvent	Ils/elles veulent

Je dois arriver à huit heures. *I must arrive at 8 o'clock.*
On ne peut pas porter des baskets. *We can't wear trainers.*
Il faut *can also be used with infinitives to mean 'we/you must'*
e.g. Il faut porter une cravate. We/you have to wear a tie.

Negatives

Ne…pas; ne…plus go around the verb

e.g. Je **n**e supporte **pas** les maths. I can't stand maths.
Je **n**' étudie **plus** l'histoire. I no longer study history.

Yr 11 FRENCH TERMS 1 & 2
Grammar and structures

Year 11 GCSE Computer Science **Term 1.1 and 1.2**

Paper 1.6: System Security

Keyword	Definition	Keyword	Definition
Network Threats			
Malware	Malware is malicious software, loaded onto a computer with the intention to cause, damage or to steal information. For example viruses infecting files.	**Phishing**	Phishing is a common way to try to steal information like passwords. Emails are sent, requesting the user logs into a website, but the site is a fake, and the user's details are logged.
People as the weak point in systems ('social engineering')	People are the weakest point of any system. If a hacker can convince a user to give over their data, this is the easiest way into a system.	**Brute Force Attacks**	Using an algorithm to try every possible combination of characters to 'guess' the users password.
Denial of Service Attacks	Hackers flood a network with huge amounts of fake data and requests in an attempt to overload the system so that it crashes, so it can't be accessed.	**Data Interception and Theft**	Data interception, or *Man in the Middle attacks* are hacks that use 'packet sniffer' software to look at every piece of data being transmitted in the local area to find ones that meet the hacker's criteria. Often done by creating 'fake' wireless networks to record users details.
The concept of SQL injection	Using SQL statements which contain malicious code to trick a database management system (DBMS) into providing access giving large amounts of data to the hacker.	**Poor Network Policy**	Network policies are not always designed to provide maximum security. For example, a strong policy should recommend changing passwords regularly and sure the passwords are strong.
Types of Attack and Identifying Vulnerabilities			
Types of Attack	Passive: monitoring data and intercepting anything sensitive. Active: attacking a network with malware. Insider: exploits network access to information. Brute Force: cracking passwords through trial and error.	**Network forensics**	Use of software for capturing, storing and analysing network events. The outcome is finding out communication between whom, when, how and how often.
Preventing Vulnerabilities			
Anti-malware software	Software which analyses files, network traffic and incoming data to look for known malware. An infected file is quarantined, and either cleaned or securely deleted to prevent further infection. Needs updating for new viruses.	**Firewalls**	A firewall protects a system by checking all incoming and outgoing network traffic is legitimate.
User Access Levels	Limiting the access of a user by their requirements to carry out their job. An admin will have more rights than a student, for example.	**Passwords**	Rules to ensure that passwords are strong enough to prevent guessing or brute force attack - requiring the use of upper and lower case letters, numbers and special characters. A minimum length is required and have to be changed on a regularly.
Encryption	Encoding all data is sent using a secure private, asymmetric key system, so that if data is stolen, it cannot be read or used.	**Network Policies**	Rules which govern how a network may be used. A strong policy should recommend changing passwords regularly and sure the passwords are strong. Users sign up to a User

Year 11 GCSE Computer Science **Term 1.1 and 1.2**

Paper 1.7: Systems Software

Keyword	Definition	Keyword	Definition
Operating Systems			
Purpose of Operating Systems Software	Programs which tells the hardware what to do.	**Functions of an operating system**	• File management • User interface • User management • Memory management • Multi-tasking • Peripheral Management/drivers
File Management	Computers store files and data in hierarchical folder systems. This is efficient and allows for quick navigation	**User interface**	The means of communication between the user and the computer. These are typically either command line or GUI (Graphical User Interface).
User Management	Multiple users can have accounts on the same computer, each with their own files, settings and applications, protected with passwords. The OS will ensure that only users who are granted permissions can use files or programs belonging to other users.	**Memory Management**	The OS controls available memory, moving programs to and from secondary storage to RAM
Multi-tasking	Often users have more than 1 program running at once. In reality, each CPU core can only carryout 1 task at a time, but the OS alternates between the programs to make it appear that multiple tasks are running simultaneously.	**Peripheral Management and drivers**	Computers must communicate with a range of external devices such as printers, monitors and scanners (peripherals). The OS uses drivers to correctly pass data to the device and ensure correct function.
Utility Software			
Utility Software	Utility software supports the OS by performing a limited and specific task. They are used to manage specific actions of the system, or undertake maintenance operations.	**Encryption**	In order to keep data secure, especially against outside threats, data must be encrypted. Encryption software uses complex algorithms to encode data so it cannot be read without the private access keys.
Defragmentation	Over time, through multiple updates and saves, files will become split up and distributed over the platters. It takes longer for the files to be accessed, slowing the machine down. Defragmentation reorganises the files' parts to bring them together.	**Data compression**	Allows files to be made smaller by removal of empty space or through compression algorithms (lossy or lossless). • **Lossy Compression:** Data is removed from the file to make it smaller. This data is lost and cannot be regained. Suitable where the loss of data is likely not to be noticed. E.g. images • **Lossless Compression:** No data is lost, but rather rearranged to ensure a perfect version of the data can be returned. Used where exact reproduction is vital. E.g. text documents

Year 11 GCSE Computer Science **Term 1.1 and 1.2**

Paper 2.6: Data Representation

Keyword	Definition	Keyword	Definition
		Units	
Units	Bit, nibble, byte, megabyte, terabyte, petabyte	**Converting between units**	If converting to a larger unit, divide by 1000. If converting to a smaller unit, multiply by 1000. Unless converting to or from bits, where you use 8.
		Numbers	
Denary	Base 10 number system. Uses digits 0,1,2,3,4,5,6,7,8,9.	**Binary**	Base 2 number system. Uses digits 0,1.
Hexadecimal	Base 16 number system. Uses characters 0-9 and A-F.		
		Characters	
Binary code represented as ASCII	A character set which uses 7 bits to store 8 characters.	**Character set**	A set of unique values stored in binary which represent letters, numbers and symbols that a computer can use.
		Images	
Images	Made up of pixels (the smallest element).	**Metadata**	Data stored about the file. E.g. date created, file size and location.
Effect of colour depth on image size	If there are more bits, more colours are represented and the image increases its size.	**Effect resolution on image size**	The number of pixels per unit. If the size of an image increases, the quality decreases.
		Sound	
Sound sampling	Converting analogue sound into a digital file containing binary numbers.	**Impact of sampling intervals on the size of a file and the quality of its playback**	Sampling intervals: how many samples per second. More samples means a larger file size, however a sound that is more like the original.
		Compression	
Compression	The re-encoding of data so that less bits are used to store it. Usually done to increase speed of transmission.	**Lossy and lossless compression**	Lossy: removes data completely to reduce file size. Lossless: reduces size of file without losing data (e.g. ZIP)

AQA Religious Studies A – Christian Practices

Key Words			
Believer's Baptism	Service where those old enough to decide for themselves are welcomed into the church	Liturgical Worship	Formal worship with set prayers, hymns and Bible readings
Christmas	Christian festival which celebrates the incarnation (birth) of Christ	Mission	The calling to spread the word of God and evangelise
Consecration	When a priest blesses bread and wine in order to use it for Eucharist	Non-liturgical worship	Worship with no set pattern, may have modern music and sermons
Easter	Christian festival which celebrates the resurrection of Christ	Persecution	Hostility and ill-treatment of a group of people
Eucharist	Service where bread and wine is received by Christians to remember Jesus' sacrifice	Pilgrimage	Going on a journey to visit a holy site
Evangelism	Spreading the word of God through action or speech	Prayer	A communication with God, can be private or during worship
Infant Baptism	Service where babies are welcomed into the church with holy water	Reconciliation	Restoring friendly relations after a conflict or falling out

<table>
<tr><th colspan="3">Key Ideas</th></tr>
<tr><td rowspan="2">Worship + Prayer
  </td><td><u>Liturgical Worship</u>
- This form of worship takes place in a church and is led by a priest
- Formal, set prayers are read out
- A more traditional, and formal form of worship</td><td rowspan="2"><u>Prayer</u>
- Prayer means communicating with God, either silently or out loud, sometimes through song
- It is one of the most important parts of the spiritual life of a Christian and enables them to have a personal relationship with God
- Intercessions are prayers made on behalf of others
- Thanksgiving is when people pray to say thank you to God
- Set prayers are written down and used in liturgical worship
- Informal prayer is off-the-cuff and often used in non-liturgical worship</td></tr>
<tr><td><u>Non-liturgical Worship</u>
- Also takes place in a church but less formal
- No set prayers, instead people take turns to preach and read from the Bible
- Can be modern and appealing to young people</td></tr>
<tr><td rowspan="2">Eucharist + Baptism
  </td><td><u>Eucharist</u>
- Eucharist and baptism are both sacraments meaning special occasions in a Christian's life
- In Eucharist a priest consecrates (blesses) bread and wine and the congregation then receives these
- Catholics believe the Holy Spirit transforms the bread and wine into Jesus' body and blood
- Anglicans believe the bread and wine are symbolic
- Christians take part in this ritual in order to remember the sacrifice Jesus Christ made for them by being crucified on the cross
"For whenever you eat this bread and drink this cup, you proclaim the Lord's death until he comes" – 1 Corinthians 11:26</td><td><u>Infant Baptism</u>
- This is a formal service welcoming a new child into the Christian church
- Holy water is sprinkled over the baby's head
- All Catholics baptise their children close to birth in order to ensure they go to heaven

<u>Believer's Baptism</u>
- A believer's baptism welcomes someone into the church who is old enough to decide themselves
- They are submerged in a pool of holy water
- They make promises to stay away from evil
- Baptists only practice this type of baptism</td></tr>
<tr><td>Pilgrimage + Festivals
  </td><td><u>Pilgrimage</u>
- A pilgrimage is a journey made by a Christian to a holy site
- Catholics go on pilgrimage to Lourdes where a vision of Mary was once seen, they believe the water there has healing effects</td><td><u>Christmas</u>
- Christmas celebrates the incarnation (birth) of Jesus Christ
- Christians give gifts to commemorate the gift of God sending his own son to the world

<u>Easter</u>
- Easter celebrates the resurrection of Jesus Christ
- Christians celebrate by saying "he is risen" and by eating chocolate eggs that represent new life</td></tr>
<tr><td>Evangelism + Church in the Community
  </td><td>Christians have a duty to evangelise (tell others of the word of God). An example is the Alpha Course which is an educational course that tells people more about the life of Jesus.</td><td>Christians also have a duty to help others in the local community. Two examples of this are Street Pastors who help drunk people at night and Food Banks that provide food to people in poverty.</td></tr>
<tr><td>Reconciliation
  </td><td colspan="2">- Christians across the world play an important role in reconciliation (seeking to restore friendly relations after a conflict or falling out)
- An example is Coventry Cathedral which was bombed during World War II but now seeks to create peace and reconciliation elsewhere in the world. The World Council of Churches also works to help after conflict.
- In some places Christians face persecution where they are treated badly for their faith. Churches around the world work together to try and overcome this.</td></tr>
</table>

Year 11 – BTEC Music Component 2
Music Knowledge Organiser

Elements of Music	Definitions
Pitch	The pitch is how high or low the sounds/notes are. For example: A scale of notes rises in pitch by step.
Tempo	The tempo is the speed of the music. For example: how fast or slow the music is being played.
Dynamics	The volume of the music. For example: how loudly or quietly the music is being played.
Duration	The length of notes. For example: a minim lasts for two beats.
Texture	The layers within a piece of music. For example: how thick or thin the music is and how the parts within the music relate to each other.
Timbre	The quality and type of sound produced by an instrument. For example: string, brass, percussion, woodwind, voice.
Silence	The absence of music sounds. For example: in music, rests are written to show where the player should be silent.

Personal and professional skills for the music industry	
Time management	The ability to manage your time well in all processes involved within the music industry.
Self-discipline	The ability to stick to your plan and commit to your rehearsal/practise session.
Working with others	The ability to communicate well with your peers and to work together well to create the final music product.
Correct and safe use of equipment	The ability to maintain and correctly use musical equipment, including musical instruments, and electrical equipment.
Maintaining a development plan	Keeping a log of your journey, always referring back to the skills you are developing with regular check-in points.

Composition Skills	
Creating chord sequences	Using major and minor triads from within a key to create patterns of chords.
Using musical starting points	Using a musical/visual stimuli to inspire continuation of an initial idea.
Exploring musical structures	Taking inspiration from other pieces of music or songs to create a structure that suits your idea. E.g. ABABA, popular song, variations on a theme.
Using rhythmic and melodic rhythms	Exploring and creating patterns of notes in certain orders to create playable rhythms for both accompaniment and for melodies (tunes)

Key Performance & Rehearsal Skills	
Rhythm and timing	Being able to play rhythms accurately and stay in time with other musicians, keeping the music together.
Accuracy of pitch	Being able to sing or play the correct notes, ideally from sheet music.
Intonation/tuning	Being able to stay in tune and not go sharp or flat when playing or singing.
Phrasing & breath control	Controlling your breathing so that you can sing or play through a phrase showing musical shape.
Learning repertoire & following an accompaniment	Being able to tackle a new song/piece of music and the ability to follow a live or pre-recorded accompaniment part.
Instrumental or vocal technique & Musical skills exercises	Breathing exercises, scales, and technical exercises specific to your instrument/voice in order to develop a good technique.
Creating a practise routine	Organising your practise sessions and keeping a log to ensure development in all areas of performance.
Stage presence	Having confidence to command the audience and allowing them to engage in your performance.
Expression & musicality	Having the ability to connect with a song/piece of music and put your own stamp on it, showing emotion.
Health and safety in the use of equipment	Learning and maintaining high standards of looking after musical equipment of all varieties.

Music Production Skills	
Recording and editing audio (voice and instruments)	Exploring how to record using music technology musical instruments and voices. Also how to edit out errors and record multiple layers.
Exploring digital recording software and tools	Exploring how to use music technology equipment and computer software to create a music recording.
Using effects	Exploring the use of reverb, echo, delay, distortion and other vocal and instrumental effects.

How you will communicate your music skills development
Methods of capturing musical development:
Digital or written portfolio – including production notes, rehearsal diaries, annotated photographs/screenshots, milestone performances and reviews, recorded audition, compositional sketches and ideas.
Keeping a clear and organised approach:
Key points in the process need to be referenced clearly and in chronological order. Your written commentaries must match the quality of your practical work to show your full understanding.

YR 11 Engineering *KNOWLEDGE ORGANISER – R105, R106, R107,R108*

In Design & Technology you are assessed on both the Practical and Theory work.

R105: Design briefs, design specifications and user requirements
Students explore the requirements of design briefs and specifications for the development of new products and how consumer requirements and market opportunities inform these briefs. They develop their understanding of the design cycle, the requirements for a design brief and design specification, and the importance of research data in developing a design solution.

R106: Product analysis and research
Students find out how to perform effective product analysis through both research and practical experience of product assembly and disassembly procedures. This helps them develop skills in critical analysis and an understanding and appreciation of manufacturing processes, design features, materials used and the principles behind good design.

R107: Developing and presenting engineering designs
Students develop their knowledge and skills in communicating 2D and 3D design ideas, including effective annotation and labelling. They use detailed hand rendering as well as computer-based presentation techniques and computer-aided design (CAD) software

R108: 3D design realisation
Students produce a model prototype and test design ideas in a practical context. They evaluate the prototype against the product specification and consider potential improvements to features, function, materials, aesthetics and ergonomics in the final product

KEYWORDS AND KEY TERMS FOR THIS PROJECT

Design cycle

IDENTIFY - Brief , research, process planning
DESIGN – Specification, plan, manufacturing plan
OPTIMISE – Prototyping, error proofing
VALIDATE – Test, evaluate

Coursework will involve;
The researching, disassembly and analysis of an engineered product

R106 Product Analysis and research

Learning Outcome 1 – Know how commercial production methods, quality and legislation impact on the design of products and components
Learning Outcome 2 – Be able to research existing products.
Learning Outcome 3 - Be able to analyse an existing product through disassembly

Knowledge Organiser: Year 11 BTEC Dance

Unit title: Exploring the Performing Arts
Learning Aims:
A: Examine professional practitioners' performance work
B: Explore the interrelationships between constituent features of existing performance material

The four components to create and evaluate a dance

Actions

WHAT the body is doing

A movement

Six categories:
Jump
Turn
Balance/stillness
Gesture
Weight transference
Travel

Dynamics

HOW the body is moving

The force and speed of a movement

Examples of different dynamics:
Fast
Slow
Sharp
Mechanical
Explosive

Space

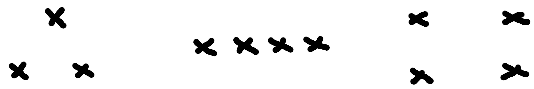
WHERE the body is moving

The area around a dancer. This could be personal or general space

Examples of space:

Levels: The height of the action. E.g. High, medium and low

Formations: Where the dancers stand in a shape.



Directions: Where the dancers goes. E.g. forwards, backwards, right, left, up, down and diagonally

Pathways: The patterns created on the floor.

Relationships

WITH WHOM you are dancing with

The interaction between a group of dancers

Examples of relationships:

UNISON – at the same time
CANON – one after each other
MIRROR IMAGE – dancers use the other side of the body to create a symmetrical effect
COMPLEMENTARY – movements that are similar but not exactly the same as your partner
CONTRAST – movements that have different dynamics or different shapes
CONTACT – where dancers lift, lean on or support one another
QUESTION AND ANSWER – movement response to another dancers' movement
COUNTERPOINT – dancers perform individual movement sequences at the same time
REPETITION – perform the original motif again
ACTION AND REACTION – a direct physical response/reaction to other dancers
RETROGRADE – perform the original motif backwards
FRAGMENTATION – an original motif is broken into separate parts and put into a random order

Performance skills

TECHNICAL SKILLS (to do with the body)	
POSTURE	The way the body is held when sitting, standing or lying.
FLEXIBILITY	The range of movement around the joints
CONTROL	Performing the movements with strength to hold positions and not fall out of them
CO-ORDINATION	Moving two different body parts at the same time in opposite directions
MOVEMENT MEMORY	Remembering the order of the movements
SPATIAL AWARENESS	Knowing where you are in the space and not colliding with anyone
STAMINA	Being able to keep high energy throughout without tiring
STRENGTH	The force your muscles exert to hold a position for a long time
BALANCE	Put weight on a specific part of the body without falling or wobbling

EXPRESSIVE SKILLS (how you perform it)	
FOCUS	Use of the eyes looking in a specific direction
PROJECTION	Extending the movement with energy
MUSICALITY	Being in time with the beat in the music and the other dancers
FLUIDITY	Smooth transitions from one movement to another to allow them to flow effectively together

Key words

Stimulus – The starting point for the dance idea. It is something that inspires you to create a piece of dance.

Visual stimuli - This can take the form of pictures, sculptures, objects, patterns, shapes.

Auditory - includes music which is the most usual accompaniment for dances. Often the choreographer begins with a desire to use a certain piece of music.

Kinesthetic - It is possible to make a dance about movement itself.

Tactile - The smooth feel of a piece of velvet may suggest smoothness as a movement quality, which could then be used as the basis for a dance. The feel and flow of a full skirt may provoke turning, swirling, free flow movements which could then become the main impetus for the choreographer.

Ideational - Here the movement is stimulated and formed with the aim of conveying an idea or to tell a story.

Contemporary dance - Tends to combine the strong but controlled legwork of ballet with modern that stresses on the torso. It also employs contract-release, floor work, fall and recovery, and improvisation characteristics of modern dance.

Types of Number:

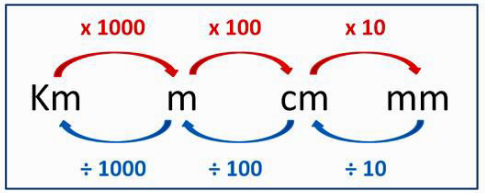
Odd: ends in 1, 3, 5, 7, 9
Even: ends in 0, 2, 4, 6, 8 (is divisible by 2)
Factor: divides exactly into a number
eg 5 is a factor of 10
Multiple: in the times table of a number
eg 20 is a multiple of 10
Prime Numbers: can only be divided by one and itself: 2, 3, 5, 7, 11, 13, 17... are prime
Triangular number: counts dots arranged in an equilateral triangle

Fibonacci Sequence: Each number equals the sum of the two numbers before it.0, 1,1,2,3,5,8…

Unit Conversions:

Length: use mm, cm, m, km
Area: use mm^2, cm^2, m^2, km^2, (hectares)
Volume: use mm^3, cm^3, m^3, ml, litres
Mass: use g, kg

Conversions:
1 litre = 1000 ml
1kg = 1000g



Time:
60 seconds = 1 minute
60minutes = 1 hour
24 hours = 1 day
365 days = 1 year

Fraction, Decimal, Percentage:

Percentage	Decimal	Fractions	Method
50%	0.5	$\frac{1}{2}$	Divide by 2
25%	0.25	$\frac{1}{4}$	Divide by 4
10%	0.10	$\frac{1}{10}$	Divide by 10
1%	0.01	$\frac{1}{100}$	Divide by 100
$33.\dot{3}\%$	$0.3\dot{3}$	$\frac{1}{3}$	Divide by 3
20%	0.20	$\frac{1}{5}$	Divide by 5
40%	0.40	$\frac{2}{5}$	Divide by 5, multiply by 2

Compound Interest:

The amount after n years is:

Starting amount x $(1\pm\frac{r}{100})^n$

Key Terms:

Sum: add the numbers together
Product: multiply the numbers
Difference: biggest take away the smallest
Estimate: round the numbers first and give an approximate answer

BIDMAS:

Brackets
Indices
Division
Multiplication
Addition
Subtraction

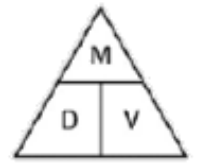
Square / Cubes:

Square Numbers: can be written as a number multiplied by itself. Eg 9 is a square number because it can be written as 3x3.
The first 5 square numbers are 1, 4, 9, 16, 25, ...
Square Root: is a value that, when multiplied by itself, gives the number. Eg: 4 × 4 = 16, so the **square root** of 16 is 4
Cube Numbers: a number that is multiplied by itself, and by itself again. Eg 2 x 2 x 2 = 8
The first 5 cube numbers are 1, 8, 27, 64, 125 …..

Compound Measures:

Speed = $\frac{distance}{time}$

Density = $\frac{mass}{volume}$

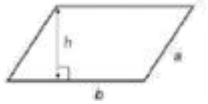


GREENSHAW LEARNING TRUST

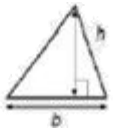
Area:

Rectangle = l x w

Parallelogram = b x h



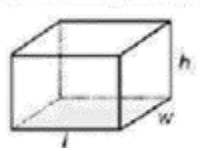
Triangle = $\frac{1}{2}$ b x h



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

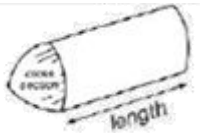
Volume:

Cuboid = l x w x h

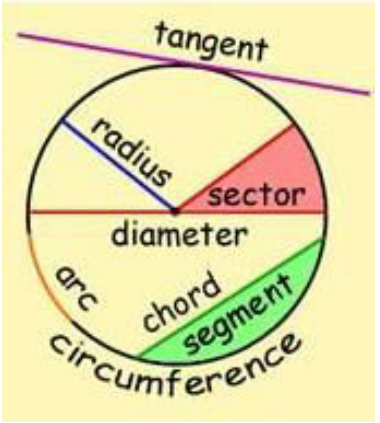


Prism = area of cross section x length

Cylinder = $\pi r^2 h$



Circles:



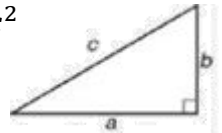
Circumference = $\pi \; x \; diameter$
$= \pi d$

Area = $\pi \; x \; radius^2$
$= \pi r^2$

Pythagoras:

For a right-angled triangle

$$a^2 + b^2 = c^2$$

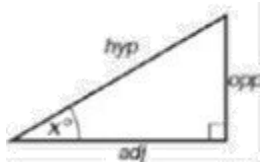


Trigonometry:

Sinx° = $\frac{OPP}{HYP}$

Cosx° = $\frac{ADJ}{HYP}$

Tanx° = $\frac{OPP}{ADJ}$

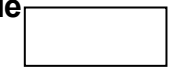


2D Shapes:

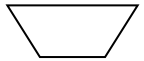
Square

Parallelogram

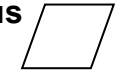
Rectangle



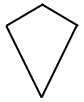
Trapezium



Rhombus



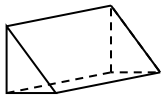
Kite



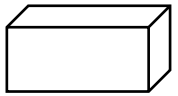
3D Shapes:

Cube

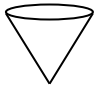
Triangular prism



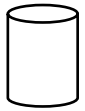
Cuboid



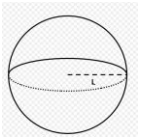
Cone



Cylinder



Sphere



Key Terms:

Perimeter: the distance around the outside of a shape.
Area: The shape inside a 2D shape
Volume: The space inside a 3D shape
Faces: Sides of a 3D shape
Edges: Lines used to connect sides of a 3D shape.
Vertices: Corners of a 3D shapes

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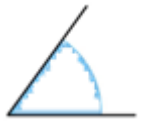
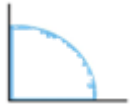
Types of Angles:

Acute Angles: Less than 90º



Right Angles: 90º



Obtuse angles: between 90º and 180º

Reflex Angles: between 180º and 360º

Angles facts:

Vertically Opposite angles are **equal**

Angles on a straight line add up to **180°**

Angles at a point add up to **360°**

Angles in a triangle add up to **180°**

Angles in a quadrilateral add up to **360°**

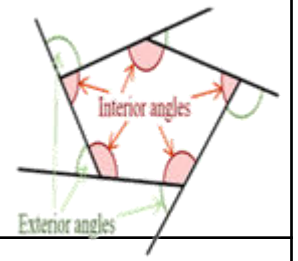
Alternate angles in parallel lines (Z angles) are **equal**

Corresponding angles in parallel lines (F angles) are **equal**

Co-Interior angles in parallel lines (C angles) add up to **180°**

Angles in Polygons:

Polygon	Sides	Total of Interior Angles	Each interior angle
Triangle	3	180^0	60^0
Quadrilateral	4	360^0	90^0
Pentagon	5	540^0	108^0
Hexagon	6	720^0	120^0
Any Polygon	n	$(n-2) \times 180^0$	$\frac{(n-2)\times 180^0}{n}$



Angles in Polygons Formula:

Sum of **Interior** Angles = $(n-2) \times 180^0$

n represents the number of sides

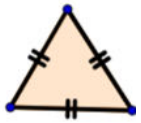
Exterior angles add up to 360º

One exterior angle in a regular polygon = $\frac{360^0}{n}$

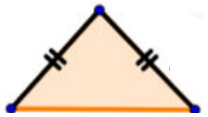
Pairs of **interior and exterior** angles add up to 180º

Types of Triangles:

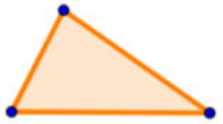
Equilateral:
3 equal sides and angles



Isosceles:
2 equal sides and 2 equal angles

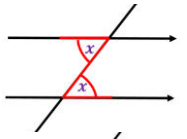


Scalene:
No equal sides or angles

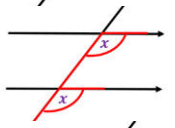


Angles in Parallel Lines:

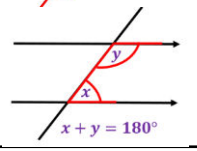
Alternate Angles



Corresponding Angles



Co-Interior



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Averages:

Mode/Modal: the most common value or values

Median: the middle value when they are in order

Mean: add up all the values and divide by the number of terms

3, 5, 1, 2, 6, 4, 2, 5, 6, 1

Add up = 35 and divide by the number of terms = 10

35 ÷ 10 = 3.5

Range: highest value take away the lowest value

Scatter Graphs:

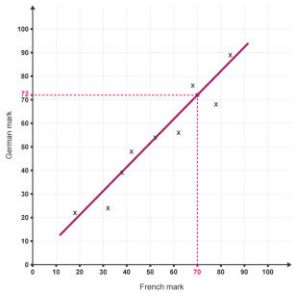
Plot Points: Plotting coordinates

Correlation: the relationship between 2 variables – it can be **positive**, **negative** or **no correlation**.

Relationship: Describing in words the connection between two variables

Line of Best Fit: a line that roughly through the middle of all the scatter points on a graph. The line of best fit does not have to go through the origin.

Estimate: Using the line of best fit to predict values when given one variable.



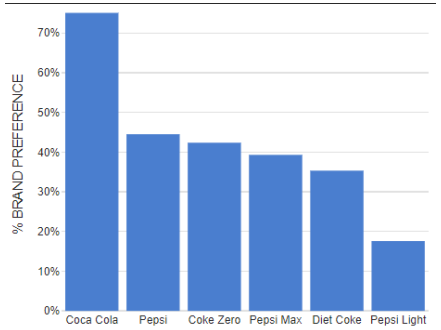
Bar Charts:

Frequency equally spaced on the y axis

Equal **gaps** between the bars

Categories equally spaced across the x axis.

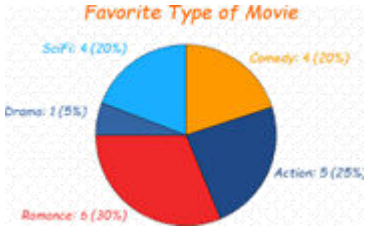
Both axes **labelled.**



Pie Charts:

The **angle** to draw for each sector is:

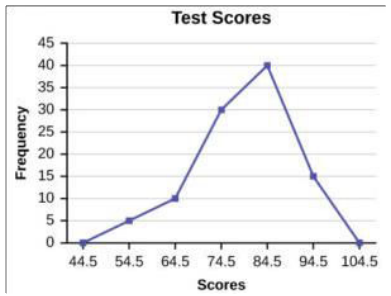
$\frac{frequency}{total} \times 360^{o}$



Frequency Polygon:

Plot on the **midpoint**

Connect points with a **straight line**



Two Way Tables:

Two-way tables are a way of sorting data so that the frequency of each category can be seen quickly and easily.

	Walk	Bus	Total
Boys	18		
Girls		22	57
Total			100

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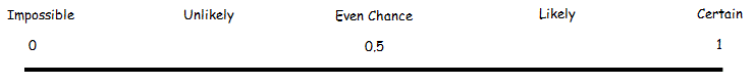
Probability Scale:

All probabilities add up to 1



Impossible: Never going to happen

Unlikely: Little chance of happening

Even Chance: a 50% chance of happening

Likely: High chance of happening

Certain: Definitely gong to happen

Probability Rules:

Multiply for independent events:
P(6 on dice and H on coin)

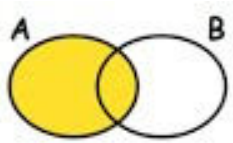
$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

Add for mutullay exclusive events
P(5 or 6 on dice)

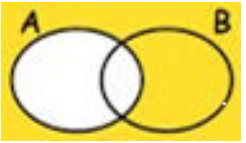
$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

Venn Diagrams:

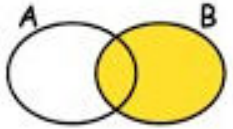
A



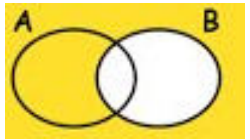
A'



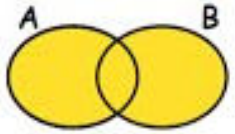
B



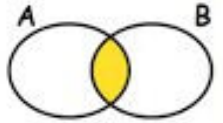
B'



A ∪ B



A ∩ B



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Key words:

Solve: work out the value of the letter

Expand: multiply out brackets 2(x+3)=2x+6

Factorise: put brackets back in $x^2-3x = x(x-3)$

Changing the subject: rearranging a formula, using balancing, to make another variable the subject

Substitution: Exchanging letters for numbers.

Equation: is true for some particular value of x

Identity: is true for every value of x

Indices:

Multiplying Indices: Add the powers

$$a^x \times a^y = a^{x+y}$$

Dividing Indices: Subtract the powers

$$\frac{a^x}{a^y} = a^{x-y}$$

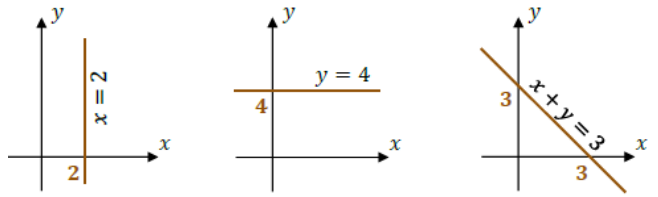
Anything to the power 0: always equals 1

Indices within Brackets: Multiply the powers

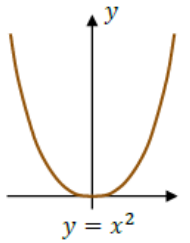
$$(a^x)^y = a^{xy}$$

Types of graph:

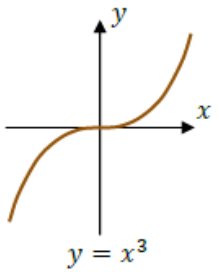
Straight Line Graphs



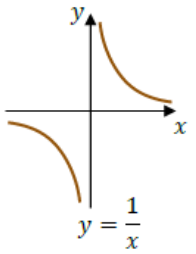
Quadratic Graph



Cubic Graph



Reciprocal Grapl



Simultaneous Equations:

Linear eg 2x + 3y = 1
3x – 5y = 11

Make y terms (or x) **equal**

Same **S**igns **S**ubtract

Different Signs **A**dd

Equation of straight line graphs:

Equation of a Straight line:

$$y = mx + c$$

M is the **gradient**, **c** is the **y intercept**

Gradient: $\frac{Change\ in\ y}{Change\ in\ x}$

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Types of Number:

Odd: ends in 1, 3, 5, 7, 9
Even: ends in 0, 2, 4, 6, 8 (is divisible by 2)
Factor: divides exactly into a number
eg 5 is a factor of 10
Multiple: in the times table of a number
eg 20 is a multiple of 10
Prime Numbers: can only be divided by one and itself: 2, 3, 5, 7, 11, 13, 17... are prime
Triangular number: counts dots arranged in an equilateral triangle

Fibonacci Sequence: Each number equals the sum of the two numbers before it.0, 1,1,2,3,5,8…

Compound Interest:

The amount after n years is:

Starting amount x $(1 \pm \frac{r}{100})^n$

Percentage change:

$$\frac{change}{orginial} \times 100$$

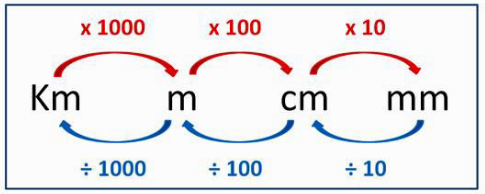
BIDMAS:

Brackets
Indices
Division
Multiplication
Addition
Subtraction

Unit Conversions:

Length: use mm, cm, m, km
Area: use mm^2, cm^2, m^2, km^2, (hectares)
Volume: use mm^3, cm^3, m^3, ml, litres
Mass: use g, kg

Conversions:
1 litre = 1000 ml
1kg = 1000g



Time:
60 seconds = 1 minute
60minutes = 1 hour
24 hours = 1 day
365 days = 1 year

Key Terms:

Sum: add the numbers together
Product: multiply the numbers
Difference: biggest take away the smallest
Estimate: round the numbers first and give an approximate answer.

Square / Cubes:

Square Numbers: can be written as a number multiplied by itself. Eg 9 is a square number because it can be written as 3x3. The first 5 square numbers are 1, 4, 9, 16, 25, ...
Square Root: is a value that, when multiplied by itself, gives the number. Eg: 4 × 4 = 16, so the **square root** of 16 is 4
Cube Numbers: a number that is multiplied by itself, and by itself again. Eg 2 x 2 x 2 = 8
The first 5 cube numbers are 1, 8, 27, 64, 125 …..

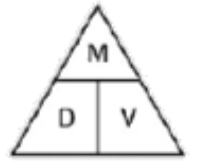
Fraction, Decimal, Percentage:

Percentage	Decimal	Fractions	Method
50%	0.5	$\frac{1}{2}$	Divide by 2
25%	0.25	$\frac{1}{4}$	Divide by 4
10%	0.10	$\frac{1}{10}$	Divide by 10
1%	0.01	$\frac{1}{100}$	Divide by 100
$33.\dot{3}\%$	$0.3\dot{3}$	$\frac{1}{3}$	Divide by 3
20%	0.20	$\frac{1}{5}$	Divide by 5
40%	0.40	$\frac{2}{5}$	Divide by 5, multiply by 2

Compound Measures:

Speed = $\frac{distance}{time}$

Density = $\frac{mass}{volume}$



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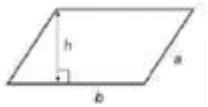
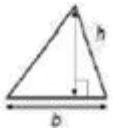
Area:

Rectangle = l x w



Parallelogram = b x h



Triangle = $\frac{1}{2}$ b x h

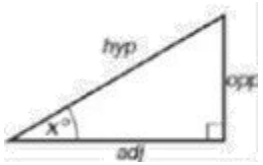
Trapezium = $\frac{1}{2}$ (a + b) h

Trigonometry:

Sinx° = $\frac{OPP}{HYP}$

Cosx° = $\frac{ADJ}{HYP}$

Tanx° = $\frac{OPP}{ADJ}$

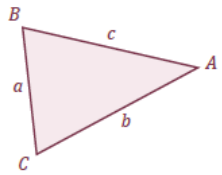


Sine Rule - Non Right Angled Triangle:

If you have 2 sides and 2 angles

Missing side: $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$

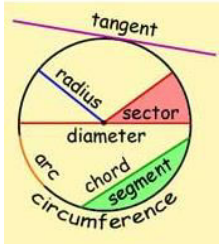
Missing angle: $\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$



A is opposite *a*
B is opposite *b*
C is opposite *c*

Circles:

Circumference = $\pi\ x\ diameter$
= πd

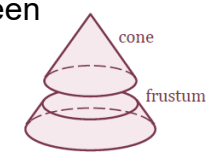


Area = $\pi\ x\ radius^2$
= πr^2

Volume of Frustum:

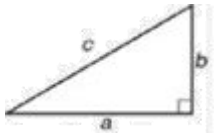
The portion of a cone or pyramid which remains after its upper part has been cut off by a plane parallel to its base.

Volume of frustum is **difference** between the volumes of two cones.



Pythagoras:

For a right-angled triangle
$a^2 + b^2 = c^2$

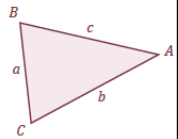


Cosine Rule – Non Right Angled Triangle:

If you have 3 sides, 1 angle

Missing side: $a^2 = b^2 + c^2 - 2bccosA$

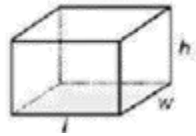
Missing angle: $cosA = \frac{b^2+c^2-a^2}{2bc}$



A is opposite *a*
B is opposite *b*
C is opposite *c*

Volume:

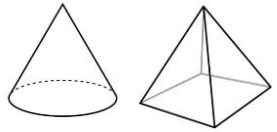
Cuboid = l x w x h



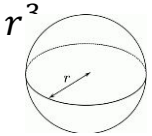
Prism = area of cross section x length

Cylinder = $\pi r^2 h$

Pyramid/ Cone = $\frac{1}{3}$ x base area x h



Sphere = $\frac{4}{3}\ \pi\ r^3$

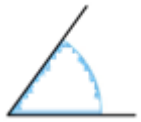


Area of a Non Right Angled Triangle:

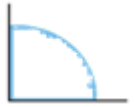
½ absinC

Types of Angles:

Acute Angles: Less than 90º



Right Angles: 90º



Obtuse angles: between 90º and 180º

Reflex Angles: between 180º and 360º

Angles facts:

Vertically Opposite angles are **equal**

Angles on a straight line add up to **180°**

Angles at a point add up to **360°**

Angles in a triangle add up to **180°**

Angles in a quadrilateral add up to **360°**

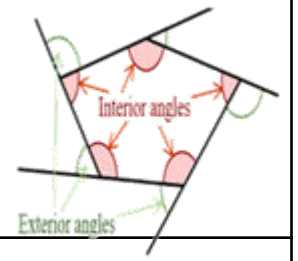
Alternate angles in parallel lines (Z angles) are **equal**

Corresponding angles in parallel lines (F angles) are **equal**

Co-Interior angles in parallel lines (C angles) add up to **180°**

Angles in Polygons:

Polygon	Sides	Total of Interior Angles	Each interior angle
Triangle	3	180^0	60^0
Quadrilateral	4	360^0	90^0
Pentagon	5	540^0	108^0
Hexagon	6	720^0	120^0
Any Polygon	n	$(n-2) \times 180^0$	$\frac{(n-2)\times 180^0}{n}$



Angles in Polygons Formula:

Sum of **Interior** Angles = $(n-2) \times 180^0$

n represents the number of sides

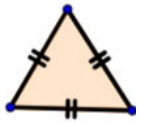
Exterior angles add up to 360º

One exterior angle in a regular polygon = $\frac{360^0}{n}$

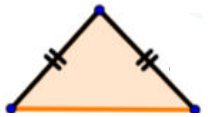
Pairs of **interior and exterior** angles add up to 180º

Types of Triangles:

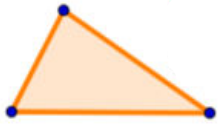
Equilateral:
3 equal sides and angles



Isosceles:
2 equal sides and 2 equal angles

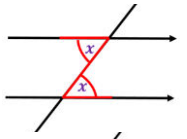


Scalene:
No equal sides or angles

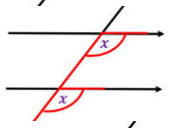


Angles in Parallel Lines:

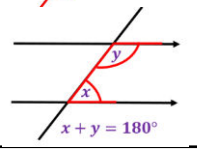
Alternate Angles



Corresponding Angles



Co-Interior



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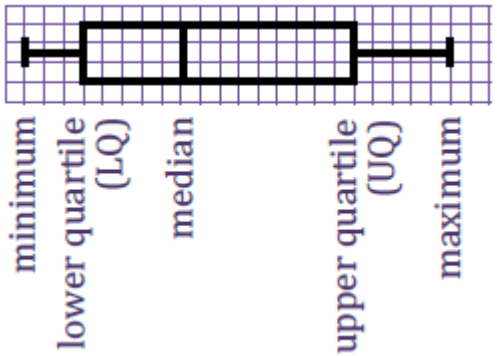
Cumulative Frequency:

Add up frequencies as you go and plot against the **top** of each group

Box Plots:
Interquartile range (IQR) = UQ-LQ



Scatter Graphs:

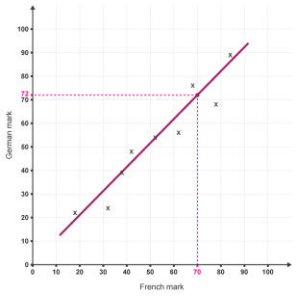
Plot Points: Plotting coordinates

Correlation: the relationship between 2 variables – it can be **positive**, **negative** or **no correlation**.

Relationship: Describing in words the connection between two variables

Line of Best Fit: a line that roughly through the middle of all the scatter points on a graph. The line of best fit does not have to go through the origin.

Estimate: Using the line of best fit to predict values when given one variable.



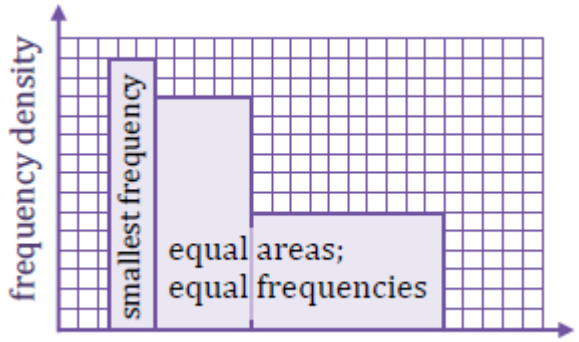
Histograms:

$$Frequency\ Density = \frac{frequency}{class\ width}$$

$$Frequency = frequency\ density \times class\ width$$

Remember that the frequency is given by the **area of each bar** not the height.

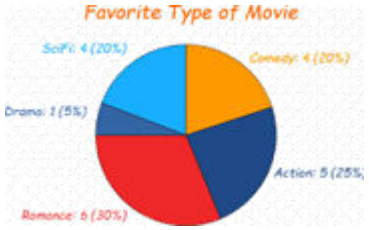
Bars with the same frequency have the same area.



Pie Charts:

The **angle** to draw for each sector is:

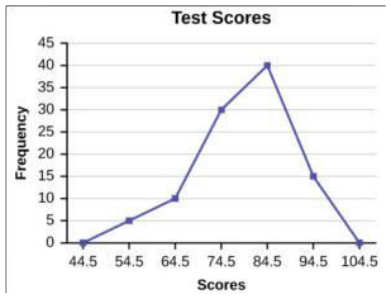
$$\frac{frequency}{total} \times 360^{o}$$



Frequency Polygon:

Plot on the **midpoint**

Connect points with a **straight line**



Two Way Tables:

Two-way tables are a way of sorting data so that the frequency of each category can be seen quickly and easily.

	Walk	Bus	Total
Boys	18		
Girls		22	57
Total			100

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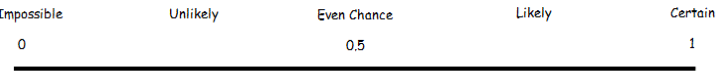
Probability Scale:

All probabilities add up to 1



Impossible: Never going to happen

Unlikely: Little chance of happening

Even Chance: a 50% chance of happening

Likely: High chance of happening

Certain: Definitely gong to happen

Probability Rules:

Multiply for independent events:
P(6 on dice and H on coin)

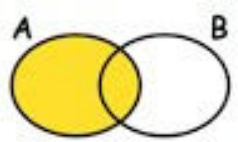
$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

Add for mutually exclusive events
P(5 or 6 on dice)

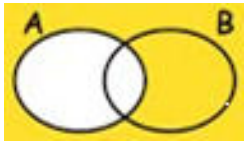
$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

Venn Diagrams:

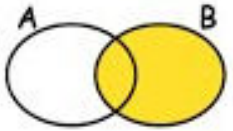
A



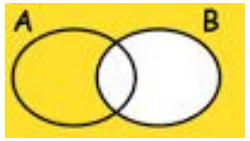
A'



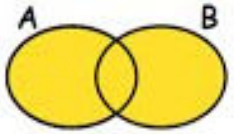
B



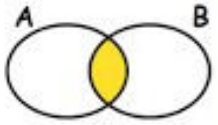
B'



A ∪ B



A ∩ B



Stratified Sampling:

The frequency for a group in a stratified sample is

$$\frac{frequency\ of\ group}{total\ frequency} \times sample\ size$$

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Key words:

Solve: work out the value of the letter
Expand: multiply out brackets 2(x+3)=2x+6
Factorise: put brackets back in $x^2-3x = x(x-3)$
Changing the subject: rearranging a formula, using balancing, to make another variable the subject
Substitution: Exchanging letters for numbers.
Equation: is true for some particular value of x
Identity: is true for every value of x

Equation of straight line graphs:

$$y = mx + c$$

m is the **gradient**, **c** is the **y intercept**

$$Gradient = \frac{change\ in\ y}{change\ in\ x}$$

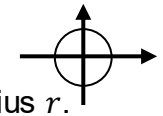
Two lines are <u>parallel</u> if they have the <u>same gradient</u>
Two lines are <u>perpendicular</u> if the <u>product of their gradients is -1.</u>

To find the midpoint between (x_1, y_1) and (x_2, y_2) use the formula:

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

Equation of a circle:

$x^2+y^2=r^2$ is a circle with centre (0 ,0) and radius r.



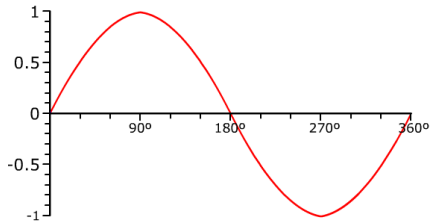
Eg. $x^2+y^2=25$ has centre (0 ,0) and radius 5

Exact Trig Values:

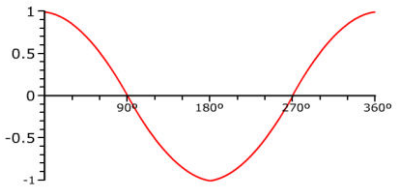
$\theta°$	$sin\theta°$	$cos\theta°$	$tan\theta°$
0	0	1	1
30	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
45	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
60	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	1	0	Undefined

Trigonometric Graphs: (LEARN the shapes and key values)

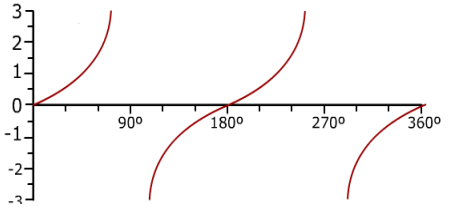
y = sin x



y = cos x

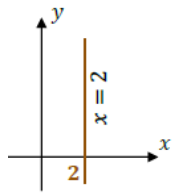


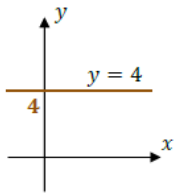
y = tan x

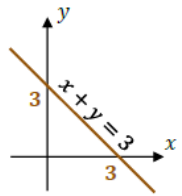


Types of graph:

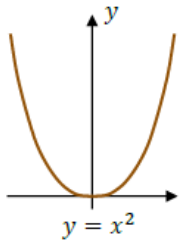
Straight Line Graphs



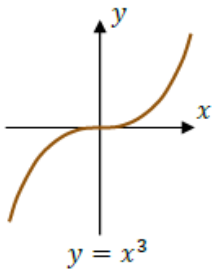




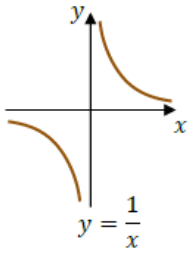
Quadratic Graph



Cubic Graph



Reciprocal Graph



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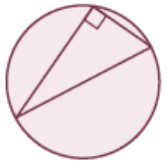
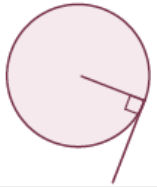
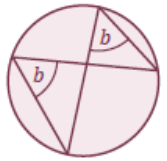
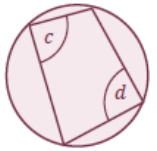
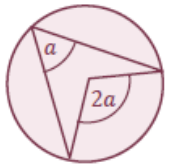
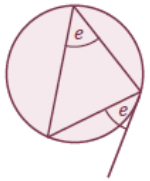
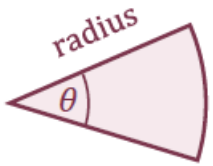
Circle Theorems:

Circle Theorems		Circle Theorems	
Angle in a semicircle is 90°		Angle between radius and tangent is 90°	
Angles in the same segment are equal		Opposite angles in a cyclic quadrilateral add up to 180°	
Angle in the centre is double the angle at the circumference		Alternate Segment Theorem	

Area of a Sector:

$$\frac{\theta}{360°} \times \pi \times r^2$$



Arc Length:

$$\frac{\theta}{360°} \times \pi \times \text{d}$$

Similar Shapes:

Ratios in similar shapes and solids:

Length/perimeter:

$1:n$

$a:b$

Area:

$1:n^2$

$a^2:b^2$

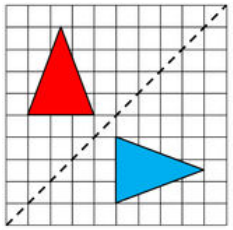
Volume:

$1:n^3$

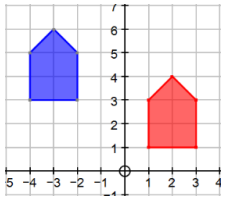
$a^3:b^3$

Transformations:

Reflection:
Line of reflection

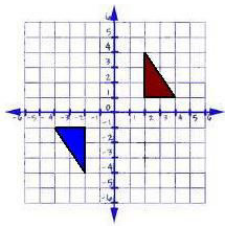


Translation:
Vector



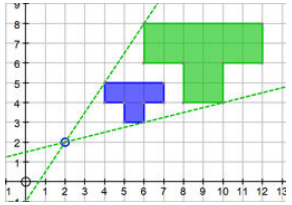
$\begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Rotation:
Centre of rotation – a coordinate
Angle of rotation
Clockwise or anti clockwise



180º
(0,0)

Enlargement:
Centre of enlargement – a coordinate
Scale Factor (if the SF is less than 1 the shape will get smaller)



SF 2
(2,2)

GREENSHAW LEARNING TRUST

Surds:

Surds are numbers left in square root form that are used when detailed accuracy is required in a calculation.

General Rules:

$$\sqrt{a} \times \sqrt{a} = a$$
$$\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$$
$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

Indices:

Multiplying Indices: Add the powers

$$y^a \times y^b = y^{a+b}$$

Dividing Indices: Subtract the powers

$$y^a \div y^b = y^{a-b}$$

Anything to the power 0: always equals 1

$$y^0 = 1$$

Indices within brackets $(y^a)^b = y^{a \times b}$

Negative indices $y^{-n} = \frac{1}{y^n}$

Fractional Indices $y^{\frac{a}{b}} = \sqrt[b]{y^a}$

Difference of two squares:

$$a^2 - b^2 = (a + b)(a - b)$$

Eg. $x^2 - 25 = (x + 5)(x - 5)$

Simultaneous Equations:

Linear Eg 2x + 3y = 1
3x – 5y = 11

Make y terms (or x) **equal**
Same **S**igns **S**ubtract
Different Signs A**dd**

Quadratic and Linear
Make y (or x) the subject in the linear equation
Substitute into the quadratic equation and solve
Remember to work out the value of both letters

Solving Quadratics:

First rearrange into $ax^2 + bx + c = 0$ then either:

Factorise put into 2 brackets and one of the brackets must = 0

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

Direct and Inverse proportion:

If x is directly proportional to y^n then:

$$x \propto y^n \text{ so } x = k \times y^n$$

If x is inversely proportional to y^n then:

$$x \propto \frac{1}{y^n} \text{ so } x = \frac{k}{y^n}$$

Functions:

Domain is all values of *x* to which the function is applied.

Range is all values of f(*x*)

fg(*x*) means f(g(*x*)) i.e. apply g first followed by f.

f $^{-1}$(*x*) is the inverse function

Transforming y = f(x):

y = f(x + a) is a translation $\begin{pmatrix} -a \\ 0 \end{pmatrix}$

y = f(x) + a is a translation $\begin{pmatrix} 0 \\ a \end{pmatrix}$

y = f(-x) is a reflection in the y-axis

y = -f(x) is a reflection in the x-axis

Velocity-Time graph:

Gradient = acceleration (you may need to draw a tangent to the curve at a point to find the gradient);

Area under curve = distance travelled.