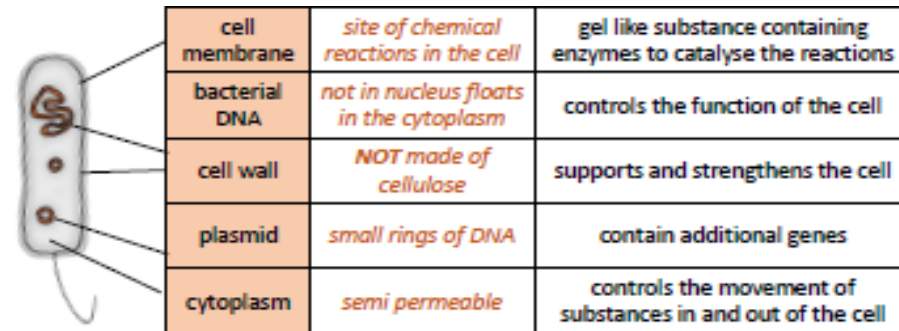
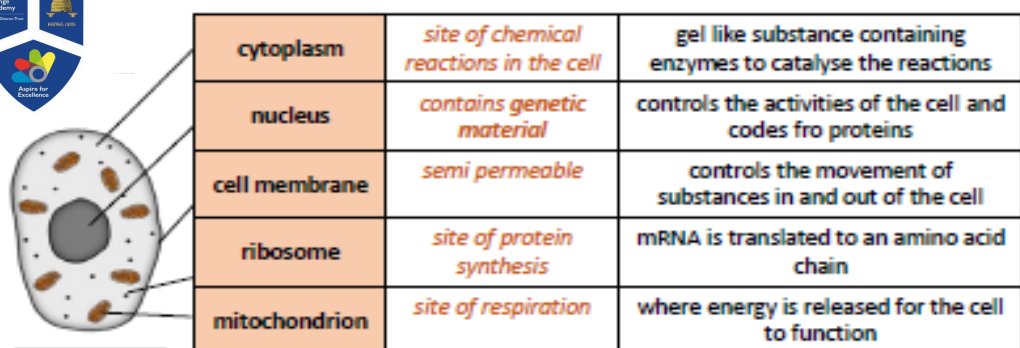




Bacterial cells are much smaller than plant and animal cells

animal cell

plant cell

Eukaryotes complex organisms

AQA Cell Structure

Prokaryotes simpler 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

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

Cell differentiation

Microscopy

animal cell differentiation

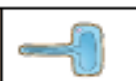
plant cell differentiation

early stages of development
only for repair and replacement

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

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

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



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	$\times 10^{-2}$
milli (mm)	1 mm = 0.001 m	$\times 10^{-3}$
micro (μm)	1 μm = 0.000 001 m	$\times 10^{-6}$
nano (nm)	1 nm = 0.000 000 001 m	$\times 10^{-9}$



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.

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.

ADAPTATIONS FOR DIFFUSION

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

AQA Cell Biology

Cell division

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.

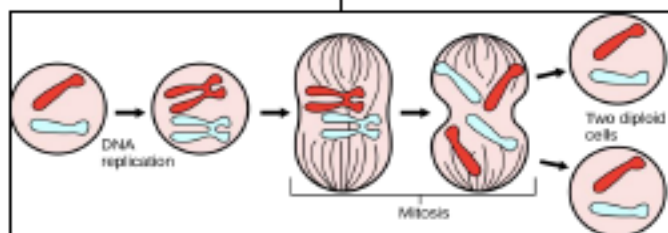
Transport in cells

Diffusion <u>No</u> 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 <u>No</u> 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 <u>ENERGY</u> 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.

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

MITOSIS AND THE CELL CYCLE

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.

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 plant.	Used to produce clones quickly and economically, e.g. rare species, crop plants with pest /disease resistance

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



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

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

B2

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



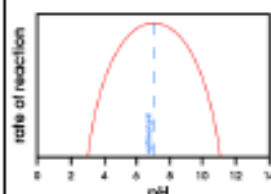
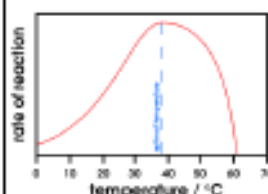
Enzymes catalyse specific reactions in living organisms due to the shape of their active site

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

The human digestive system

AQA GCSE ORGANISATION Part 1

Principles of organisation

Non-communicable diseases

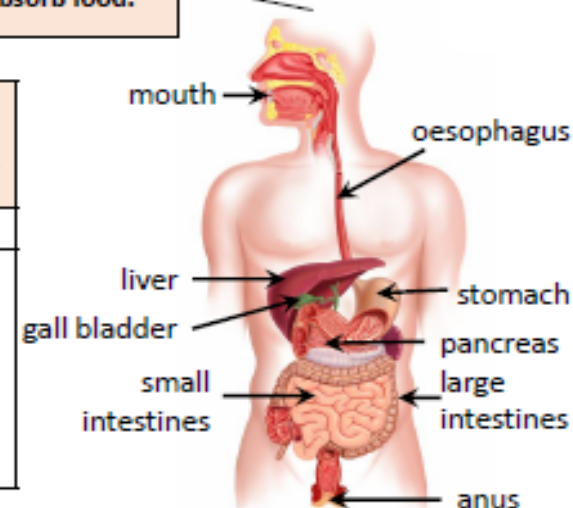
More energy consumed in food and drink than used

obesity

Linked to increased rates of cardiovascular disease and development of diabetes type 2.

Food tests

Sugars (glucose)	<i>Benedict's test</i>	Orange to brick red precipitate.
Starch	<i>Iodine test</i>	Turns black.
Biuret	<i>Biuret reagent</i>	Mauve or purple solution.



Carbohydrases (e.g. amylase)

Proteases

Lipases

Bile (not an enzyme)



Made in salivary glands, pancreas, small intestine

Break down carbohydrates to simple sugar (e.g. amylase breaks down starch to glucose).

Made in stomach, pancreas

Break down protein to amino acids.

Made in pancreas (works in small intestine)

Break down lipids (fats) to glycerol and fatty acids.

Made in liver, stored in gall bladder.

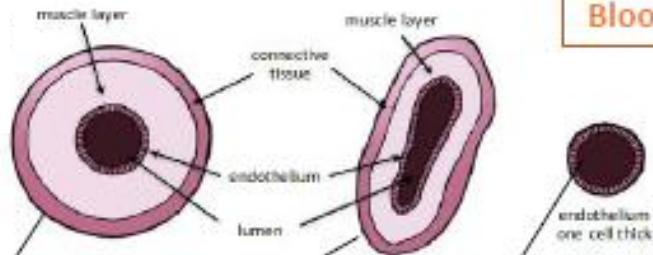
Emulsifies lipids to increase surface area to increase the rate of lipid break down by lipase. Changes pH to neutral for lipase to work

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

Cells, tissues, organs and systems

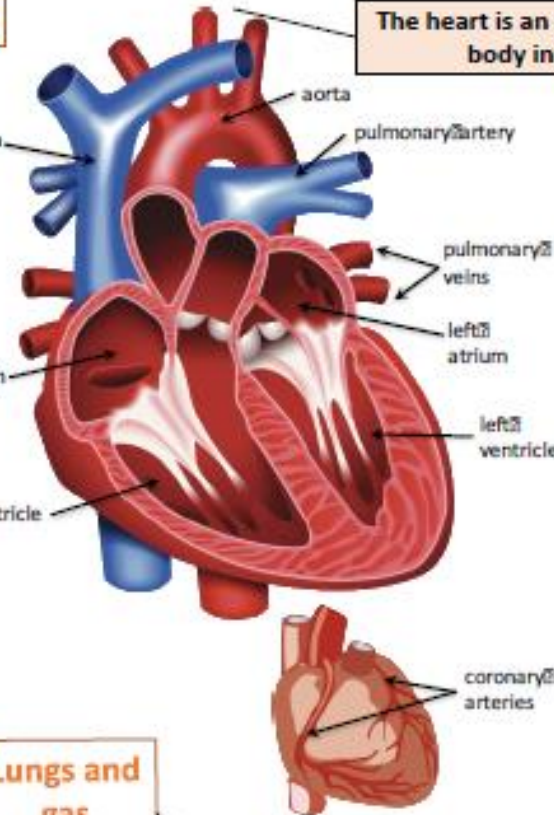
Cells		<i>e.g. muscle cells</i>	The basic building blocks of all living organisms.
Tissues		<i>e.g. muscle tissue</i>	A group of cells with a similar structure and function.
Organs		<i>e.g. the heart</i>	Aggregations (working together) of tissues performing a specific function.
Organ systems		<i>e.g.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

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

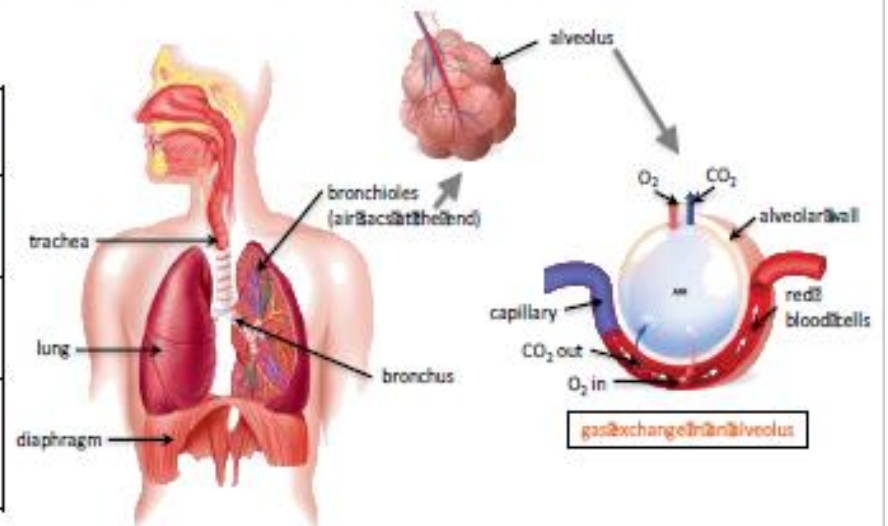
AQA GCSE ORGANISATION part 2

Lungs and gas exchange

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

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.

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

Heart failure can be treated with a transplant or artificial heart

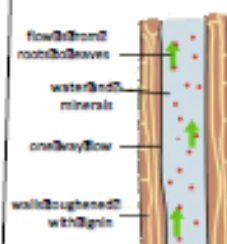
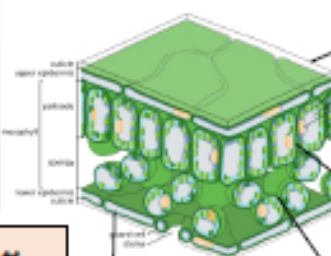
AQA GCSE ORGANISATION part 3

Plant tissues

Cause	Effect	Treatment
Coronary heart disease (CHD)		
A build up for fatty substances in the coronary arteries (atherosclerosis)	Oxygenated 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

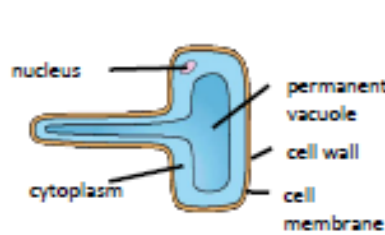
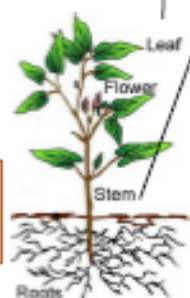
Plant organ systems

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



xylem

phloem



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.

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

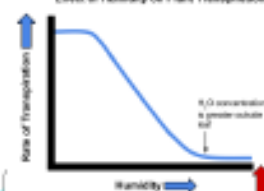
A potometer is used to measure the amount of water lost over time (rate of transpiration)

Transpiration

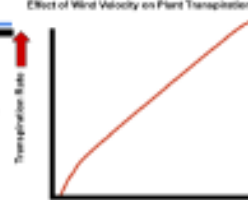
The rate at which water is lost from the leaves of a plant. The transpiration stream is the column of water moving through the roots, stem and leaves

Temperature, humidity, air movement and light intensity affect the rate of transpiration.

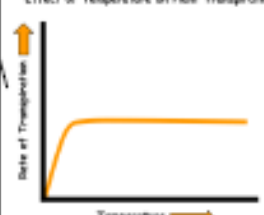
Effect of Humidity on Plant Transpiration



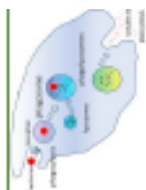
Effect of Wind Velocity on Plant Transpiration



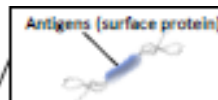
Effect of Temperature on Plant Transpiration



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



Phagocytes	<i>Phagocytosis</i>	Phagocytes engulf the pathogens and digest them.
Lymphocytes	<i>Antibody production</i>	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.
	<i>Antitoxin production</i>	Antitoxin is a type of antibody produced to counteract the toxins produced by bacteria.



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

White blood cells are part of the immune system

Immune system

Non-specific defence systems

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

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

AQA GCSE INFECTION AND RESPONSE part 1

Plants have several ways of defending themselves from pathogens and animals

Human defence systems

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

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

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	

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.

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

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
<i>e.g. cold, influenza, measles, HIV, tobacco mosaic virus</i>	<i>e.g. tuberculosis (TB), Salmonella, Gonorrhoea</i>	<i>e.g. dysentery, sleeping sickness, malaria</i>	<i>e.g. athlete's foot, thrush, rose black spot</i>
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

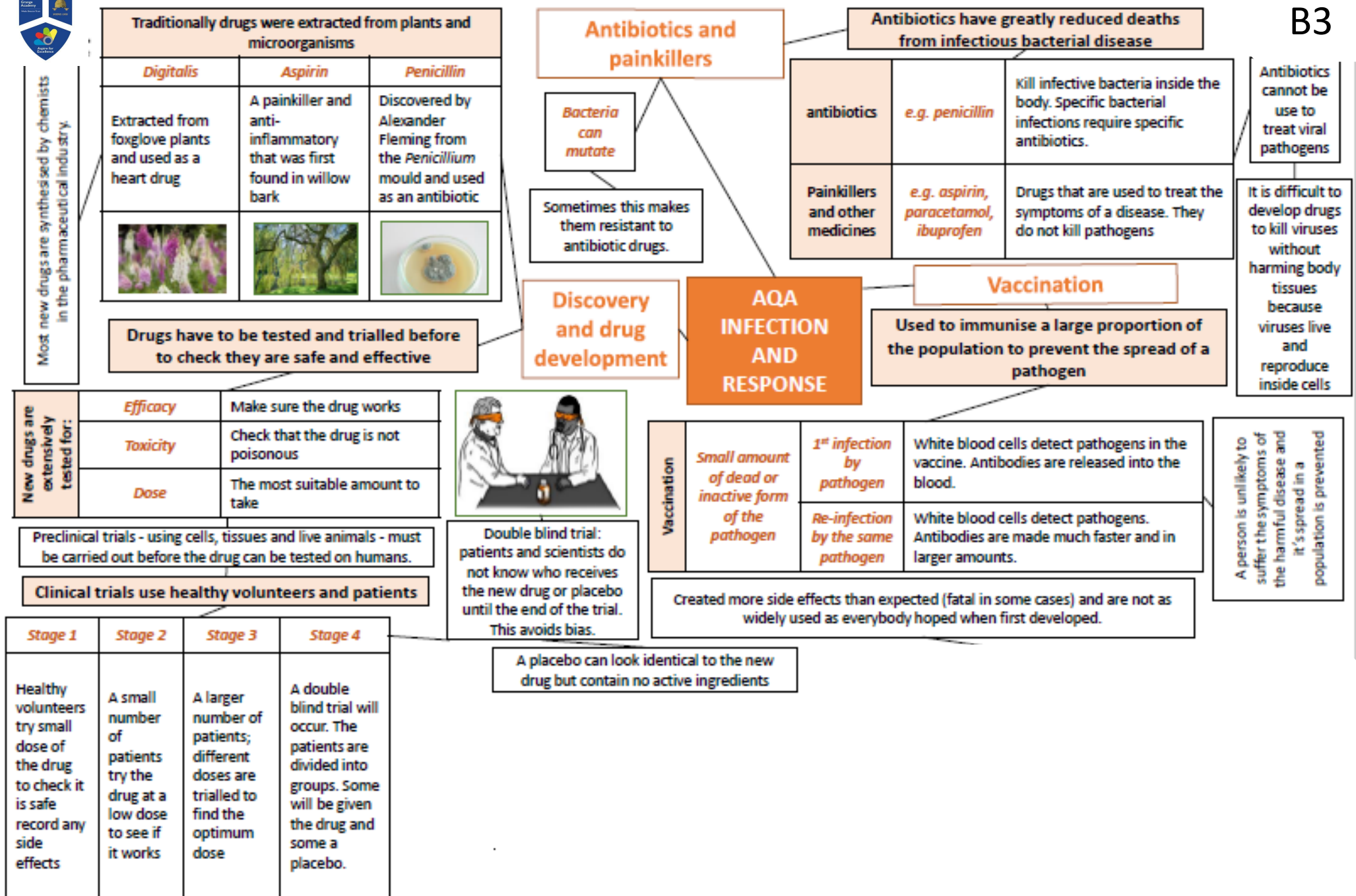
Pathogens are microorganisms that cause infectious disease

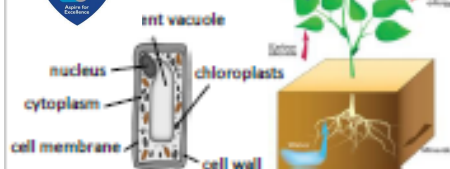
Pathogens

Communicable diseases

Viruses live and reproduce inside cells causing damage

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





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

$\text{CO}_2 + \text{H}_2\text{O} \xrightarrow{\text{light}} \text{O}_2 + \text{C}_6\text{H}_{12}\text{O}_6$

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

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

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.

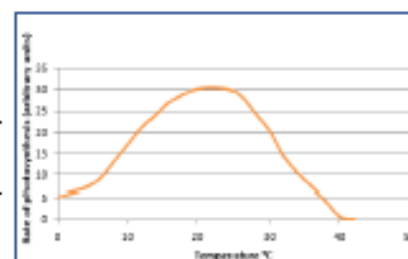
Growers must balance the economics of additional costs of controlling the conditions to maximise photosynthesis with making a profit.



AQA GCSE BIOENERGETICS part 1

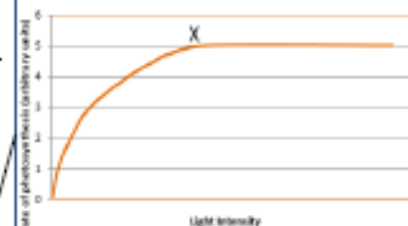
Rate of photosynthesis

Rate of photosynthesis HT Only



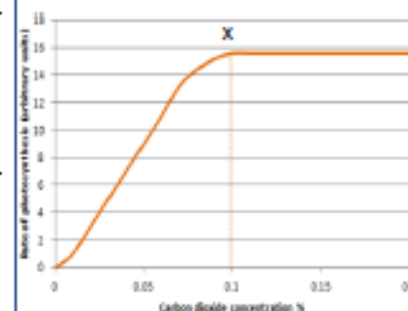
Graph lines C and D: If temperature is increased by 10°C then a slight increase in rate of photosynthesis occurs.

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

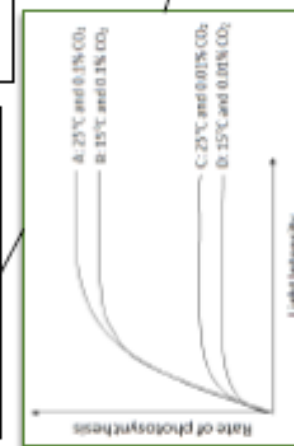


Graph lines A and D: If carbon dioxide concentration and temperature are increased the rate of photosynthesis increases significantly up to a point.

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.



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%.

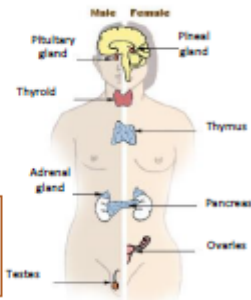


Light intensity obeys the inverse square law. This means that if you double the distance between the plant and the light source you quarter the light intensity

Human control systems include	Cells called receptors	Detect stimuli (changes in environment).
	Coordination centres	e.g. brain, spinal cord and pancreas that receive information from receptors.
	Effectors	Muscles or glands, which bring about responses to restore optimum levels.

Enables humans to react to their surroundings and to co-ordinate their behaviour

Human endocrine system



Endocrine system
Composed of glands which secrete chemicals called hormones directly into the bloodstream.
The blood carries the hormone to a target organ where it produces an effect. Compared to the nervous system effects are slower but act for longer.

Pituitary gland
'Master gland'; secretes several hormones into the blood
Stimulates other glands to produce hormones to bring about effects.

Control of blood glucose concentration

Negative feedback (HT only)	Adrenaline	Produced in adrenal glands, increases breathing/heart rate, blood flow to muscles, conversion glycogen to glucose. Prepares body for 'fight or flight'.
	Thyroxine	Produced in the thyroid gland, stimulates the basal metabolic rate. Important in growth and development.

Blood glucose concentration	
Monitored and controlled by the pancreas	
Too high	(HT only) Too low
Pancreas produces the hormone insulin, glucose moves from the blood into the cells. In liver and muscle cells excess glucose is converted to glycogen for storage.	Pancreas produces the hormone glucagon that causes glycogen to be converted into glucose and released into the blood.

(HT) Rising glucose levels inhibit the release of glucagon in a negative feedback system. Insulin is released to reduce glucose levels and which cause the pancreas to release glucagon

Increasing thyroxine levels prevent the release of thyroid stimulating hormone which stops the release of thyroxine.

Diabetes	
Type 1	Type 2
Pancreas fails to produce sufficient insulin leading to uncontrolled blood glucose levels. Normally treated by insulin injection.	Obesity is a risk factor. Body cells no longer respond to insulin. Common treatments include changing by diet and increasing exercise.

res in excellence

Response to internal and external change

Controls in the human body	Blood glucose concentration	These automatic control systems may involve nervous responses or chemical responses.
	Body temperature	
	Water levels	

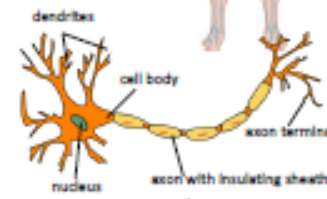
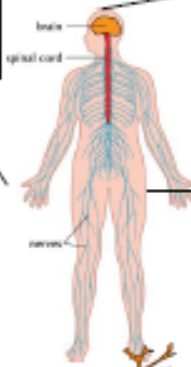
The regulation of internal conditions of a cell or organism to maintain optimum conditions for function.

Homeostasis maintains optimal conditions for enzyme action and all cell functions.

Homeostasis

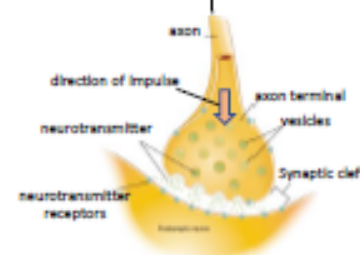
AQA GCSE HOMEOSTASIS AND RESPONSE part 1

The human nervous system



Typical motor neurone

Synapse (gap where two neurones meet).



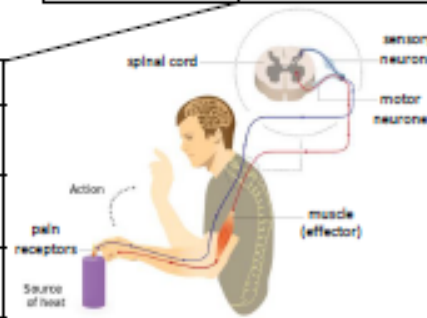
Information from receptors passes along cells (neurones) as electrical impulses to the central nervous system (CNS)

The CNS is the brain and the spinal cord.

Coordinates the response of effectors; muscles contracting or glands secreting hormones

Stimulus	Lights switch on
Receptor	Cells in retina
Coordinator	CNS
Effector	Muscles connected to iris
Response	Pupils get smaller

Reflex arc	Receptor	Detect stimuli.
	Sensory neurone	Long axon carries impulse from receptor to spinal cord.
	Synapse	Gap where neurones meet. Chemical message using neurotransmitter.
	Relay neurone	Allows impulses to travel between sensory and motor neurones in the spinal cord.
	Motor neurone	Long axon carries impulse from receptor to effector.
	Effector	Muscle or gland that carries out response.



Reflex actions are automatic and rapid; they do not involve the conscious part of the brain and can protect humans from harm.



FSH and LH are used as 'fertility drugs' to help someone become pregnant in the normal way

In Vitro Fertilisation (IVF) treatment.

Involves giving a mother FSH and LH to stimulate the maturation of several eggs

The eggs are collected from the mother and fertilised by sperm from the father in a laboratory.

The fertilised eggs develop into embryos.

At the stage when they are tiny balls of cells, one or two embryos are inserted into the mother's uterus (womb).

Potential disadvantages of IVF

- Emotional and physical stress.
- Success rates are not high.
- Multiple births risk to mother and babies.

Hormones are used in modern reproductive technologies to treat infertility

Plants produce hormones to coordinate and control growth

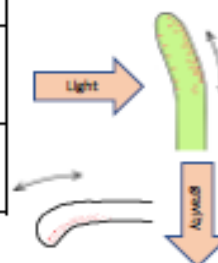
Plant responses using hormones (auxins)

Light
(phototropism)

Light breaks down auxins and they become unequally distributed in the shoot. The side with the highest concentration of auxins has the highest growth rate and the shoot grows toward the light.

Gravity
(geotropism or gravitropism)

Gravity causes an unequal distribution of auxins. In roots the side with the lowest concentration has the highest growth rate and the root grows in the direction of gravity. In new shoots from a seedling the unequal distribution of auxins causes the shoot to grow away from gravity.



B5

(HT only) Gibberellins are important in initiating seed germination.

(HT only) Ethene controls cell division and ripening of fruits.

The use of hormone to treat infertility (HT only)

Plant hormones

Use of plant hormones (HT only)

Plant growth hormones are used in agriculture and horticulture

Auxins	Weed killers, rooting powders, promoting growth in tissue culture.
Ethene	Control ripening of fruit during storage and transport.
Gibberellins	End seed dormancy, promote flowering, increase fruit size.

AQA GCSE HOMEOSTASIS AND RESPONSE

Contraception

Hormones in human reproduction

During puberty reproductive hormones cause secondary sexual characteristics to develop

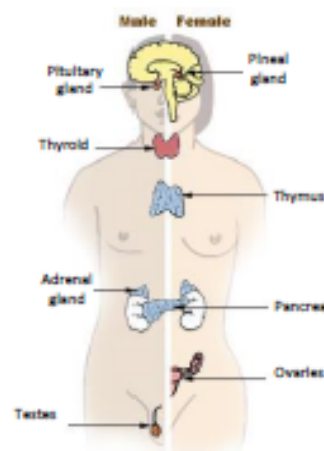
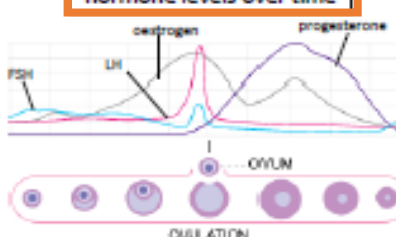
Oestrogen (main female reproductive hormone)

Produced in the ovaries. At puberty eggs begin to mature releasing one every 28 days – ovulation.

Testosterone (main male reproductive hormone)

Produced in the testes stimulation sperm production.

(HT only) a graph of hormone levels over time



Fertility can be controlled by hormonal and non hormonal methods

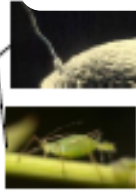
Oral contraceptives	Contain hormones to inhibit FSH production so that no eggs mature.
Injection, implant, skin patch	For slow release of progesterone to inhibit the maturation and release of eggs for months or years.
Barrier methods	Condoms or diaphragms which prevent sperm reaching the egg.
Intrauterine devices	Prevent implantation of an embryo or release a hormone.
Spermicidal agents	Kill or disable sperm.
Abstaining	Avoiding intercourse when an egg may be in the oviduct.
Surgery	Male or female sterilisation.

Menstrual cycle	Follicle stimulating hormone (FSH)	Causes maturation of an egg in the ovary.	(HT) FSH stimulates ovaries to produce oestrogen.
	Luteinising hormone (LH)	Stimulates release of an egg.	(HT) Oestrogen stops FSH production and stimulates LH production in pituitary gland.
	Oestrogen and progesterone	Maintain uterus lining.	



Meiosis halves the number of chromosomes

Gametes are made in reproductive organs (in animals ovaries and testes)	<i>Cells divide by meiosis to form gametes</i>	Copies of the genetic information are made.		Sexual reproduction involves the fusion of male and female gametes.	<i>Sperm and egg in animals.</i>	Produced by meiosis. There is mixing of genetic information which leads to a variety in the offspring.
		The cell divides twice to form four gametes each with single set of chromosomes.		Asexual reproduction involves only one parent and no fusion of gametes.	<i>Pollen and egg cells in flowering plants.</i>	Only mitosis is involved. There is no mixing of genetic information. This leads to genetically identical clones.
		All gametes are genetically different from each other.			<i>e.g. cloning of females only in an aphid population.</i>	



Gametes join at fertilisation to restore the number of chromosomes	The new cell divides by mitosis. The number of cells increase. As the embryo develops cells differentiate.	When the protein chain is complete it folds to form a unique shape. This allows proteins to do their job as enzymes, hormones or new structures such as collagen.
Meiosis	Meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed	Some change the shape and affect the function of proteins e.g. and enzyme active site will change or a structural protein loses its strength
		Most do not alter the protein so that its appearance or function is not changed.

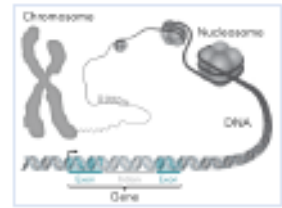
DNA and the genome

Sexual and asexual reproduction

AQA GCSE INHERITANCE, VARIATION AND EVOLUTION Part 1

Genetic material in the nucleus is composed of a chemical called DNA.

DNA structure
<i>Polymer made up of two strands forming a double helix.</i>
Contained in structures called chromosomes. A gene is a small section of DNA on a chromosome. Each gene codes for a sequence of amino acids to make a specific protein.



The genome is the entire genetic material of an organism.

Mutations occur continuously (HT only)

Protein synthesis (HT only)

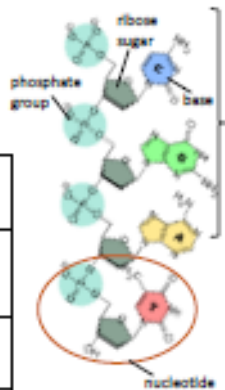
In DNA the complementary strands C, A, T, G always link in the same way. C always linked to G on the opposite strand and A to T.

(HT) Making new proteins (protein synthesis)

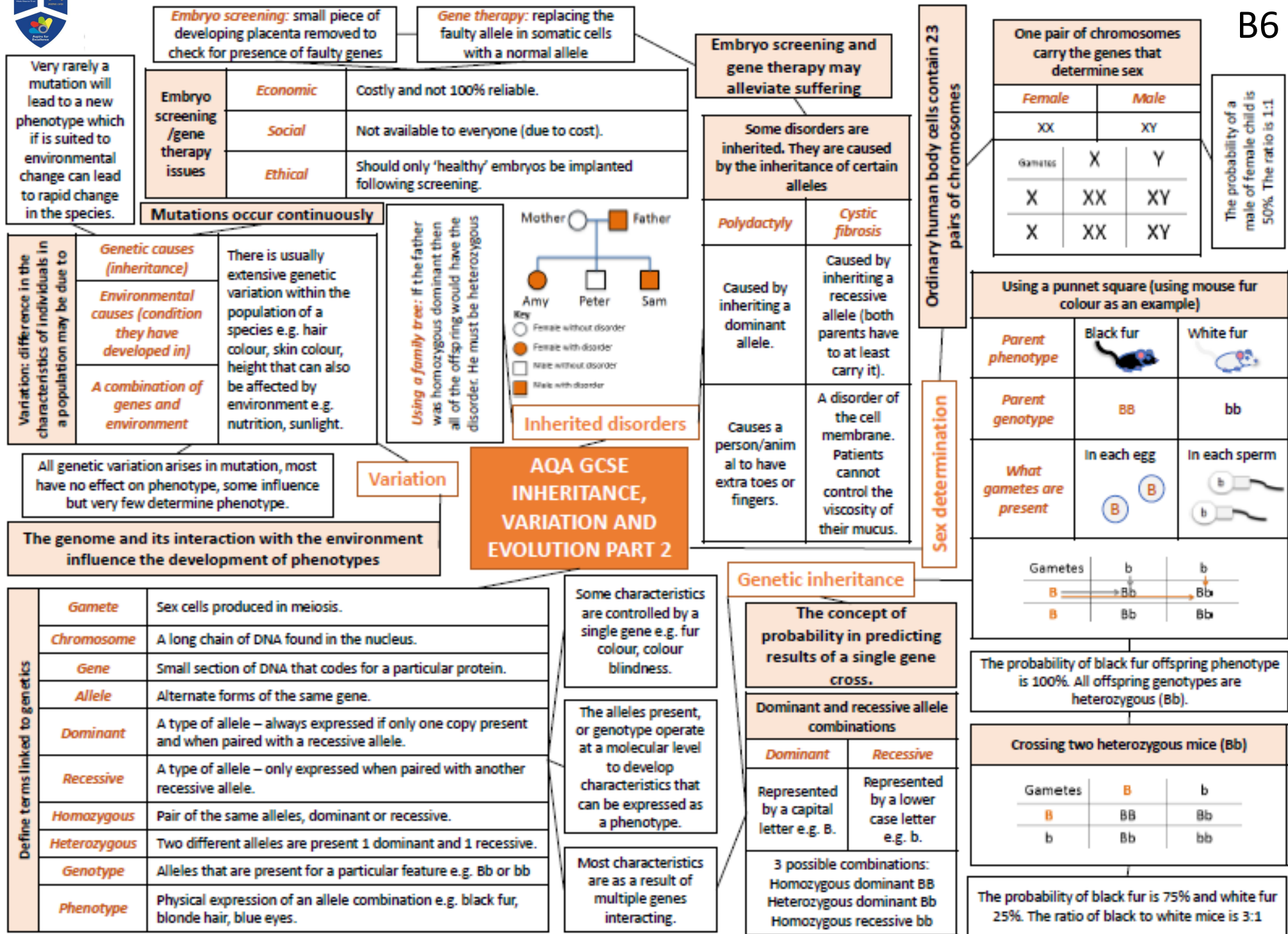
Composed of chains of amino acids. A sequence of 3 bases codes for a particular amino acid.

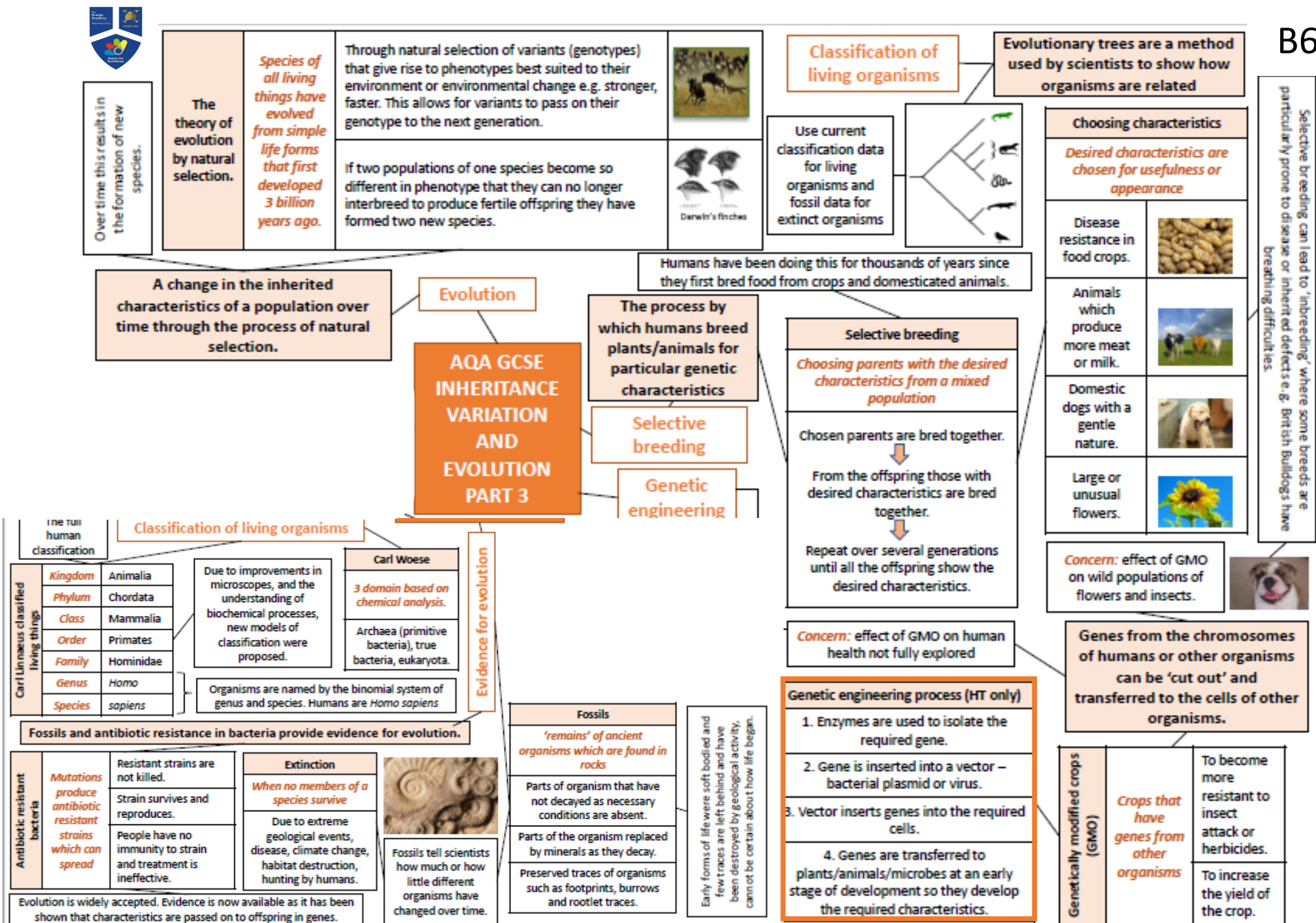
DNA in the nucleus unravels.
↓
Enzymes make a copy of the DNA strand called mRNA.
↓
mRNA moves from the nucleus to ribosome in the cytoplasm.
↓
Ribosomes translate each 3 bases into amino acids according to mRNA template
↓
Ribosomes link amino acids brought by carrier proteins.
↓
A long chain of amino acids form. Their specific order forms a specific protein.

A sequence of 3 bases is the code for a particular amino acid. The order of bases controls the order in which each amino acid is assembled to produce a specific protein.



The whole human genome has now been studied.	<i>It is of great importance for future medical developments</i>	Searching for genes linked to different types of disease.
		Understanding and treatment of inherited disorders.
		Tracing migration patterns from the past.

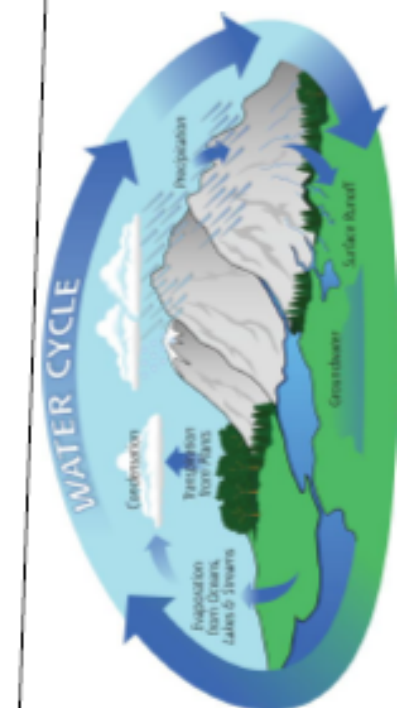






Farmers optimise conditions for making compost for use as a natural fertiliser.

Anaerobic decay in biogas generators produces methane gas, used as a fuel.



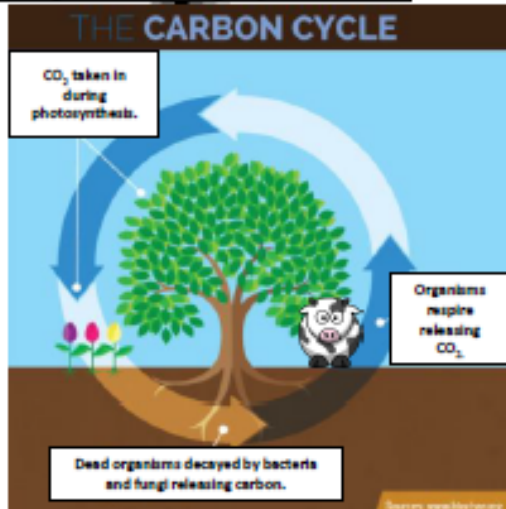
Factors affecting rate of decay
Temperature, water, oxygen
 Increase the rate of decay. In enzyme controlled reactions raising the temperature too high will denature the enzymes.

Breakdown of dead organisms releases mineral ions into the soil.

Ecosystem	Environment	The conditions surrounding an organism; abiotic and biotic.
	Habitat	Place where organisms live e.g. woodland, lake.
	Population	Individuals of a species living in a habitat.
	Community	Populations of different species living in a habitat.

Organisms require a supply of materials from their surroundings and from the other living organisms.

Bacteria respire when breaking down dead organisms releasing CO_2 .



Materials are recycled to provide the building blocks for future organisms

Photosynthetic organisms are the producers of biomass for life on Earth

Food chains			
Feeding relationships in a community			
Producer	Primary consumer	Secondary consumer	Tertiary consumer
Grass	Grasshopper	Mouse	Owl
All food chains begin with a producer e.g. grass that is usually a green plant or photosynthetic algae.		Consumers that kill and eat other animals are predators and those eaten are prey.	

Surviving and reproducing	Competition	Plants in a community or habitat compete with each other for light, space, water and mineral ions. Animals compete with each other for food, mates and territory.
	Interdependence	Species depend on each other for food, shelter, pollination, seed dispersal etc. Removing a species can affect the whole community



EXAMPLE: Introduction of grey squirrels to UK increased competition for food for red squirrels. The greys also carry a pathogen that kills reds.

Decomposition and material cycling

EXAMPLE: climate change is leading to more dissolved CO_2 in oceans lowering the pH of the water affecting organisms living there.

AQA GCSE ECOLOGY PART 1

Levels of organisation

Adaptations

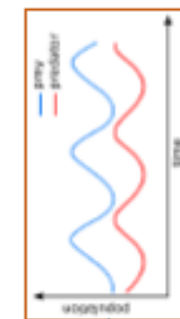
Organisms adaptations enable them to survive in conditions where they normally live.

Adaptations may be structural, behavioural or functional.

Interdependence and competition

Abiotic and biotic factors.

Abiotic	Biotic
Non-living factors that affect a community	Living factors that affect a community
Living intensity.	Availability of food.
Temperature.	New predators arriving.
Moisture levels.	
Soil pH, mineral content.	New pathogens.
Wind intensity and direction.	One species outcompeting so numbers are no longer sufficient to breed
Carbon dioxide levels for a plant.	
Oxygen levels for aquatic organisms.	



In a stable community the numbers of predators and prey rise and fall in cycles.

Adaptations		
Plants	Animals	Extremophiles
Cactus in dry, hot desert	Polar bear in extreme cold arctic	Deep sea vent bacteria
No leaves to reduce water loss, wide deep roots for absorbing water.	Hollow hairs to trap layer of heat. Thick layer of fat for insulation.	Populations form in thick layers to protect outer layers from extreme heat of vent.



Human activity can have a negative impact on biodiversity



Pollution kills plants and animals which can reduce biodiversity.



Waste management	Rapid growth in human population and higher standard of living	More resources used and more waste produced.
		Pollution in water; sewage, fertiliser or toxic chemicals.
		Pollution in air; smoke or acidic gases.
		Pollution on land; landfill and toxic chemicals.

Waste, land use and deforestation



Land use
Humans reduce the amount of land and habitats available for other plants, animals and microorganisms.
Building and quarrying.
Farming for animals and food crops.
Dumping waste.
Destruction of peat bogs to produce cheap compost for gardeners/farmers to increase food production.

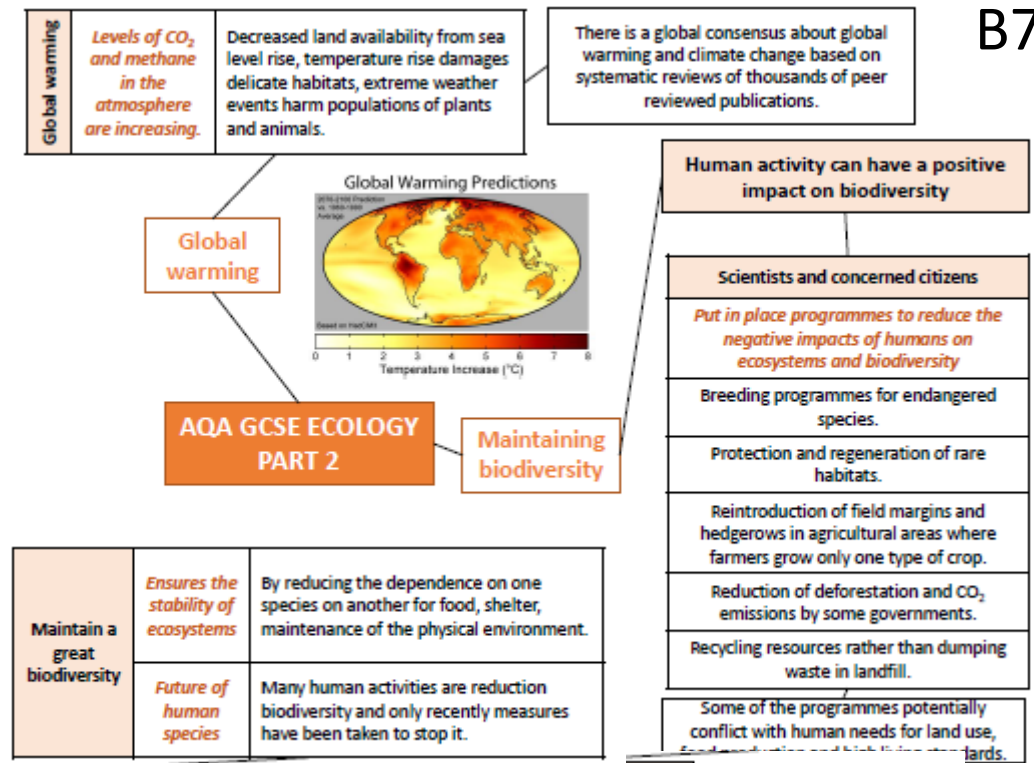
The decay or burning of peat release CO₂ into the atmosphere.



This conflicts with conserving peat bogs and peatlands as habitats for biodiversity and reduce CO₂ emissions.

Large scale deforestation
Provide land for cattle and rice fields, grow crops for biofuels.

Deforestation reduces biodiversity and removes a sink for increasing the amount CO₂ in the atmosphere.



Maintain a great biodiversity	Ensures the stability of ecosystems	By reducing the dependence on one species on another for food, shelter, maintenance of the physical environment.
	Future of human species	Many human activities are reduction biodiversity and only recently measures have been taken to stop it.

Biodiversity is the variety of all different species of organisms on Earth, or within an ecosystem

Biodiversity

Experimental methods are used to determine the distribution and abundance of a species.

Sampling techniques	Quadrats	Organisms are counted within a randomly placed square
	Transects	Organisms are counted along a belt (transect) of the ecosystem.



Processing data	
Median	Middle value in a sample.
Mode	Most occurring value in a sample.
Mean	The sum of all the value in a sample divided by the sample number.

