

OCR 21st Century GCSE Biology A

Biology					
B1 – You and Your Genes	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
		B1.1 What are genes and how do they affect the way that organisms develop?	Instructions for how an organism develops are found in the nucleus of its cells.	Genes and Genetic Engineering	Animal and Plant Cells Cell Division
	Genes are instructions for a cell that describe how to make proteins, which may be structural or enzymes.	Genes and Genetic Engineering	Animal and Plant Cells		
	Genes are sections of very long DNA molecules that make up chromosomes in the nuclei of cells.	Genes and Genetic Engineering	Cell Division		

Biology

Biology					
B1 – You and Your Genes	B1.2 Why can people look like their parents, brothers and sisters, but not be identical to them?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Sex cells have only one copy of each chromosome.		Cell Division	
		The occurrence of chromosomes (and hence genes) in pairs relates to their origin from each parent's sex cells.		Inheritance	
		Chromosomes in a pair carry the same genes in the same place, but there are different versions of the genes called alleles.		Inheritance	
		A person may have two of the same alleles two different alleles for any gene.		Inheritance	
		Interpret (through family trees or genetic diagrams) the inheritance of normal single gene characteristics with a dominant and recessive allele.		Inheritance	
		Offspring may have some similarity to their parents because of the combination of maternal and paternal alleles in the fertilised egg.		Inheritance	
		Why different offspring from the same parents can differ from each other.		Inheritance	
		Human males have sex chromosomes XY and females have sex chromosomes XX.		Inheritance	
		Sex of a human embryo is determined by a gene on the Y chromosome.		Inheritance	
		The link between this gene and the development of sex organs into either ovaries or testes.			

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Biology					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
B1 – You and Your Genes	B1.3 How can and should genetic information be used? How can we use our knowledge of genes to prevent disease?	Most characteristics are determined by several genes working together, for example, height.		Inheritance	
	Most characteristics are also affected by environmental factors, for example, lifestyle factors contributing to disease.		Inheritance		
	A small number of disorders are caused by alleles of a single gene, limited to Huntington’s disorder and cystic fibrosis.		Inherited Diseases		
	The symptoms of Huntington’s disorder and cystic fibrosis.		Inherited Diseases		
	Why a person with one recessive allele will not show the associated characteristic, but is a carrier and can pass the allele to their children.		Inherited Diseases		
	Interpret (through family trees or genetic diagrams) the inheritance of a single gene disorder, including the risk of a child being a carrier.		Inherited Diseases		
	The implications of testing adults and fetuses for alleles which cause genetic disease, for example: - whether or not to have children at all; - whether or not a pregnancy should be terminated.		Inherited Diseases		
	The implications of testing embryos for embryo selection (pre-implantation genetic diagnosis).	Genes and Genetic Engineering			
	The implications of the use of genetic testing by others, (for example, for genetic screening programmes, by employers and insurance companies).				
	Gene therapy may make it possible to treat certain genetic diseases.	Genes and Genetic Engineering	Inherited Diseases		
	In the context of genetic testing (when provided with additional information about the reliability and risks of genetic tests) or gene therapy be able to: - distinguish questions which could be addressed using a scientific approach, from questions which could not; - say clearly what the issue is; - summarise different views that may be held; - identify and develop arguments based on the ideas that: - the right decision is the one which leads to the best outcome for the majority of people involved; - certain actions are never justified because they are unnatural or wrong;	Genes and Genetic Engineering	Inherited Diseases		

	<p>In the context of use of genetic testing by others can:</p> <ul style="list-style-type: none">- distinguish what can be done (technical feasibility), from what should be done (values);- explain why different courses of action may be taken in different social and environmental contexts			
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Biology					
B1 – You and Your Genes	B1.4 What are stem cells, and why could they be useful in treating some diseases?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Bacteria, plants and some animals can reproduce asexually to form clones (with identical genes to their parent).	Cloning		Using Micro-organisms for Food
		Any differences between clones are likely to be due only to environmental factors.		Inheritance	
		How clones of animals occur: - naturally, when cells of an embryo separate (identical twins); - artificially, when the nucleus from an adult body cell is transferred to an empty unfertilised egg cell.	Cloning		
		Embryonic stem cells are unspecialised cells that can develop into any type of cell.	Cloning	Growth and Development	
		There is the potential to use stem cells to treat some illnesses.	Cloning	Growth and Development	
		The cells of multicellular organisms become specialised during the early development of the organism.		Growth and Development	
		In the context of cloning embryos to produce large numbers of stem cells to treat illnesses, can: - say clearly what the issue is; - summarise different views that may be held; - identify and develop arguments based on the ideas that: - the right decision is the one which leads to the best outcome for the majority of people involved; - certain actions are never justified because they are unnatural or wrong.	Cloning	Growth and Development	

Biology					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
B2 – Keeping Healthy	B2.1 How do our bodies resist infection?	There are natural barriers to reduce the risk of harmful microorganisms entering the body (limited to the skin, chemicals in tears, sweat and stomach acid).	Infections and Immunity		
		In suitable conditions (such as inside the body) these microorganisms can reproduce rapidly.	Infections and Immunity		
		Symptoms of a disease are caused by damage done to cells by the microorganisms or the poisons (toxins) they produce.	Infections and Immunity		
		Our bodies have immune systems to defend themselves against the invading microorganisms.	Infections and Immunity		
		White blood cells can destroy microorganisms by engulfing and digesting them, or by producing antibodies.	Infections and Immunity		
		A different antibody is needed to recognise each different type of microorganism.	Infections and Immunity		
		Once the body has made the antibody to recognise a particular microorganism it can make that antibody again very quickly, therefore protecting against that particular microorganism.	Infections and Immunity		

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B2 – Keeping Healthy	Biology			
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B2.2 What are vaccines and how do they work?	Microorganisms may enter the body and cause illness before the immune system can destroy them.	Infections and Immunity		
	Vaccinations provide protection from microorganisms by establishing antibodies before infection.	Infections and Immunity		
	A vaccination contains a usually safe form of a disease-causing microorganism.	Infections and Immunity		
	Vaccination can never be completely safe, since individuals have varying degrees of side-effects from a vaccine.	Infections and Immunity		
	Why, to prevent epidemics of infectious diseases, it is necessary to vaccinate a high percentage of a population.	Infections and Immunity		
	There is a conflict between a person’s right to decide about vaccination for themselves or their children, and what is of benefit to society as a whole.	Infections and Immunity		
	New vaccines against influenza have to be developed regularly because the virus changes very quickly.			
	It is difficult to develop an effective vaccine against the HIV virus (which causes AIDS) because the virus damages the immune system and has a high mutation rate.			
	With respect to vaccination policy can: - say clearly what the issue is; - summarise different views that may be held; - distinguish what can be done (technical feasibility) from what should be done (values); - explain why different courses of action may be taken in different social and economic contexts; - identify, and develop, arguments based on the ideas that: - the right decision is the one which leads to the best outcome for the majority of people involved; - certain actions are never justified because they are unnatural or wrong.	Infections and Immunity		

Biology					
B2 – Keeping Healthy	B2.3 What are antibiotics, and why can they become less effective? How are new drugs developed and tested?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		We can kill bacteria and fungi but not viruses, using chemicals called antibiotics.			Other Uses for Micro-organisms
		Over a period of time, bacteria and fungi may become resistant to antibiotics.	Evolution		
		Random changes (mutations) in the genes of these microorganisms sometimes lead to varieties which are less affected by the antibiotic.	Evolution		
		To reduce antibiotic resistance we should only use antibiotics when necessary and always complete the course.			
		New drugs are first tested for safety and effectiveness using human cells grown in the laboratory and animals.	Drug Use and Abuse		
		Human trials may then be carried out: - on healthy volunteers to test for safety; - on people with the illness to test for safety and effectiveness.	Drug Use and Abuse		
		Use of ‘blind’ or ‘double-blind’ human trials in the testing of a new medical treatment.	Drug Use and Abuse		
		Why placebos are not commonly used in human trials.			

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Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B2 – Keeping Healthy B2.4 What factors increase the risk of heart disease?	Why heart muscle cells need their own blood supply.			
	How the structure of arteries and veins is related to their function.			The Circulatory System
	How fatty deposits in the blood vessels supplying the heart muscle can produce a ‘heart attack’.	Health and Diet		The Heart
	Heart disease is usually caused by lifestyle factors and / or genetic factors, not microorganisms.			
	These lifestyle factors include poor diet, stress, cigarette Smoking and excessive alcohol intake.			
	Heart disease is more common in the UK than in non-industrialised countries.			
	Regular moderate exercise reduces the risk of developing heart disease.			
	<p>In the context of how lifestyle factors that can increase the risk of heart disease are identified, via epidemiological studies:</p> <ul style="list-style-type: none"> - can give an example from everyday life of a correlation between a factor and an outcome; - uses the ideas of correlation and cause appropriately; - can explain why a correlation between a factor and an outcome does not necessarily mean that one causes the other, and give an example to illustrate this; - can suggest factors that might increase the chance of an outcome but not invariably lead to it; - can explain that individual cases do not provide convincing evidence for or against a correlation; - can evaluate the design for a study to test whether or not a factor increases the chance of an outcome, by commenting on sample size and how well the samples are matched; - can use data to develop an argument that a factor does/does not increase the chance of an outcome; - can identify the presence (or absence) of a plausible mechanism as significant for the acceptance (or rejection) of a claimed causal link; - can describe in broad outline the ‘peer review’ process, in which new scientific claims are evaluated by other scientists; - can recognise that new scientific claims which have not yet been evaluated by the scientific community are less reliable than well established ones; - can identify absence of replication as a reason for questioning a scientific claim; - can explain why scientists regard it as important that a scientific claim can be replicated by other scientists. 			

Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B3 – Life on Earth B3.1 How did life on Earth begin and evolve?	The many different species of living things on Earth (and many species that are now extinct) evolved from very simple living things.	Evolution		
	Life on Earth began about 3500 million years ago.	Evolution		
	Evidence for evolution is provided by fossils and from analysis of similarities and differences in DNA of organisms.	Evolution		
	The first living things developed from molecules that could copy themselves.			
	These molecules were produced by the conditions on Earth at that time, or may have come from elsewhere.	Evolution		
	Evolution happens due to natural selection.	Evolution		
	The process of natural selection in terms of variation, competition, increased chance of survival and reproduction, and increased number of individuals displaying certain characteristics in later generations.	Evolution		
	Variation is caused by both environment and genes, but only genetic variation can be passed on.		Inheritance	
	The difference between natural selection and selective breeding.	Genes and Genetic Engineering, Evolution		
	Interpret data on changes in a species in terms of natural selection.	Evolution		
	Changes can occur in genes (mutations).		Inheritance Inherited Diseases	
	Mutated genes in sex cells can be passed on to offspring and may occasionally produce new characteristics.			
	The combined effect of mutations, environmental changes and natural selection can produce new species.			
	If the conditions on Earth had, at any stage, been different from what they actually were, evolution by natural selection could have produced different results.			

Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B3 – Life on Earth	<p>B3.2 How have scientists developed explanations of evolution?</p> <p>When provided with information about alternative views on the origin of life on Earth, or the evolutionary process:</p> <ul style="list-style-type: none"> - can identify statements which are data and statements which are (all or part of) an explanation; - can recognise data or observations that are accounted for by, (or conflict with), an explanation; - can identify imagination and creativity in the development of an explanation; - can justify accepting or rejecting a proposed explanation on the grounds that it: <ul style="list-style-type: none"> - accounts for observations; - and / or provides an explanation that links things previously thought to be unrelated; - can identify a scientific question for which there is not yet an agreed answer and suggest a reason why; - can suggest plausible reasons why scientists involved in a scientific event or issue disagree(d); - can suggest reasons for scientists' reluctance to give up an accepted explanation when new data appear to conflict with it. 	<p>Evolution</p>		

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B3 – Life on Earth	Biology				
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
B3.3 How did humans evolve? How are our nervous systems organised?	The evolution of multicellular organisms has led to nervous and hormonal communication systems.				
	Sensor (receptor) cells detect stimuli and effector cells produce responses to stimuli.	Electrical Signals			
	Nervous systems are made up of nerve cells (neurons) linking receptor cells (e.g. in eyes, ears and skin) to effector cells (in muscles / glands).	Electrical Signals			
	In humans and other vertebrates the nervous system is coordinated by a central nervous system (spinal cord and brain).	Electrical Signals			
	Nervous systems use electrical impulses for fast, short-lived responses.	Electrical Signals			
	Hormones are chemicals which travel in the blood and bring about slower, longer-lasting responses.				
	Two examples, in humans, of both nervous and hormonal communication.	Electrical Signals Hormones			
	Nervous and hormonal communication systems are involved in maintaining a constant internal environment (homeostasis).		Homeostasis		
	The evolution of a larger brain gave some early humans a better chance of survival.				
	Human evolution in terms of a common ancestor, divergence of hominid species, extinction of all but one of these species.				
	When provided with additional information about human evolution: - can draw valid conclusions about the implications of given data for a given theory, for example: - recognises that an observation that agrees with a prediction (derived from an explanation) increases confidence in the explanation but does not prove it is correct; - recognises that an observation that disagrees with a prediction (derived from an explanation) indicates that either the observation or the prediction is wrong, and that this may decrease our confidence in the explanation.				

Biology					
B3 – Life on Earth	B3.4 Why do some species become extinct, and does it matter? What is the importance of biodiversity?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Living organisms are dependent on the environment and other species for their survival.	Competition	Energy and Biomass	
		There is competition for resources between different species of animals or plants in the same habitat.	Competition		
		Relate changes affecting one species in a food web to the impact on other species that are part of the same food web.	Competition		
		A rapid change in the environment may cause a species to become extinct, for example, if: - the environmental conditions change; - a new species that is a competitor, predator or disease organism of that species is introduced; - another organism in its food web becomes extinct.	Evolution		
		Species have become extinct (or are in danger of becoming extinct) and that this is likely to be due to human activity.	Sustainability		
		Two examples of modern extinctions caused by direct human activity, and two caused by indirect human activity.	Evolution Sustainability		
		Why maintaining biodiversity is an important part of using the environment in a sustainable way.	Sustainability		
		Biodiversity may be important for the future development of food crops and medicines.			

Biology					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
B4 – Homeostasis	B4.1 What is homeostasis?	Homeostasis is the maintenance of a constant internal environment.		Homeostasis	
		Automatic control systems throughout the body maintain a range of factors at steady levels, which are required for cells to function properly (limited to temperature and water).		Homeostasis	The Kidneys
		Strenuous exercise, survival in hot or cold climates, scuba-diving and mountain climbing affect homeostasis (temperature, blood oxygen levels , hydration and salt levels).		Homeostasis	
		Artificial systems, such as the temperature control system in an incubator, are similar to body control systems.		Homeostasis	
		Artificial and body systems have: - receptors to detect stimuli; - processing centres to receive information and coordinate responses; - effectors which produce the response automatically.		Homeostasis	
		The principle of negative feedback		Homeostasis	
		Negative feedback between the effector and the receptor of a control system reverses any changes to the systems steady state.		Homeostasis	
		Some effectors work antagonistically, which allows a more sensitive response.			

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Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B4 – Homeostasis B4.2 Why is homeostasis important for a cell?	Diffusion is the passive overall movement of molecules from a region of their high concentration to a region of their low concentration.		Movement In and Out of Cells	
	Osmosis (a specific case of diffusion) is the overall movement of water from a dilute to a more concentrated solution through a partially permeable membrane.		Movement In and Out of Cells	
	Examples of chemicals, such as O ₂ , CO ₂ and dissolved food, which move in / out of cells by diffusion.		Movement In and Out of Cells	The Circulatory System
	Some chemicals (for example, glucose) are also moved by active transport.		Movement In and Out of Cells	
	If excess water moves into animal cells by osmosis, the cell membrane may rupture and if too much water moves out of cells they are unable to function correctly.		Movement In and Out of Cells	
	Enzymes are proteins that speed up chemical reactions in cells.		Enzymes	
	Enzymes need a specific constant temperature to work at their optimum.		Enzymes	
	At low temperatures, small increases in temperature increase the frequency and energy of collisions between an enzyme and other molecules, so the rate of reaction increases.			
	At higher temperatures enzymes stop working (denature).		Enzymes	
	Only molecules with the correct shape can fit into the enzyme. This is known as the lock and key model.		Enzymes	
	Enzymes have a small part called the active site where certain molecules bind to the enzyme and the reaction occurs.		Enzymes	
	The shape of the active site is can be changed by heating above a certain temperature and altering the pH, so that the molecules can no longer fit and the reaction cannot happen.		Enzymes	

Biology

B4 – Homeostasis	B4.3 How is our body temperature kept constant?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
			Energy gain and loss must be balanced in order to maintain a constant body temperature.		Homeostasis
Body extremities tend to be cooler than the core body temperature. Energy is transferred from the blood to the tissues when blood reaches cooler parts.		Homeostasis			
Temperature receptors in the skin detect external temperature.		Homeostasis			
Temperature receptors in the brain (hypothalamus) detect the temperature of the blood.		Homeostasis			
The brain (hypothalamus) acts as a processing centre, receiving information from the temperature receptors and triggering the effectors automatically.		Homeostasis			
Effectors include sweat glands and muscles.		Homeostasis			
At high body temperatures: - more sweat is produced by sweat glands which cools the body when it evaporates; - blood vessels supplying the capillaries of the skin dilate (vasodilation) allowing more blood to flow through skin capillaries which increases energy loss.		Homeostasis			
Heat stroke is an uncontrolled increase in body temperature.		Homeostasis			
The common causes, symptoms and initial treatment of heat stroke.		Homeostasis			
How exposure to very hot temperatures produces increased sweating, and can produce dehydration, which may lead to reduced sweating and further increase of core body temperature.		Homeostasis			
When core body temperature becomes too high the normal mechanisms for controlling body temperature break down.		Homeostasis			
At low body temperatures: - the increased rate of respiration stimulated when muscles contract rapidly (shivering) results in some of the energy transferred in respiration warming the surrounding tissues; - blood vessels supplying the capillaries of the skin constrict (vasoconstriction) restricting blood flow through skin capillaries which reduces energy loss.		Homeostasis			
Hypothermia is when core body temperature falls below 35°C.		Homeostasis			
The cause, symptoms and initial treatment of hypothermia.		Homeostasis			
In hypothermia body heat cannot be replaced as fast as it is being lost.		Homeostasis			

Biology

B4 – Homeostasis	Biology			
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B4.4 How does the body control water balance?	Water is gained from drinks, food and respiration and is lost through sweating, breathing, faeces and the excretion of urine.		Homeostasis	
	A balanced water level is important for maintaining the concentration of cell contents at the correct level for cell activity.		Homeostasis	
	How the kidneys play a vital role in removing waste urea from the blood and in balancing levels of other chemicals in the blood by: - filtering small molecules from the blood to form urine (water, salt and urea); - reabsorbing all the sugar; - reabsorbing as much salt as the body requires; - reabsorbing as much water as the body requires; - excreting the remaining urine, which is stored in the bladder. Candidates are not expected to recall details of kidney structure.			The Kidneys
	The kidneys balance water levels by producing dilute or concentrated urine as a response to concentration of blood plasma, which varies with external temperature, exercise level, intake of fluids and salt.		Homeostasis	The Kidneys
	Concentration of urine is controlled by a hormone called ADH, which is released into the bloodstream by the pituitary gland.		Homeostasis	The Kidneys
	How ADH secretion is controlled by negative feedback.		Homeostasis	The Kidneys
	Alcohol results in a greater volume of more dilute urine, due to ADH suppression , which can lead to dehydration.			
	The drug Ecstasy results in a smaller volume of less dilute urine, due to increased ADH production .			

Biology					
B5 – Growth and Development	B5.1 How does an organism produce new cells?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		DNA has a double helix structure.	Genes and Genetic Engineering	Cell Division	
		Cell division by mitosis produces two new cells identical to each other and to the parent cell.		Cell Division	
		<p>The main processes of the cell cycle:</p> <ul style="list-style-type: none"> - cell growth during which: - numbers of organelles increase; - the chromosomes are copied when the two strands of each DNA molecule separate and new strands form alongside them; - mitosis during which: - copies of the chromosomes separate; - the cell divides. <p>Candidates are not expected to recall intermediate stages of mitosis.</p>		Cell Division	
		Meiosis is a type of cell division that produces gametes.		Cell Division	
		Why, in meiosis, it is important that the cells produced only contain half the chromosome number of the parent cell.		Cell Division	
		<p>A zygote contains a set of chromosomes from each parent.</p> <p>Candidates are not expected to recall intermediate stages of meiosis.</p>		Cell Division	

Biology					
B5 – Growth and Development	B5.2 How do genes control growth and development within the cell?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		The genetic code is in the cell nucleus but proteins are produced in the cell cytoplasm.	Genes and Genetic Engineering	Animal and Plant Cells	
		Genes do not leave the nucleus but a copy of the gene is produced to carry the genetic code to the cytoplasm.		Animal and Plant Cells	
		Both strands of the DNA molecule are made up of four different bases, which always pair up in the same way.	Genes and Genetic Engineering	Animal and Plant Cells	
		The order of bases in a gene is the code for building up amino acids in the correct order to make a particular protein. Candidates are not expected to recall details of nucleotide structure, transcription or translation.	Genes and Genetic Engineering	Animal and Plant Cells	

Biology

Syllabus point (text abridged)

Boardworks presentations

**GCSE
Science**

**Additional
Science**

**Separate
Sciences**

B5.3 How do new organisms develop from a single cell?

The zygote divides by mitosis to form an embryo.

Cell Division

In a human embryo, up to the eight cell stage, all the cells are identical and could produce any sort of cell required by the organism (embryonic stem cells).

Growth and Development

After this point the cells become specialised and form different types of tissue.

Growth and Development

Although body cells in an organism contain the same genes, many genes in a particular cell are not active because it only produces the specific proteins it needs.

In carefully controlled conditions of mammalian cloning, it is possible to reactivate inactive genes in the nucleus of a body cell to form cells of all tissue types.

Adult and embryonic stem cells have the potential to produce cells needed to replace damaged tissues.

Cloning

Growth and Development

New cells in plants specialise into cells of roots, leaves or flowers.

Unlike animal cells some plant cells remain unspecialised and can develop into any type of plant cell.

Growth and Development

Relate the presence of these unspecialised cells to the production of clones of a plant with desirable features, from cuttings.

Cloning

Growth and Development

Unlike animals, most plants continue to grow in height and width throughout their lives.

Growth and Development

Plant meristems divide to produce cells that result in increased height, length of roots, and girth of the plant.

Growth and Development

If the hormonal conditions in their environment are changed, unspecialised plant cells can develop into a range of other tissues (to include xylem and phloem) or organs (to include leaves, roots and flowers).

Plant Growth

How cut stems from a plant can develop roots in the presence of plant hormones (**auxins**) and grow into a complete plant, which is a clone of the parent.

Plant Growth

How phototropism increases the plant's chance of survival.

Plant Growth

Phototropism in terms of the effect of light on the distribution of auxin in a shoot tip.

Plant Growth

B5 – Growth and Development

Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B6 – Brain and Mind	B6.1 How do organisms respond to changes in their environment?	A stimulus is a change in the environment of an organism.		
	Animals respond to stimuli in order to keep themselves in favourable conditions.			Behaviour
	The central nervous system (CNS) coordinates an animal's responses via: - sensory neurons carrying impulses from receptors to the CNS; - motor neurons carrying impulses from the CNS to effectors.	Electrical Signals		
	Receptors and effectors can form part of complex organs, for example: - light receptor cells in the retina of the eye; - hormone secreting cells in a gland; - muscle cells in a muscle.	Electrical Signals		
	In the mammalian nervous system the CNS (brain and spinal cord) is connected to the body via the peripheral nervous system (sensory and motor neurons).			

Biology

Biology				
B6 – Brain and Mind	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B6.2 How is information passed through the nervous system?	Neurons transmit electrical impulses when stimulated.	Electrical Signals		
	In motor neurons the cytoplasm forms a long fibre surrounded by a cell membrane called an axon.	Electrical Signals		
	Some axons are surrounded by a fatty sheath, which insulates the neuron from neighbouring cells and increases the speed of transmission of a nerve impulse.	Electrical Signals		
	There are gaps between adjacent neurons called synapses.	Electrical Signals		
	At the end of a sensory neuron an impulse triggers the release of chemicals into the synapse, which diffuse across and bind to receptor molecules on the membrane of a motor neuron.	Electrical Signals		
	The receptor molecules only bind to specific chemicals, initiating a nerve impulse in the motor neuron.	Electrical Signals		

Biology

Biology					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
B6 – Brain and Mind	B6.3 What are reflex actions?	Simple reflexes produce rapid involuntary responses.	Electrical Signals		Behaviour
		The nervous pathway of a reflex arc.	Electrical Signals		
		Simple reflexes ensure that an animal will respond to a stimulus in a way that is most likely to result in its survival, to include finding food, sheltering from predators and finding a mate.			Behaviour
		Simple animals rely on reflex actions for the majority of their behaviour.			
		The disadvantage of this simple behaviour is that these animals have difficulty responding to new situations.			Behaviour
		Examples of simple reflexes in humans, to include newborn reflexes, pupil reflex.	Electrical Signals		
		A reflex response to a new stimulus can be learned by introducing a secondary stimulus in association with the primary stimulus, e.g. Pavlov's dogs (conditioned reflex action).			Behaviour
		In a conditioned reflex the final response has no direct connection to the stimulus.			Behaviour
		Some conditioned reflexes increase the animal's chances of survival, e.g. rejection by birds of caterpillars with particular colouring.			Behaviour
		In some circumstances the brain can modify a reflex response via a neuron to the motor neuron of the reflex arc, to include keeping hold of a hot dinner plate.			

Biology

	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B6 – Brain and Mind B6.4 How do humans develop more complex behaviour?	Mammals have a complex brain of billions of neurons that allows learning by experience, including social behaviour.			
	During development the interaction between mammals and their environment results in neuron pathways forming in the brain.			
	Learning as the result of experience where certain pathways in the brain will become more likely to transmit impulses than others.			
	This is why some skills may be learnt through repetition.			
	The variety of potential pathways in the brain makes it possible for the animal to adapt to new situations.			
	There is evidence to suggest that children may only acquire some skills at a particular age, to include language development in feral children.			

Biology

B6 – Brain and Mind	B6.5 What do we know about the way in which the brain co-ordinates our senses?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		GCSE Science	Additional Science	Separate Sciences	
	The cerebral cortex is the part of our brain most concerned with intelligence, memory, language and consciousness.				
	A variety of methods have been used by scientists to map the regions of the cortex (including studies of patients with brain damage, studies in which different parts of the brain are stimulated electrically and, more recently, MRI brain scans).				
	Memory as the storage and retrieval of information.				
	Verbal memory can be divided into short-term memory and long-term memory.				
	Humans are more likely to remember information if they can see a pattern in it (or impose a pattern on it), if there is repetition of the information, especially over an extended period of time, or if there is a strong stimulus associated with it, including colour, light, smell, sound.				
	Scientists have produced models for memory but so far none of these has been able to provide an adequate explanation.				

Biology

	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B6 – Brain and Mind	B6.6 How do drugs affect our nervous systems?	Some drugs and toxins affect the transmission of impulses across synapses.	Drug Use and Abuse	
	Ecstasy (MDMA) blocks the sites in the brain's synapses where the chemical serotonin is removed.			
	The mood-enhancing effects of Ecstasy are due to the subsequent increase in serotonin concentration.			

Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B7 – Further Biology B7.1 Living organisms are interdependent	All organisms are ultimately dependent on energy from the Sun.		Energy and Biomass	
	Plants absorb a small percentage of this energy for the process of photosynthesis.		Energy and Biomass Photosynthesis	
	This energy is stored in the chemicals which make up the plant's cells.		Energy and Biomass Photosynthesis	
	Distinguish between autotrophs and heterotrophs in an ecosystem.			
	How energy is transferred between organisms in an ecosystem: - when organisms are eaten; - when dead organisms and waste materials are fed on by decay organisms.		Energy and Biomass Decay and Recycling	Soil and Nutrients
	Draw and interpret pyramids of number and biomass to illustrate feeding relationships in a food chain.		Energy and Biomass	
	Advantages of using each type of pyramid.		Energy and Biomass	
	How energy passes out of a food chain at each stage via heat, waste products and uneaten parts, limiting the length of food chains.		Energy and Biomass	
	Calculate from given data the percentage efficiency of energy transfer at different stages of a food chain.		Energy and Biomass	
	Soil is composed of: - biomass (living organisms and decaying material); - inorganic material; - air; - water (with dissolved mineral ions).			Soil and Nutrients
Calculate percentage water and biomass in soil samples.				

Biology

Biology					
B7 – Further Biology	B7.2 Photosynthesis	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		The equation for photosynthesis: light energy carbon dioxide + water → glucose + oxygen		Photosynthesis Animal and Plant Cells	
		The main stages of photosynthesis: - light energy absorbed by the green chemical chlorophyll; - energy used to rearrange the atoms of carbon dioxide and water to produce glucose (a sugar); - oxygen produced as a waste product.		Photosynthesis	
		Glucose may be: - converted into chemicals needed for growth of plant cells, for example, cellulose, protein, chlorophyll; - converted into starch for storage; - used in respiration to release energy.		Photosynthesis Animal and Plant Cells	
		Starch is a better storage molecule than glucose because it is insoluble and has little effect on the osmotic balance of the cell.			
		Interpret data on the levels of carbon dioxide and oxygen exchanged between a plant and the surrounding atmosphere during a 24 hour period, including the compensation point.			
		The energy released by respiration may be used to synthesise polymers required by the plant cell, to include: - glucose to starch and cellulose; - glucose and nitrates to amino acids and then to proteins.		Photosynthesis	
		Plant roots absorb nitrates by active transport.		Movement In and Out of Cells Transport in Plants	
		Rate of photosynthesis may be limited by low levels of: - temperature; - carbon dioxide; - light intensity.		Photosynthesis	
		Interpret data on limiting factors.		Photosynthesis	
		The limitations of data measuring rate of photosynthesis.			
		Most scientists agree that human activity is causing an increased level of atmospheric carbon dioxide.		Decay and Recycling	

Biology

		Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Syllabus point (text abridged)					
B7 – Further Biology	B7.3 Heterotrophic nutrition	Examples of symbiosis and commensalism.	Competition		
		Parasitism as a close association between two organisms of different species which is beneficial to one (the parasite) and harmful to the other (the host).	Competition		
		Recall two parasites and explain how specific features enable them to be successful.	Competition		
		The importance of parasites: - as causes of human diseases, including malaria; - for their impact on food production (both plants and animals); - understand that the evolution of a parasite is thought to be closely linked to that of its host.			
		Symptoms of sickle-cell anaemia, caused by a faulty recessive allele.		Inherited Diseases	
		Carriers of the sickle-cell allele have some protection from malaria.		Inherited Diseases	
		How natural selection has resulted in an increased frequency of the sickle-cell allele in certain populations.		Inherited Diseases	

Biology					
B7 – Further Biology	B7.4 New technologies	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Structure of bacteria, limited to: - cell wall; - cell membrane; - circular DNA chromosome; - DNA plasmid.			Using Micro-organisms for Food
		Bacteria and fungi can be grown on a large scale (fermentation) to include: - production of antibiotics; - production of single-cell protein; - enzymes for food manufacture, for example, rennin.	Genes and Genetic Engineering	Enzymes	Using Micro-organisms for Food Other Uses for Micro-organisms
		Main steps in genetic modification: - isolating and replicating the required gene; - transferring the gene into a new cell; - use of a vector (virus or plasmid).	Genes and Genetic Engineering		
		Genetic modification includes: - bacterial synthesis of drugs and hormones, for example, insulin; - disease resistance in crop plants.	Genes and Genetic Engineering		
		Economic, social and ethical implications for the release of genetically modified organisms.	Genes and Genetic Engineering		
		Use of DNA technology in genetic testing: - isolating DNA from white blood cells; - production of gene probe; - use of UV or autoradiography to locate gene probe.			

Biology

Biology				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
B7 – Further Biology B7.5 Respiration	Energy is released from food chemicals in the process of respiration.		Animal and Plant Cells Enzymes??	
	Aerobic respiration requires oxygen.		Animal and Plant Cells Enzymes	
	The equation for aerobic respiration: glucose + oxygen → carbon dioxide + water (+ energy released)		Animal and Plant Cells Enzymes	
	Energy released during respiration is used to synthesize a chemical called ATP.		Animal and Plant Cells	
	ATP can be referred to as the “energy currency” of living things.		Animal and Plant Cells	
	Muscle tissue contracts when provided with energy (ATP) from respiration.		Animal and Plant Cells	
	During exercise respiration in muscle cells increases to provide additional energy for movement.			
	Muscle cells require a faster supply of oxygen and glucose and removal of carbon dioxide.			The Heart
	This need is met by increasing heart and breathing rates.			The Heart
	‘Normal’ measurements for factors such as heart rate and blood pressure are given within a range, and individuals vary.	Health and Diet		The Heart
	The word equation for anaerobic respiration in human body cells: glucose → lactic acid (+ energy released)		Animal and Plant Cells	
	Anaerobic respiration takes place in muscle cells when there is a shortage of oxygen and leads to a build up of lactic acid in muscles.		Animal and Plant Cells	
	Oxygen is needed to break down the lactic acid, referred to as the ‘oxygen debt’.		Animal and Plant Cells	
	Aerobic respiration releases more energy per glucose molecule than anaerobic respiration.		Animal and Plant Cells	
	Anaerobic respiration may be advantageous to human beings and other organisms in certain conditions.			

Biology

Biology					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
B7 – Further Biology	B7.6 Circulation	Components of blood and their functions: - red blood cells – transporting oxygen; - white blood cells – fighting infection; - platelets – blood clotting at injury sites;			The Circulatory System
		The ABO blood type system describes: - antigens on the surface of red blood cells; - antibodies in blood plasma.			The Circulatory System
		For blood transfusions the donor and recipient must be matched to avoid clotting.			The Circulatory System
		Interpret compatibility data for the ABO system.			The Circulatory System
		ABO blood type is determined by a single gene with three alleles, A, B and O.		Inheritance	
		A and B are co-dominant, and that O is recessive to both.		Inheritance	
		Draw and interpret genetic diagrams illustrating the inheritance of ABO blood type.		Inheritance	
		Main structures and blood vessels of the heart.			The Heart
		What is meant by a double circulatory system.			The Circulatory System
		The function of valves in the heart and veins.			The Circulatory System The Heart
		Tissue fluid is formed as blood passes through capillary beds.			
		This assists the exchange of chemicals by diffusion between capillaries and tissues, to include oxygen, carbon dioxide, glucose, urea.			

Biology

Biology					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
B7 – Further Biology	B7.7 Skeletal system	Vertebrates have an internal skeleton for support and movement.			Bones and Growth
		The relationship between bones, ligaments, muscles and tendons.			Bones and Growth
		Muscles can only move bones at a joint by contraction and thus operate in antagonistic pairs.			Bones and Growth
		The outline structure of a joint including: - smooth layer of cartilage to prevent the bones rubbing together; - synovial fluid which is oily and helps joint movement.			Bones and Growth
		How the specific properties of ligaments, cartilage and tendons enable them to function effectively.			Bones and Growth
		Factors in a person's medical or lifestyle history that should be disclosed before treatment begins or an exercise regime is started (for example symptoms, current medication, alcohol or tobacco consumption, level of physical activity, family medical history, previous treatments).	Health and Diet		
		Why this information is needed.			
		Advantages of regular contact between health or fitness practitioners and their patients or clients.			
		Why personal medical or fitness information must be recorded, stored and made available to other people on the health or fitness practitioner team.			
		Treatments often have side effects and that these are weighed against the benefits gained.			
		There is often more than one way to achieve an agreed target (enhanced fitness, cure, recovery, rehabilitation).			
		One example of monitoring a person's progress (a) during treatment or fitness training (b) after this is complete.			
		Why accurate record-keeping during treatment or fitness training is essential.			
		Any assessment of progress needs to take into account the accuracy of the monitoring technique and the reliability of the data obtained.			
		Two examples of reasons for modifying a programme before it has been completed.			
		Common injuries that can be caused by excessive exercise, to include sprains, dislocations, torn ligaments or tendons.			
Symptoms and basic treatments for a sprain.					

	The role of the physiotherapist in treatment of skeletal-muscular injury.			
	A set of exercises to treat one such injury.			