		Biology Unit 1			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1a: Human Biology	11.1 How do human bodies respond to changes inside them and to their environment?	The use of hormones to control fertility, including IVF	Hormones		
		Evaluate the claims of manufacturers about sports drinks			
		The nervous system enables humans to react to their surroundings and coordinate their behaviour	Electrical Signals		
		Receptors detect stimuli which include light, sound, changes in position, chemicals, touch, pressure, pain and temperature	Electrical Signals		
		Information from receptors passes along cells (neurones) in nerves to the brain. The brain coordinates the response	Electrical Signals		
		Reflex actions are automatic and rapid. They often involve sensory, relay and motor neurones	Electrical Signals		
		The role of receptors, sensory neurones, motor neurones, relay neurones, synapses and effectors in simple reflex actions	Electrical Signals		
		Internal conditions which are controlled include: – the water content of the body – the ion content of the body – temperature – blood sugar levels	Hormones	Homeostasis	The Kidneys
		Many processes within the body are coordinated by hormones. Hormones are secreted by glands and are transported by the bloodstream	Hormones	Homeostasis	
		Hormones regulate the functions of many organs and cells. The monthly release of an egg from a woman's ovaries and the menstrual cycle are controlled by hormones secreted by the pituitary gland and ovaries	Hormones		
		Several hormones are involved in the menstrual cycle	Hormones		
		The hormones involved in promoting the release of an egg include: – FSH which is secreted by the pituitary gland and causes eggs to mature, and also stimulates the ovaries to produce hormones – oestrogen which is secreted by the ovaries and inhibits the production of FSH as well as stimulating the pituitary gland to produce the hormone, LH	Hormones		
		The hormones used in controlling fertility include: – oral contraceptives containing hormones to inhibit FSH production – giving FSH as a fertility drug to a woman whose own level of FSH is too low to stimulate eggs	Hormones		

		Biology Unit 1			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1a: Human Biology	11.2 What can we do to keep our bodies healthy?	Evaluate information about the effect of food on health	**Health and Diet**		
		Evaluate claims made by slimming programmes			
		A healthy diet contains the right balance of the different foods and the right amount of energy. A person is malnourished if their diet is not balanced. This may lead to being too fat or too thin, and to deficiency diseases	**Health and Diet**		
		The rate at which chemical reactions in the cells of the body are carried out (the metabolic rate) varies with the amount of activity you do and the proportion of muscle to fat in your body. It may be affected by inherited factors	**Health and Diet**		
		The less exercise you take and the warmer it is, the less food you need. People who exercise regularly are usually fitter. If you exercise, your metabolic rate stays high for some time after you have finished	**Health and Diet**	**Homeostasis**	**The Heart**
		In the developed world too much food and too little exercise lead to obesity and the resultant diseases: – arthritis – diabetes – high blood pressure – heart disease	**Health and Diet**		**The Heart**
		Some people in the developing world suffer from health problems linked to lack of food, including: – reduced resistance to infection – irregular periods in women	**Health and Diet**		
		Cholesterol is made by the liver and found in the blood. The amount of cholesterol produced depends on diet and inherited factors. High levels of cholesterol increase the risk of diseases of the heart and blood vessels	**Health and Diet**		
		Cholesterol is carried around the body by two types of lipoproteins. Low-density lipoproteins (LDLs) are 'bad' cholesterol and cause heart disease. High-density lipoproteins (HDLs) are 'good' cholesterol.	**Health and Diet**		**The Heart**
		Saturated fats increase cholesterol levels. Mono-unsaturated and polyunsaturated fats may help to reduce cholesterol levels and to improve the balance between LDLs and HDLs	**Health and Diet** Also see, "**Food Chemistry**" (in *GCSE Chemistry* and *GCSE Science*)		
		Too much salt in the diet can lead to increased blood pressure for about 30% of the population	**Health and Diet**		
		Processed food often contains a high proportion of fat and/or salt	**Health and Diet**		

Biology Unit 1					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1a: Human Biology	11.3 How do we use/abuse medical and recreational drugs?	Evaluate the effect of statins on cardio-vascular disease	Health and Diet		
		Evaluate the different types of drugs and why some people use illegal drugs for recreation	Drug Use and Abuse		
		Evaluate claims about the effect of cannabis on health and the link between cannabis and addiction to hard drugs	Drug Use and Abuse		
		Explain how the link between smoking tobacco and lung cancer gradually became accepted	Drug Use and Abuse		
		Evaluate the different ways of trying to stop smoking			
		Drugs can be beneficial but may harm the body	Drug Use and Abuse		
		Many drugs derived from natural substances have been known to indigenous peoples for many years			
		New drugs need to be thoroughly tested	Drug Use and Abuse		
		When new medical drugs are devised, they have to be extensively tested and trialled. Drugs are tested in the laboratory to find if they are toxic. They are then trialled on human volunteers	Drug Use and Abuse		
		Thalidomide was a sleeping pill. It was also found to be effective in relieving morning sickness, but had not been tested for this use. Many babies born to mothers who took the drug were born with limb abnormalities. The drug was then banned, but is now being used to treat leprosy	Drug Use and Abuse		
		Some recreational drugs are more harmful than others. Some of these drugs are legal, some illegal	Drug Use and Abuse		
		The overall impact of legal drugs on health is greater than the impact of illegal drugs, because more people use them	Drug Use and Abuse		
		People may become dependent or addicted to drugs and suffer withdrawal symptoms without them. Heroin and cocaine are very addictive	Drug Use and Abuse		
		Nicotine is the addictive substance in tobacco smoke. Tobacco smoke contains carcinogens	Drug Use and Abuse		
		Tobacco smoke also contains carbon monoxide which reduces the oxygen-carrying capacity of the blood. This can deprive a fetus of oxygen and lead to a low birth mass	Drug Use and Abuse		
		Alcohol affects the nervous system by slowing reactions and helps people relax. Too much may lead to lack of self-control, unconsciousness or even coma, eventually damaging the liver and brain	Drug Use and Abuse		

Biology Unit 1					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1a: Human Biology	11.4 What causes infectious diseases and how can our bodies defend themselves against them?	Relate the contribution of Semmelweiss in controlling infection to solving modern problems with the spread of infection in hospitals			
		Evaluate the advantages and disadvantages of being vaccinated against a disease	**Infections and Immunity**		
		Explain how the treatment of disease has changed as a result of increased understanding of antibiotics and immunity	**Infections and Immunity**		
		Evaluate the consequences of mutations of bacteria and viruses in relation to epidemics and pandemics eg bird flu	**Infections and Immunity, Evolution**		
		Microorganisms that cause infectious disease are called pathogens	**Infections and Immunity**		
		Bacteria and viruses reproduce rapidly inside the body and may produce poisons (toxins) which make us ill. Viruses damage cells in which they reproduce.	**Infections and Immunity**		
		The body has different ways of protecting itself against pathogens	**Infections and Immunity**		
		White blood cells help to defend against pathogens: – by ingesting pathogens – by producing antibodies which destroy particular bacteria or viruses – by producing antitoxins which counteract toxins	**Infections and Immunity**		
		Some medicines, e.g. painkillers, help relieve the symptoms of infectious disease, but do not kill the pathogens			
		Antibiotics, e.g. penicillin, are medicines that help to cure bacterial disease by killing infective bacteria inside the body	**Infections and Immunity**		
		Antibiotics cannot be used to kill viral pathogens, which live and reproduce inside cells. It is difficult to develop drugs which kill viruses without also damaging the body's tissues			**Other Uses of Micro-organisms**
		Strains of bacteria, e.g. MRSA, have developed resistance to antibiotics through natural selection. It is important to avoid over-use of antibiotics	**Infections and Immunity, Evolution**		
		People can be immunised against a disease by introducing dead/inactive forms of the pathogen into the body (vaccination). Vaccines stimulate white blood cells to produce antibodies. This makes the person immune to future infections by the microorganism, because the body can rapidly make the correct antibody, as if the person had previously had the disease. An example is the MMR vaccine	**Infections and Immunity**		

	Biology Unit 1				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1b: Evolution and Environment	11.5 What determines where particular species live and how many of them are there?	Suggest how organisms are adapted to the conditions in which they live	**Adaptation**		
		Suggest the factors for which organisms are competing in a habitat	**Competition**		
		Suggest reasons for the distribution of animals or plants in a habitat	**Adaptation**		
		To survive, organisms need a supply of materials from their surroundings and from the other living organisms	**Adaptation, Competition**		
		Plants compete with each other for light, water and nutrients	**Competition**		
		Animals compete with each other for food, mates and territory	**Competition**		
		Organisms have adaptations which enable them to survive in the conditions in which they live	**Adaptation**		
		Animals and plants may be adapted for survival in the conditions where they normally live	**Adaptation**		
		Animals and plants may be adapted to cope with specific features of their environment	**Adaptation**		

Biology Unit 1					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1b: Evolution and Environment	11.6 Why are individuals of the same species different from each other? What new methods do we have for producing plants and animals with the characteristics we prefer?	Interpret information about cloning techniques and genetic engineering	Genes and Genetic Engineering, Cloning		
		Make informed judgements about the economic, social and ethical issues about cloning and genetic engineering, including GM crops	Genes and Genetic Engineering		
		The information that results in plants and animals having similar characteristics to their parents is carried by genes, passed on in sex cells from which the offspring develop	Genes and Genetic Engineering	Inheritance	
		Different genes control the development of different characteristics	Genes and Genetic Engineering		
		The nucleus of a cell contains chromosomes. Chromosomes carry genes that control characteristics of the body	Genes and Genetic Engineering		
		There are two forms of reproduction: – sexual reproduction. The mixture of the genetic information from two parents leads to variety in the offspring – asexual reproduction. There is no mixing of genetic information and so no variation in the offspring. These genetically identical individuals are known as clones	Cloning		
		New plants can be produced by taking cuttings from older plants. The new plants are genetically identical to the parent plant	Cloning		
		Modern cloning techniques include: – tissue culture using cells from part of a plant – embryo transplants – splitting apart cells from a developing animal embryo before they become specialised, then transplanting identical embryos into host mothers – fusion cell and adult cell cloning	Cloning		
		In genetic engineering, genes from humans and other organisms can be cut out using enzymes and transferred to cells of other organisms	Genes and Genetic Engineering		
		Genes can be transferred to the cells of animals or plants at an early stage in their development so that they develop with desired characteristics	Genes and Genetic Engineering		

	Biology Unit 1				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1b: Evolution and Environment	11.7 Why have some species of plants and animals died out? How do new species of plants and animals develop?	Suggest reasons why scientists cannot be certain about how life began on Earth	**Evolution**		
		Interpret evidence relating to evolutionary theory	**Evolution**		
		Suggest reasons why Darwin's theory of natural selection was only gradually accepted	**Evolution**		
		Identify the differences between Darwin's theory of evolution and conflicting theories	**Evolution**		
		Suggest reasons for the different theories	**Evolution**		
		Fossils provide evidence of how different organisms have changed since life developed on Earth	**Evolution**		
		The theory of evolution states that all living things evolved from simple life-forms which first developed more than three billion years ago	**Evolution**		
		Studying the similarities and differences between species helps us to understand evolutionary and ecological relationships	**Evolution**		
		Extinction may be caused by: – changes to the environment – new predators – new diseases – new competitors	**Evolution, Competition, Sustainability**		
		Evolution occurs via natural selection: – individuals within a particular species may show a range of variation because of differences in their genes – individuals with characteristics most suited to the environment are more likely to breed successfully – the genes which have enabled these individuals to survive are passed on to the next generation	**Evolution**		
		Where new forms of a gene result from mutation there may be more rapid change in a species	**Evolution**	**Inheritance**	

		Biology Unit 1			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 1b: Evolution and Environment	11.8 How do humans affect the environment?	Analyse and interpret scientific data concerning environmental issues	**Human Impact on the Environment, Sustainability**		
		Weigh evidence and form balanced judgements about major environmental issues facing society, including sustainable development	**Human Impact on the Environment, Sustainability**		
		Evaluate methods of collecting environmental data and consider their validity and reliability as evidence for environmental change	**Human Impact on the Environment, Sustainability**		
		Growth in the human population and an increase in the standard of living means that: – raw materials, including non-renewable energy resources, are rapidly being used up – more waste is produced – unless waste is properly handled, more pollution will be caused	**Human Impact on the Environment, Sustainability**		
		Humans reduce the land available for other animals and plants by building, quarrying, farming and dumping waste	**Human Impact on the Environment, Sustainability**		
		Waste is produced which, unless properly handled, may pollute: – water with sewage, fertiliser or toxic chemicals – air with smoke and gases, e.g. sulfur dioxide which causes acid rain – land with toxic chemicals, e.g. pesticides and herbicides, which wash from land into water	**Human Impact on the Environment**		**Aquatic Ecology**
		Living organisms can be used as indicators of pollution: – lichens can be used as air pollution indicators – invertebrates can be used as water pollution indicators	**Human Impact on the Environment**		**Aquatic Ecology**
		Large scale deforestation, for timber and for agriculture, has: – increased the release of carbon dioxide into the atmosphere (burning and microorganisms) – reduced the rate at which carbon dioxide is removed from the atmosphere by trees	**Human Impact on the Environment**		
		Loss of forest leads to reduction in biodiversity. Some of the organisms that are lost may have been of future use	**Human Impact on the Environment**		
		Increases in cattle and rice fields have increased the amount of methane released into the atmosphere			

		Carbon dioxide and methane in the atmosphere absorb energy radiated by the Earth. Some of this energy is reradiated back to Earth and keeps the Earth warm. Increasing levels of these gases may be causing global warming by increasing the greenhouse effect. An increase in the Earth's temperature of only a few degrees Celsius: – may cause quite big changes in the Earth's climate – may cause a rise in sea level	**Human Impact on the Environment**		
		Improving the quality of life without compromising future generations is known as sustainable development. Planning is needed at local, regional and global levels to manage sustainability	**Sustainability**		

	Biology Unit 2				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.1 What are animals and plants built from?	Relate the structure of different types of cell to their function		Animal and Plant Cells	
		Most human cells and other animal cells have the following parts: – a nucleus – controls the activities of the cell – cytoplasm – where chemical reactions take place – a cell membrane – controls the movement of substances in and out of the cell – mitochondria – where energy is released in respiration – ribosomes –where protein synthesis occurs		Animal and Plant Cells	
		Plant cells also have a cell wall which strengthens the cell. Plant cells often have: – chloroplasts – absorb light energy to make food – a permanent vacuole filled with cell sap		Animal and Plant Cells	
		Chemical reactions inside cells are controlled by enzymes		Animal and Plant Cells, Enzymes	
		Cells may be specialised to carry out a function		Animal and Plant Cells	

	Biology Unit 2				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.2 How do dissolved substances get into and out of cells?	Dissolved substances can move into and out of cells by diffusion and osmosis		Movement In and Out of Cells	
		Diffusion is the spreading of the particles of a gas, or of any substance in solution, resulting in a net movement from a region where they are of a higher concentration. The greater the difference in concentration, the faster the rate of diffusion. Oxygen for respiration passes through cell membranes by diffusion		Movement In and Out of Cells	
		Water often moves across boundaries by osmosis. Osmosis is the diffusion of water from a dilute to a more concentrated solution through a partially permeable membrane		Movement In and Out of Cells	
		Differences in the concentrations of the solutions inside and outside a cell cause water to move into or out of the cell by osmosis		Movement In and Out of Cells	

	Biology Unit 2				
		Syllabus point (text abridged)	Boardworks presentation		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.3 How do plants obtain the food they need to live and grow?	Interpret data on factors affecting the rate of photosynthesis. Evaluate the benefits of artificially manipulating the environment in which plants are grown		**Photosynthesis, Energy and Biomass**	
		Photosynthesis equation: carbon dioxide + water (+ light energy) → glucose + oxygen		**Photosynthesis**	
		During photosynthesis: – light energy is absorbed by chlorophyll which is found in chloroplasts – this energy is used by converting carbon dioxide and water into glucose – oxygen is released as a by-product		**Photosynthesis**	
		The rate of photosynthesis may be limited by: – low temperature – shortage of carbon dioxide – shortage of light		**Photosynthesis**	
		Light, temperature and the availability of carbon dioxide interact. Any one of them may be the factor that limits photosynthesis		**Photosynthesis**	
		The glucose produced in photosynthesis may be converted into starch for storage. Plants use some of the glucose produced during photosynthesis for respiration		**Photosynthesis**	
		Plant roots absorb mineral salts including nitrates needed for healthy growth. For health, plants need mineral ions including: – nitrates (for producing amino acids and proteins) – magnesium (needed for chlorophyll production)		**Plant Growth**	
		The symptoms shown by plants growing in conditions where mineral ions are deficient include: – stunted growth if nitrate ions are deficient – yellow leaves if magnesium ions are deficient.		**Plant Growth**	

		Biology Unit 2			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.4 What happens to energy and biomass at each stage in a food chain?	Interpret pyramids of biomass and construct them from information		**Energy and Biomass**	
		Evaluate the positive and negative effects of managing food production and distribution. Be able to recognise that practical solutions to human needs may require compromise		**Energy and Biomass**	
		Radiation from the Sun is the source of energy for most living organisms. Green plants capture some solar energy which reaches them. This energy is stored in the substances which make up the cells of the plants		**Energy and Biomass, Photosynthesis**	
		The biomass at each stage in a food chain is less than it was at the previous stage. The biomass at each stage can be drawn to scale as a pyramid of biomass		**Energy and Biomass**	
		At each stage in a food chain, less material and less energy are contained in the biomass of the organisms. The efficiency of food production can be improved by reducing the number of stages in food chains		**Energy and Biomass**	
		The efficiency of food production can be improved by restricting energy loss from food animals by limiting their movement and by controlling the temperature		**Energy and Biomass**	
		The amounts of material and energy in the biomass of organisms is reduced at each successive stage in a food chain because: – some materials and energy are lost in the organisms (waste materials) – respiration supplies the energy needs for living processes, e.g. movement. Much of this energy is eventually lost as heat – these losses are especially large in mammals and birds whose bodies must be kept at a constant temperature, higher than that of their surroundings		**Energy and Biomass**	

		Biology Unit 2			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.5 What happens to the waste material produced by plants and animals?	Living things remove materials from the environment for growth and other processes. These materials return to the environment in waste materials or though death and decay.		Decay and Recycling	Soil and Nutrients
		Materials decay because they are broken down by microorganisms. Microorganisms digest materials faster in warm, moist conditions. Many microorganisms are more active when there is plenty of oxygen.		Decay and Recycling	
		The decay process releases substances which plants need to grow.		Decay and Recycling	Soil and Nutrients
		In a stable community, the processes which remove materials are balanced by processes which return them. The materials are constantly cycled.		Decay and Recycling	Soil and Nutrients
		The constant cycling of carbon is called the carbon cycle. In the carbon cycle: – carbon dioxide is removed from the environment by green plants for photosynthesis. The carbon is used to make carbohydrates, fats and proteins in the body of plants – some carbon dioxide is returned to the atmosphere when green plants respire – Some of the carbon becomes part of the fats and proteins which make up animals through being eaten – when animals respire some of this carbon is released into the atmosphere as carbon dioxide – when plants and animals die, animals and micro-organisms feed on their bodies. Carbon is released as carbon dioxide when these organisms respire – by the time the microorganisms and detritus feeders have broken down waste products and dead bodies of organisms in ecosystems and cycled the materials as plant nutrients, all the energy originally captured by green plants has been transferred.		Decay and Recycling	

		Biology Unit 2			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.6 What are enzymes and what are some of their functions?	Evaluate the advantages and disadvantages of using enzymes in home and industry		Enzymes	
		Catalysts increase the rate of chemical reactions. Biological catalysts are called enzymes		Enzymes	
		Enzymes are protein molecules made up of long chains of amino acids. These chains are folded to produce a special shape which other molecules fit into. This shape is vital for the enzymes function. High temperatures destroy its shape. Different enzymes work best at different pH values		Enzymes	
		Enzymes inside living cells catalyse processes such as respiration, protein synthesis and photosynthesis		Animal and Plant Cells, Enzymes	
		During aerobic respiration reactions occur which: – use glucose and oxygen – release energy		Animal and Plant Cells	
		Most of the reactions in aerobic respiration take place inside mitochondria		Animal and Plant Cells	
		Aerobic respiration equation: glucose + oxygen → carbon dioxide + water (+ energy)		Animal and Plant Cells, Enzymes	
		The energy released during respiration is used: – to build up larger molecules using smaller ones – to enable muscles to contract – to maintain a steady body temperature in colder surroundings – to build up sugars, nitrates and other nutrients into amino acids which are then built up into proteins		Animal and Plant Cells	
		Enzymes in living cells catalyse the reactions that build up amino acids and proteins		Enzymes	

		Some enzymes work outside the body. Digestive enzymes are produced by specialised cells in glands and in the gut. The enzymes pass out of the cells into the gut where they come into contact with food molecules. They catalyse the breakdown of large molecules into smaller molecules: – amylase is produced in the salivary glands, the pancreas and the small intestine. It catalyses the breakdown of starch into sugars in the mouth and small intestine – protease enzymes are produced by the stomach, the pancreas and the small intestine. They catalyse the breakdown of proteins into amino acids in the stomach and the small intestine – lipase enzymes are produced by the pancreas and small intestine. They catalyse the breakdown of lipids into fatty acids and glycerol in the small intestine – the stomach produces hydrochloric acid. Stomach enzymes work most effectively in these acid conditions – the liver produces bile which is stored in the gall bladder before being released into the small intestine. Bile neutralises the acid that was added in the stomach. This provides alkaline conditions in which enzymes in the small intestine work most effectively	**Health and Diet**	**Enzymes**	
		Some microorganisms produce enzymes which pass out of the cells. These enzymes are used in the home and in industry		**Enzymes**	
		Biological detergents may contain protein-digesting and fat-digesting enzymes (proteases and lipases)		**Enzymes**	
		In industry: – proteases are used to ‘pre-digest’ protein in baby foods – carbohydrases are used to convert starch into sugar syrup – isomerase is used to convert glucose syrup to fructose syrup which is sweeter and therefore can be used in smaller quantities in slimming foods		**Enzymes**	

		Biology Unit 2			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.7 How do our bodies keep internal conditions constant?	Evaluate data from experiments by Banting and Best which led to the discovery of insulin	Hormones		
		Evaluate modern methods of treating diabetes.	Hormones		
		Waste products which have to be removed from the body include: – carbon dioxide produced by respiration – most of this leaves the body via the lungs when we breathe out – urea produced in the liver by the breakdown of excess aminoacids – this is removed by the kidneys in the urine, which is temporarily stored in the bladder.		Movement In and Out of Cells Homeostasis	The Kidneys
		Internal conditions which are controlled include the water content and ion content of the body, temperature and blood sugar levels.	Hormones	Movement In and Out of Cells Homeostasis	The Kidneys
		If the water or ion content of the body is wrong, too much water may move into or out of cells and damage them. Water and ions enter the body through eating and drinking.		Movement In and Out of Cells	
		Sweating helps to cool the body. More water is lost when it is hot, and more water has to be taken as drink or in food to balance this loss.		Homeostasis	
		Body temperature is monitored and controlled by the thermoregulatory centre in the brain. This centre has receptors sensitive to the temperature of blood flowing through the brain. Temperature receptors in the skin send impulses to the centre giving information about skin temperature.		Homeostasis	
		HT If the core body temperature is too high: – blood vessels supplying the skin capillaries dilate so that more blood flows through the capillaries and more heat is lost – sweat glands release more sweat which cools the body as it evaporates.		Homeostasis	
		HT If the core body temperature is too low: – blood vessels supplying skin capillaries constrict to reduce the flow of blood through the capillaries – muscles may 'shiver' – their contraction needs respiration which releases some energy as heat.		Homeostasis	
		The blood glucose concentration of the body is monitored and controlled by the pancreas. The pancreas produces the hormone insulin which allows glucose to move from the blood into the cells.	Hormones	Homeostasis	
		Diabetes is a disease in which a person's blood glucose concentration may rise to a fatally high level because the pancreas does not produce enough of the hormone insulin. Diabetes may be treated by careful attention to diet and by injecting insulin into the body.	Hormones		

		Biology Unit 2			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 2	12.8 Which human characteristics show a simple pattern of inheritance?	Explain why Mendel proposed the idea of separately inherited factors and why the importance of this discovery was not recognised until after his death		Inheritance	
		Interpret genetic diagrams		Inheritance	
		Make informed judgements about the social and ethical issues concerning the use of stem cells from embryos in medical research and treatments	Cloning	Growth and Development	
		Make informed judgements about the economic, social and ethical issues concerning embryo screening that has been studied or from information that is presented	Genes and Genetic Engineering		
		HT Predict and/or explain the outcome of crosses between individuals for each possible combination of dominant and recessive alleles of the same gene		Inheritance	
		HT Construct genetic diagrams.		Inheritance	
		Chromosomes are normally found in pairs in body cells. Body cells divide by mitosis to produce additional cells during growth or to produce replacement cells. Body cells have two sets of genetic information; sex cells (gametes) have only one set.		Cell Division	
		HT Cells in reproductive organs – testes and ovaries in humans - divide to form gametes.		Cell Division	
		HT Cell division in which a cell divides to form gametes is called meiosis. When a cell divides to form gametes: – copies of the chromosomes are made – the cell then divides twice to form four gametes, each with a single set of chromosomes.		Cell Division	
		When gametes join at fertilisation, a single body cell with new pairs of chromosomes is formed. A new individual then develops by this cell repeatedly dividing by mitosis.		Cell Division	
		Most types of animal cells differentiate at an early stage whereas many plant cells retain the ability to differentiate throughout life. In mature animals, cell division is mainly restricted to repair and replacement. Cells from human embryos and adult bone marrow, called stem cells, can be made to differentiate into many different types of cells e.g. nerve cells. Treatment with these cells may help conditions such as paralysis.		Growth and Development	
		Cells of offspring produced by asexual reproduction are produced by mitosis from the parental cells. They contain the same genes as the parents.		Cell Division	

		Sexual reproduction gives rise to variation because, when gametes fuse, one of each pair of alleles comes from each parent.		**Cell Division**	
		In human body cells, one of the 23 pairs of chromosomes carries the genes which determine sex. In females the sex chromosomes are the same (XX) in males the sex chromosomes are different (XY).		**Inheritance**	
		Some characteristics are controlled by a single gene. Each gene may have different forms called alleles.		**Inheritance**	
		An allele which controls the development of a characteristic when it is present on only one of the chromosomes is a dominant allele.		**Inheritance**	
		An allele which controls the development of characteristics only if the dominant allele is not present is a recessive allele.		**Inheritance**	
		Chromosomes are made up of large molecules of DNA (deoxyribose nucleic acid). A gene is a small section of DNA	**Genes and Genetic Engineering**	**Cell Division**	
		HT Each gene codes for a particular combination of amino acids which make a specific protein.	**Genes and Genetic Engineering**	**Animal and Plant Cells**	
		Each person (apart from identical twins) has unique DNA. This can be used to identify individuals in a process known as DNA fingerprinting.			
		Some disorders are inherited: – Huntington's disease – a disorder of the nervous system – is caused by a dominant allele of a gene and can therefore be passed on by only one parent who has the disorder – cystic fibrosis – a disorder of cell membranes – must be inherited from both parents. The parents may be carriers of the disorder without having the disorder themselves. It is caused by a recessive allele of a gene and can therefore be passed on by parents, neither of whom has the disorder.		**Inherited Diseases**	
		Embryos can be screened for the alleles that cause these and other genetic disorders	**Genes and Genetic Engineering**		

Biology Unit 3					
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.1 How do dissolved substances get into and out of plants and animals?	How gas and solute exchange surfaces in humans and other organisms are adapted to maximise effectiveness.		Movement In and Out of Cells	
		Dissolved substances move by diffusion		Movement In and Out of Cells	
		HT Substances are sometimes absorbed against a concentration gradient. This requires use of energy from respiration. The process is called active transport. It enables cells to absorb ions from very dilute solutions. Other substances, such as sugar and ions, can also pass through cell membranes.		Movement In and Out of Cells	
		Many organ systems are specialised for exchanging materials.		Movement In and Out of Cells	The Kidney The Circulatory System
		In humans: – the surface area of the lungs is increased by alveoli – and that of the small intestine by villi.		Movement In and Out of Cells	
		The lungs are in the upper part of the body (thorax) protected by the ribcage and separated from the lower part of the body (abdomen) by the diaphragm.			
		The breathing system takes air into and out of the body so that oxygen from the air can diffuse into the bloodstream and carbon dioxide can diffuse out of the bloodstream into the air.		Movement In and Out of Cells	
		Alveoli provide a very large, moist surface, richly supplied with blood capillaries so that gases can readily diffuse into and out of the blood.		Movement In and Out of Cells	
		Villi provide a large surface area with an extensive network of capillaries to absorb the products of digestion by diffusion and active transport.		Movement In and Out of Cells	
		In plants: – carbon dioxide enters leaf cells by diffusion – most of the water and mineral ions are absorbed by root hair cells.		Transport in Plants	
		Surface area of roots is increased by root hairs and surface area of leaves by the flattened shape and internal air spaces.		Transport in Plants	
		Plants have stomata to obtain carbon dioxide from the atmosphere.		Transport in Plants	
		Plants lose water vapour from leaves, this is called transpiration. Transpiration is more rapid in hot, dry and windy conditions. Most transpiration is through stomata. Size of stomata is controlled by guard cells. If plants lose water faster than it is replaced by the roots, the stomata can close to prevent wilting.		Transport in Plants	

	Biology Unit 3				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.2 How are dissolved materials transported around the body?	The heart pumps blood around the body. Blood flows from the heart to the organs through arteries and returns through veins. In the organs, blood flows through capillaries. Substances needed by cells in the body tissues pass out of the blood, and substances produced by the cells pass into the blood through the walls of the capillaries.			**The Circulatory System**
		There are two separate circulation systems, one to the lungs and one to all the other body organs.			**The Circulatory System**
		Blood plasma transports: – carbon dioxide from organs to the lungs – soluble products of digestion from the small intestine to other organs – urea from the liver to the kidneys.			**The Circulatory System** **The Kidneys**
		Red blood cells transport oxygen from the lungs to organs. Red blood cells have no nucleus. They are packed with a red pigment, haemoglobin. In the lungs haemoglobin combines with oxygen to form oxyhaemoglobin. In other organs oxyhaemoglobin splits up into haemoglobin and oxygen.			**The Circulatory System**

		Biology Unit 3			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.3 How does exercise affect the exchanges talking place within the body?	Interpret data relating to the effects of exercise on the human body.			The Heart
		Energy released during respiration is used to enable muscles to contract.		Animal and Plant Cells	
		During exercise a number of changes take place: – the heart rate increases – rate and depth of breathing increases – arteries supplying the muscles dilate.			The Heart
		These changes increase blood flow to muscles and so increase the supply of sugar and oxygen and increase rate of removal of carbon dioxide.			The Heart
		Glycogen stores in the muscle are used during exercise.			
		Muscles subjected to long periods of vigorous activity become fatigued, i.e. they stop contracting efficiently. If insufficient oxygen is reaching the muscles they use anaerobic respiration to obtain energy.		Animal and Plant Cells	
		HT Anaerobic respiration is the incomplete breakdown of glucose and produces lactic acid. As the breakdown of glucose is incomplete, much less energy is released than during aerobic respiration. Anaerobic respiration results in an oxygen debt that has to be repaid in order to oxidise lactic acid to carbon dioxide and water.		Animal and Plant Cells	

		Biology Unit 3			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.4 How do exchanges in the kidney help us to maintain the internal environment in mammals and how has biology helped us to treat kidney disease?	Evaluate the advantages and disadvantages of treating kidney failure by dialysis or kidney transplant.			**The Kidneys**
		A healthy kidney produces urine by: – first filtering the blood – reabsorbing all the sugar – reabsorbing the dissolved ions needed by the body – reabsorbing as much water as the body needs – releasing urea, excess ions and water as urine			**The Kidneys**
		HT Sugar and dissolved ions may be actively absorbed against a concentration gradient.		**Movement In and Out of Cells**	**The Kidneys**
		People who suffer from kidney failure may be treated by using a kidney dialysis machine or by having a healthy kidney transplanted.			**The Kidneys**
		In a dialysis machine a person's blood flows between partially permeable membranes. Dialysis fluid contains the same concentration of useful substances as blood. This ensures that glucose and useful mineral ions are not lost. Urea passes out from the blood into dialysis fluid. Treatment by dialysis restores concentrations of dissolved substances in the blood to normal levels and has to be carried out at regular intervals.			**The Kidneys**
		A kidney transplant enables a diseased kidney to be replaced with a healthy one from a donor. However, the donor kidney may be rejected by the immune system unless precautions are taken.			**The Kidneys**
		To prevent rejection of the transplanted kidney: – a donor kidney with a 'tissue-type' similar to the recipient is used – the recipient is treated with drugs that suppress the immune system.			**The Kidneys**

	Biology Unit 3				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.5 How are micro-organisms used to make food and drink?	Explain how scientists such as Spallanzani, Schwann and Pasteur were involved in the development of the theory of biogenesis.			**Using Micro-organisms for Food**
		Microorganisms are used to make food and drink: – bacteria are used in yoghurt and cheese manufacture – yeast is used in making bread and alcoholic drinks.		**Enzymes**	**Using Micro-organisms for Food**
		Yeast is a single-celled organism. Cells have a nucleus, cytoplasm and a membrane surrounded by a cell wall.			**Using Micro-organisms for Food**
		Yeast can respire without oxygen (anaerobic respiration), producing carbon dioxide and ethanol (alcohol). This is called fermentation. In the presence of oxygen yeast carries out aerobic respiration and produces carbon dioxide and water. Aerobic respiration provides more energy and is necessary for yeast to grow and reproduce.			**Using Micro-organisms for Food**
		In brewing beer and wine-making, carbohydrates are used as an energy source for yeast to respire. For making beer: – starch in barley grains is broken down into a sugary solution by enzymes in the germinating grains, a process called malting – the sugary solution is extracted then fermented – hops are added to give the beer flavour.			**Using Micro-organisms for Food**
		In wine-making the yeast uses natural sugars in the grapes as its energy source.			**Using Micro-organisms for Food**
		In the production of yoghurt: – a starter of bacteria is added to warm milk – the bacteria ferment the milk sugar (lactose) producing lactic acid – lactic acid causes the milk to clot and solidify into yoghurt.			**Using Micro-organisms for Food**

		Biology Unit 3			
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
Biology 3	13.6 What other useful substances can we make using microorganisms?	Interpret economic and environmental data relating to production of fuels by fermentation and their use.		Energy and Biomass	Other Uses for Micro-organisms
		Evaluate the advantages and disadvantages of given designs of biogas generator.			Other Uses for Micro-organisms
		Microorganisms can be grown in large vessels called fermenters to produce useful products such as antibiotics. Industrial fermenters usually have: – an air supply providing oxygen for respiration of the microorganisms – a stirrer to keep the microorganisms in suspension and maintain an even temperature – a water-cooled jacket to remove heat produced by the respiring microorganisms – instruments to monitor factors such as pH and temperature.	Genes and Genetic Engineering		Other Uses for Micro-organisms
		The antibiotic, penicillin, is made by growing the mould *Penicillium*, in a fermenter. The medium contains sugar and other nutrients e.g. a source of nitrogen. *Penicillium* only starts to make penicillin after using up most of the nutrients for growth.			Other Uses for Micro-organisms
		The fungus *Fusarium* is used to make mycoprotein, a protein-rich food suitable for vegetarians. The fungus is grown on starch in aerobic conditions and the biomass is harvested and purified			Using Micro-organisms for Food
		Fuels can be made from natural products by fermentation. Biogas, mainly methane, can be produced by anaerobic fermentation of a range of plant products or waste material containing carbohydrates.			Other Uses for Micro-organisms
		On a large scale, waste from, for example, sugar factories or sewage works can be used. On a small scale, biogas generators can be used to supply the energy needs of individual families or farms. Many different microorganisms are involved in the breakdown of materials in biogas production.			Other Uses for Micro-organisms
		Ethanol-based fuels can be produced by anaerobic fermentation of sugar cane juices and from glucose derived from maize starch by carbohydrase. Ethanol is distilled from the products of fermentation and can be used in motor vehicle fuels.			Other Uses for Micro-organisms

Biology 3	Biology Unit 3				
		Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
	13.7 How can we be sure we are using micro-organisms safely?	Microorganisms can be grown in culture medium containing carbohydrates as an energy source, mineral ions, and in some cases supplementary protein and vitamins. These nutrients are often contained in an agar medium which can be poured into a Petri dish.			**Other Uses for Micro-organisms**
		To prepare useful products, uncontaminated cultures of microorganism are required. For this: – Petri dishes and culture media must be sterilised before use to kill unwanted microorganisms – inoculating loops used to transfer microorganisms to the media must be sterilised by passing them through a flame – the lid of the Petri dish should be taped down to prevent microorganisms from air contaminating the culture.			
		In school and college laboratories, cultures should be incubated at a maximum temperature of 25 ˚C which greatly reduces the likelihood of pathogens growing that might be harmful to humans. In industrial conditions higher temperatures can produce more rapid growth.			