Science

We intend to equip our young people with the knowledge needed to understand the world and technology around them. We aim to encourage a curiosity in the natural, physical and chemical world around them; and to foster critical thinking. We strive to provide our young people with a chance to broaden their horizons and provide multiple routes into STEM careers.

Year 13 A Level Biology

Terms One and Two

Content of study	Energy transfers in and between organisms and Genetics, populations, evolution and ecosystems
What are the aims and objectives of this term?	• Explain how to extract photosynthetic pigments from leaves and separate them using chromatography. • Identify photosynthetic pigments found in leaves of different plants. • Describe the structure of chloroplasts. • Explain where, specifically, the light-dependent reaction occurs. • Explain the role of light in photolysis and photoionisation. • Explain how photoexcited electrons move along the electron transfer chain, and how ATP and reduced NADP are produced. • Explain chemiosmosis and the role of ATP synthase in producing ATP. Explain where the light-independent reaction occurs. • Describe the Calvin cycle. • Explain the roles of reduced NADP and ATP. • Interpret experimental data about the light independent reaction. • Design an experiment to investigate the effect of a named factor on the rate of the reaction catalysed by dehydrogenase. • Process data to calculate rates. • Represent raw and processed data clearly using tables and graphs. • Explain why scientists carry out statistical tests. • Calculate an appropriate statistical test and interpret values in terms of probability and chance. • Apply knowledge to draw and explain conclusions. • Evaluate the results conclusions. • Explain what is meant by limiting factors. • Identify environmental factors that limit the rate of photosynthesis. • Interpret graphs showing the rate of photosynthesis and explain graphs in terms of which factors are rate limiting. • Explain how farmers seek to maximise crop growth through knowledge of rate limiting factors, and how this is a balance between cost vs profit. • Evaluate data relating to common agricultural practices used to overcome the effect of these limiting factors. • Know where the different stages of aerobic respiration occur. • Explain the significance of the oxidation reactions involved in glycolysis, the link reaction and the Krebs cycle. • Explain the roles of coenzymes and reduced NAD in respiration. • Describe the process of electron transfer associated with oxidative phosphorylation. • Explain chemiosmosis and the role of ATP synthase in producing ATP. • Apply knowledge to explain trends in data.

	• Describe the process of anaerobic respiration in animals and some microorganisms. • Explain the advantage of producing ethanol or lactate using reduced NAD. • Compare and contrast aerobic and anaerobic respiration. • Interpret information/data about anaerobic respiration and apply knowledge. • Design an experiment to investigate the effect of a named factor on a culture of single-celled organisms. • Process data to calculate rates. • Represent raw and processed data clearly using tables and graphs. • Calculate an appropriate statistical test and interpret values in terms of probability and chance. • Apply knowledge to draw and explain conclusions. • Evaluate the results and conclusions. • Explain how plants utilise the sugars from photosynthesis. • Explain what is meant by biomass and how it can be measured. • Suggest units for biomass. • Explain the process of calorimetry. • Evaluate the accuracy of results from simple calorimetry. • Explain the concepts of gross primary production and net primary production. • Understand the mathematical relationship between the two and use it to calculate values when supplied with data. • Explain the reduction in energy/biomass along a food chain. • Explain the concept of net production in consumers, linked to how energy losses occur along food chains. • Apply knowledge to the context of exam questions. • Explain the ways in which production is affected by simplifying food webs. • Explain the ways in which farmers are reducing respiratory losses within a human food chain. • Interpret and calculate data on efficiency when provided with appropriate information. • Evaluate the ethics of some of these farming practices. • Describe the stages of the phosphorus cycle, and the ions at each stage. • Explain the role of saprobionts and mycorrhizae in the phosphorus cycle. • Interpret information/data about the phosphorus cycle and apply knowledge. • Describe the stages of the nitrogen cycle, and the ions/ molecules at each stage. • Explain the processes of saprobiotic nutrition, ammonification, nitrification, nitrogen fixation and denitrification within the nitrogen cycle. • Explain the role of saprobionts and mycorrhizae in the nitrogen cycle. • Interpret information/data about the nitrogen cycle and apply knowledge. • Explain why farmers utilise natural and artificial fertilisers. • Explain how eutrophication is caused, and what the impact is on the ecosystem in which it happens. • Interpret information/data about eutrophication and apply knowledge. • Recall the key features of good experimental design. • Apply knowledge to design a valid experiment to test the effect of named mineral ions on plant growth. **<u>Genetics, populations, evolution and ecosystems</u>**

	Explain the meaning of the key terms: • gene • allele • genotype • phenotype • homozygous • heterozygous. • Define what is meant by dominant and recessive alleles and describe how to represent these. • Draw genetic diagrams of dominant/recessive monohybrid crosses to predict offspring genotypes and phenotypes. Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring when supplied with appropriate information. • Explain what the chi-squared test is used for. • Set a null hypothesis. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret chi-squared tests in terms of probability and chance. • Define what is meant by codominant alleles and describe how to represent these. • Draw genetic diagrams of codominant monohybrid crosses to predict offspring genotypes and phenotypes. • Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared tests in terms of probability and chance. • Describe how to represent alleles in crosses involving multiple alleles. • Draw genetic diagrams to predict offspring genotypes and phenotypes. • Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared • tests in terms of probability and chance. • Explain what is meant by sex-linked genes and describe how to represent these. • Draw genetic diagrams of sex-linked crosses to predict offspring genotypes and phenotypes. • Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared tests in terms of probability and chance.

	• Draw genetic diagrams of dihybrid crosses to predict offspring genotypes and phenotypes. • Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared tests in terms of probability and chance. • Apply knowledge to calculate the predicted frequencies of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared tests in terms of probability and chance. • Apply knowledge to calculate the predicted ratios of genotypes and phenotype of offspring, using fully labelled diagrams, when supplied with appropriate information. • Use the chi-squared test to compare observed values against those predicted from genetic crosses. • Interpret P values from chi-squared tests in terms of probability and chance. • Define what is meant by the term 'population'. • Explain what is meant when we refer to allele frequencies and a gene pool. • Explain why some genotypes cannot be determined by looking at phenotypes. • Explain what the Hardy-Weinberg principle predicts. • Explain the conditions under which Hardy-Weinberg principle is valid. • Describe and explain the mathematical equations used to express allele and genotype frequencies. • Apply knowledge of the Hardy-Weinberg equation to the data given in a question to calculate the frequency of an allele or genotype • Explain why individuals within a population of a species may show a wide range of variation in phenotype. • Describe variation based on trends in graphs and link this to the causes of variation. • Explain what is meant by selection. • Explain how natural selection is linked to inheritance of alleles by the next generation and adaptation. • Explain the concept of differential reproductive success. • Apply your knowledge to explain data. • Recall what is meant by allele frequency. • Explain what is meant by stabilising, directional and disruptive selection in the context of the effect that each has on phenotypes and allele frequencies. • Explain what is meant by allopatric and sympatric speciation. • Explain how natural selection and isolation may result in change in the allele and phenotype frequency and lead to the formation of a new species by allopatric speciation and sympatric speciation. • Explain possible mechanisms for sympatric speciation. • Apply knowledge to unfamiliar contexts. • Explain how evolutionary change over a long period of time has resulted in a great diversity of species. • Explain the process of genetic drift and its impact on allele frequencies.

	• Explain how genetic drift differs from natural selection. • Explain why genetic drift is important only in small populations. • Define the terms community, biotic, abiotic, ecosystem and niche. • Explain what is meant by the carrying capacity of a population, and the biotic and abiotic factors which determine population size. • Explain how some common abiotic factors could be measured. • Explain why no two species have exactly the same niche. • Describe and explain the techniques of sampling at random using quadrats, and systematic sampling using transects. • Explain when it would be appropriate to use each technique. • Describe the different measures of abundance that can be measured. • Explain how sampling at random can be done to avoid bias. • Explain how to ensure that estimates and conclusions are reliable. • Explain the technique of mark-release-recapture and when it would be appropriate to use this technique. • Use given data to calculate the size of a population estimated using the mark-release-recapture method. • Explain why careful consideration must be given to the method used to mark animals. • Explain the assumptions which must be made during mark-release-recapture. • Propose a null hypothesis to test. • Design an experiment to investigate the effect of a named factor on the distribution of a given species, taking into account the need for data to be reliable. • Suggest what you will do for variables which cannot be controlled. • Represent raw and processed data clearly using tables and graphs. • Select and use an appropriate statistical test and interpret the P value that results in terms of probability and chance. • Apply knowledge to draw and explain conclusions. • Explain what succession is. • Explain how succession causes changes to ecosystems over time. • Explain the impact of environmental changes on biodiversity. • Apply knowledge to unfamiliar contexts. • Use their knowledge and understanding to present scientific arguments and ideas relating to the conservation of species and habitats. • Evaluate evidence and data concerning issues relating to the conservation of species and habitats and consider conflicting evidence. • Know that management of succession can involve preventing succession occurring to maintain a desired community.
What previous knowledge is required?	• During photosynthesis, light is absorbed by chlorophyll and used to convert carbon dioxide and water to glucose and oxygen. • The rate of photosynthesis may be limited by shortage of light, carbon dioxide or low/high temperature. • Graphs can be interpreted showing how factors affect the rate of photosynthesis. • There are benefits to artificially manipulating the environment in which plants are grown but these must be evaluated. • Respiration is an enzyme catalysed process. • Aerobic respiration is mainly carried out within the mitochondria.

	• During aerobic respiration, glucose and oxygen react to produce carbon dioxide and water. Energy is released in this process. • The energy released during respiration is used to synthesise larger molecules, contract muscles (in animals), maintain a constant body temperature (birds and mammals) and produce amino acids (in plants). • Anaerobic respiration releases less energy and is used when insufficient oxygen reaches the muscles. • Glucose is not completely broken down and produces lactic acid. This causes muscle fatigue. An oxygen debt has to be repaid in order to oxidise the lactic acid into glucose and water. • Green plants and algae absorb a small amount of the light that reaches them. The transfer from light energy to chemical energy occurs during photosynthesis. This energy is stored in the substances that make up the cells of the plants. • The amount of material and energy contained with the biomass decreases at each successive stage in a food chain. This can be represented using a pyramid of biomass. This reduction is due to energy losses through waste and processes linked to respiration eg movement. Much of this energy is eventually transferred to the surroundings. • When gametes join, one of each allele in a pair comes from each parent. • Some characteristics are controlled by one gene, which might have different alleles. • The allele which controls the development of a characteristic even if they are only present on one chromosome is called the dominant allele. • The allele which controls the development of a characteristic only when the dominant allele is not present is called the recessive allele. • Some disorders are inherited. These include polydactyly, which is caused by a dominant allele, and cystic fibrosis which is a recessive disorder. • Genetic diagrams are biological models which can be used to predict the outcomes of genetic crosses. • Differences between individuals may be due to the genes they have inherited, the environment or a combination of the two. • Plants often compete for light, water, space and minerals. Animals often compete for food, mates and territory. • Organisms have adaptations which enable them to survive in the conditions in which they normally live. • Darwin's theory of evolution by natural selection states that all life evolved from simple organisms that developed three billion years ago. • Physical factors which affect organisms include: light; temperature; water availability; nutrient availability; carbon dioxide and oxygen availability. • Quantitative data on the distribution of organisms can be obtained by random sampling with quadrats or sampling along a transect. • Evaluation of methods used to collect environmental data, including understanding of the terms mean, median and mode and understanding that the sample size affects validity and reproducibility.
How will this term's content help with future learning?	Continuation from the AS, informs remainder of A2, no further learning unless a Bio Science degree course is chosen.
Resources	Revision guides, Kerboodle on-line textbook https://www.kerboodle.com

	YouTube – crash course biology - (15) Biology - YouTube AQA | Resources | Past Papers & AQA Mark Schemes Required practicals https://youtu.be/P6VRvQ7p2mk?si=CYgb7W6CAiDrCb6z (31) Primrose Kitten Academy | GCSE & A-Level Revision - YouTube Google NotebookLM | Note Taking & Research Assistant Powered by AI https://www.briskteaching.com
Links to the national curriculum/specification	*https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF*
Assessments	End of topic tests. Students are informed ahead of time what exact spec points are to be tested in each paper. Marked and annotated by teachers and a U-A grade awarded. Cumulative tests will be set on a regular basis without warning.
Terms Three and Four	
Content of study	Organisms respond to changes in their internal and external environments The control of gene expression
What are the aims and objectives of this term?	• Explain what is meant by phototropism and gravitropism, and by positive and negative tropisms. • Describe where IAA is produced. • Describe the effect of different IAA concentrations on root/shoot growth. • Explain how IAA causes positive phototropism in shoots. • Explain how IAA causes positive gravitropism in roots. • Apply knowledge of IAA to interpret results and draw conclusions. • Explain what is meant by taxes and kinesis and how they differ. • Explain how taxes and kinesis aid survival. • Represent raw and processed data clearly using tables. • Calculate an appropriate statistical test and interpret values in terms of probability and chance. • Apply knowledge of kinesis to draw and explain conclusions. • Explain the role of reflexes and why they are important. • Explain the role of sensory, intermediate and motor neurones in a reflex arc. • For a given context, explain the sequence of events which brings about a reflex action (from stimulus to response). • Explain the features of sensory reception which are common to all receptors. • Describe the structure of a Pacinian corpuscle. • Explain the stimulus which Pacinian corpuscles respond to. • Explain how a Pacinian corpuscle produces a generator potential in response to a specific stimulus. • Identify the pigments in rod and cone cells. • Explain how rod cells' visual acuity, sensitivity to light and sensitivity to colour are accounted for by the presence of rhodopsin and connections to the optic nerve.

	• Explain how cone cells' visual acuity, sensitivity to light and sensitivity to colour are accounted for by the presence of different forms of iodopsin and connections to the optic nerve. • Describe, and locate on a diagram, the structures, which are responsible for events during the cardiac cycle. • Explain the events which take place during the cardiac cycle to produce and transmit a wave of electrical activity to make the heartbeat • Explain the roles of the SAN, AVN and bundle of His. • Describe the location of, and the role played by, chemoreceptors and pressure receptors involved in detecting changes which lead to changes in heart rate. • Explain what is meant by the sympathetic and parasympathetic nervous system. • Explain the role of the autonomic nervous system (sympathetic and parasympathetic) in controlling heart rate. • Explain the role of the medulla oblongata. • Describe and explain the structure of a myelinated motor neurone. • Explain what is meant by a resting and an action potential. • Explain the events in establishing a resting potential. • Explain the events in generating an action potential. • Explain what is meant by the all or nothing principle. • Explain how action potentials pass along unmyelinated neurones. • Describe what nodes of Ranvier are. • Describe how action potentials pass along myelinated neurones by saltatory conduction, and why this is faster than conductance along unmyelinated neurones. • Explain what is meant by the refractory period and why action potentials are prevented. • Explain the importance of the refractory period. • Apply knowledge of action potentials and refractory period to the context of exam questions. • Explain the factors which affect the speed of nerve impulse conductance. • Calculate an appropriate statistical test and interpret values in terms of probability and chance (eg mean speed of conductance at 2 different temperatures). • Apply knowledge to draw and explain conclusions/answer questions. • Explain the functions of synapses. • Describe the detailed structure of a synapse. • Explain the sequence of events involved in transmission of an action potential from one neurone to another. • Explain why synaptic transmission is unidirectional. • Explain temporal, spatial summation, and inhibition by inhibitory synapses. • Use information provided to predict and explain the effects of specific drugs on a synapse. • Explain what a neuromuscular junction is. • Describe and explain the detailed structure of a neuromuscular junction. • Explain transmission across a neuromuscular junction by release of acetylcholine and compare this to synaptic transmission. • Explain how muscle fibres stimulated to contract by one motor neurone act as a motor unit. • Explain the role of skeletal muscle, linked to the role of tendons and joints.

	• Explain how muscles which move bones that form part of a joint work as antagonistic pairs. To produce movement as they contract, muscles work against/are attached to an incompressible skeleton/bone. • Describe the gross structure of skeletal muscles. • Explain what is meant by a myofibril. • Describe the microscopic structure of skeletal muscle. • Explain what is meant by a sarcomere. • Explain how actin and myosin are arranged within a myofibril to produce contraction of a sarcomere. • Interpret diagrams to identify I bands, A bands, the H zone and the Z line on a diagram. • Recall how the release of acetylcholine across neuromuscular junctions, triggers the release of calcium ions. • Explain the importance of the release of calcium ions leading to a conformational change in tropomyosin. • Explain the sliding theory filament of myofibril contraction. • Explain the roles of key molecules myosin, actin, calcium and ATP in causing myofibril contraction. • Explain the role of phosphocreatine in muscle fibres. • Describe the locations of slow and fast skeletal muscle fibres. • Describe differences in the structure of slow and fast skeletal muscle fibres. • Explain differences in the properties of slow and fast skeletal muscle fibres. • Define what homeostasis is. • Explain why it is important that core temperature, blood pH, blood glucose concentration and blood water potential are maintained within restricted limits and the consequences of not doing so. • Explain what is meant by negative and positive feedback. • Explain the general stages involved in negative feedback, and why these are used in homeostatic mechanisms. • Explain the benefit of having separate mechanisms for different departures from the original level. • Interpret information relating to examples of negative and positive feedback. • Explain the factors which can influence blood glucose concentration. • Explain how hormones work to bring about a response. • Explain the role of the pancreas, specifically the α and β cells of the Islets of Langerhans, in regulating blood glucose concentration. • Explain what is meant by the terms glycogenesis, glycogenolysis and gluconeogenesis. • Apply knowledge to explain the stages involved in negative feedback in response to changes in blood glucose concentration. • Explain what triggers the release of insulin. • Explain how insulin acts at the cellular level to lower blood glucose concentration. • Explain the role of the liver in glycogenesis. • Explain what triggers the release of glucagon. • Explain how glucagon acts at the cellular level to raise blood glucose concentration • Explain the role of the liver in glycogenolysis and gluconeogenesis. • Explain what triggers the release of adrenaline.

	• Explain how adrenaline acts at the cellular level to control blood glucose concentration. • Explain the second messenger model related to adrenaline and glucagon action. • Describe the role of adenylate cyclase, cyclic AMP and protein kinase in the second message model. • Explain the causes of type I and II diabetes. • Explain how type 1 and type 2 diabetes can be controlled. • Apply knowledge of blood sugar regulation and diabetes to interpret data. • Evaluate the positions of health advisers and the food industry in relation to the increased incidence of type II diabetes. • Apply knowledge of diabetes and biochemical tests, to design an experiment to identify the concentration of glucose in a 'urine' sample. • Explain how to use colorimetry of known concentrations, alongside calibration curves to identify unknown concentrations. • Explain the usefulness of calibration curves or standards. • Describe the structure of a nephron. • Explain the process of ultrafiltration and where it occurs. • Explain the process of selective reabsorption, where it occurs along a nephron and the transport processes involved. • Explain the adaptations of cells of the proximal convoluted tubule • Explain the importance of maintaining a sodium ion gradient in the medulla, and how this is achieved. • Explain the reabsorption of water from the distal convoluted tubule and collecting ducts. • Explain the role of the hypothalamus and posterior pituitary gland in osmoregulation. • Explain the responses which are brought about by the release of ADH. • Apply knowledge to explain the stages involved in negative feedback in response to changes in blood water potential. **<u>The control of gene expression</u>** • Describe what happens in substitution, addition, deletion, inversion, duplication and translocation mutations. • Explain how mutations can arise spontaneously, and the effect that mutagenic agents have on the rate of mutation. Relate the nature of a gene mutation to its effect on the encoded polypeptide. • Define what a stem cell is. • Explain the characteristics of totipotent, pluripotent, multipotent and unipotent stem cells, and the sources of each type. • Explain how induced pluripotent cells can be produced and why they are of interest. Evaluate the use of stem cells in treating human disorders. • Explain what a transcription factor is. • Describe the role of transcription factors in gene expression. • Describe the mechanism by which oestrogen is able to initiate transcription.

	Interpret data provided from investigations into gene expression. • Explain what epigenetics is, and what happens to the DNA or histone to modify gene expression. • Interpret data provided from investigations into gene expression. • Evaluate appropriate data for the relative influences of genetic and environmental factors on phenotype. Explain how epigenetic control can cause disease, and how it could be used to treat diseases such as cancer • Explain how gene expression can be inhibited by RNA interference of translation. • Explain how siRNA interferes with translation. Interpret data provided from investigations into gene expression. • Describe the characteristics of benign and malignant tumours. • Explain the role of oncogenes/tumour suppressor genes, abnormal methylation and increased oestrogen concentrations in the development of cancer. • Evaluate evidence showing correlations between genetic and environmental factors and various forms of cancer. • Interpret information relating to the way in which an understanding of the roles of oncogenes and tumour suppressor genes could be used in the prevention, treatment and cure of cancer. • Explain the principles of gel electrophoresis in separating DNA fragments. • Explain how sequencing techniques have become automated and faster. • Explain why it is harder to translate genomic sequences into the proteome for complex organisms than for simpler organisms. • Explain what is meant by recombinant DNA technology. • Explain how the methods given in the specification can be used to produce fragments of DNA containing a desired gene. • Explain what is meant by a restriction endonuclease and how they work to leave sticky ends. • Describe the process of PCR in amplifying DNA fragments. • Explain the role of primers and Taq polymerase in PCR. • Explain the processes of strand separation, primer annealing, and strand synthesis. • Evaluate the pros and cons of using PCR to clone DNA fragments over in vivo methods. • Explain what gene cloning is and why it is important in a range of applications. • Describe the stages involved in in vivo gene cloning. • Explain the importance of the addition of promoter and terminator regions. • Explain the importance of the use of restriction enzymes and sticky ends. • Explain the methods used for transformation. • Explain the use of marker genes and replica plating. • Interpret information provided in exam questions, to interpret which colonies have been successfully transformed with recombinant DNA. • Interpret information relating to the use of recombinant DNA technology. • Evaluate the ethical, financial and social issues associated with the use and ownership of recombinant DNA technology in agriculture, in industry and in medicine.

	• Balance the humanitarian aspects of recombinant DNA technology with the opposition from environmentalists and anti-globalisation activists. • Explain the principles of gene therapy. • Explain the use of liposomes and viruses in delivering genes into cells. • Explain the difference between somatic and germ line therapy, and why germ line therapy is prohibited. • Evaluate the effectiveness and risks of gene therapy. • Explain how DNA probes and hybridisation are used to locate specific alleles. • Explain the benefits of screening for genetic diseases. • Explain some of the issues raised by screening, and the role of genetic counsellors. • Evaluate information relating to screening individuals for genetically determined conditions and drug responses. • Describe the methodology involved in producing a genetic fingerprint. • Explain what variable number tandem repeats are, and how these allow the production of a virtually unique genetic fingerprint. • Explain the applications of genetic fingerprinting. • Interpret genetic fingerprint patterns and draw conclusions.

What previous knowledge is required?	• The nervous system enables humans to react to their surroundings and coordinate their behaviour.
	• Reflex actions are automatic and rapid. They often involve sensory, relay and motor neurones.
	• Plants are sensitive to light, moisture and gravity. Their shoots grow towards light and against the force of gravity. Their roots grow towards moisture and in the direction of the force of gravity.
	• Plants produce hormones to coordinate and control growth. Auxin controls phototropism and gravitropism (geotropism).
	• The responses of plant roots and shoots to light, gravity and moisture are the result of unequal distribution of hormones, causing unequal growth rates.
	• Internal conditions that are controlled include:
	  ○ the water content of the body – water leaves the body via the lungs when we breathe out and via the skin when we sweat to cool us down and excess water is lost via the kidneys in the urine
	  ○ the ion content of the body – ions are lost via the skin when we sweat and excess ions are lost via the kidneys in the urine
	  ○ temperature – to maintain the temperature at which enzymes work best
	  ○ blood sugar levels – to provide the cells with a constant supply of energy
	• Many processes in the body are controlled by hormones, which are secreted by glands and are usually transported to their target organs by the bloodstream.
	
	New forms of a gene are generated by mutation.
	
	• Most types of animal cells differentiate at an early stage whereas many plant cells retain the ability to differentiate throughout life.
	• Cells from human embryos and adult bone marrow, called stem cells, can be made to differentiate into many different types of cells, eg nerve cells.
	• Human stem cells have the ability to develop into any kind of human cell.
	• Treatment with stem cells may be able to help conditions such as paralysis.
	• There are social and ethical issues concerning the use of stem cells from embryos in medical research and treatments.

	• In genetic engineering, genes from the chromosomes of humans and other organisms can be 'cut out' using enzymes and transferred to cells of other organisms. • Genes can also be transferred to the cells of animals, plants or microorganisms at an early stage in their development so that they develop with desired characteristics. • Genes transferred to crop plants are called genetically modified (GM) crops. Examples of these include crops that are resistant to insect attack or herbicides. These crops generally show increased yield. • Concerns about GM crops include the effect on populations of wild flowers and insects, and uncertainty about the effects of eating GM crops on human health. • There are economic, social and ethical arguments for and against genetic engineering, including GM crops.
How will this term's content help with future learning?	Continuation from the AS, informs remainder of A2, no further learning unless a Bio Science degree course is chosen.
Resources	Revision guides, Kerboodle on-line textbook https://www.kerboodle.com YouTube – crash course biology - (15) Biology - YouTube AQA | Resources | Past Papers & AQA Mark Schemes Required practicals https://youtu.be/P6VRvQ7p2mk?si=CYgb7W6CAiDrCb6z (31) Primrose Kitten Academy | GCSE & A-Level Revision - YouTube Google NotebookLM | Note Taking & Research Assistant Powered by AI https://www.briskteaching.com
Links to the national curriculum/specification	https://media.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF
Assessments	End of topic tests. Students are informed ahead of time what exact spec points are to be tested in each paper. Marked and annotated by teachers and a U-A grade awarded. Cumulative tests will be set on a regular basis without warning.
Term Five	
Content of study	Revision for final exams
What are the aims and objectives of this term?	Revision using past papers. Required practical content and aim recap.
What previous knowledge is required?	
How will this term's content help with future learning?	Informs remainder of A2, no further learning unless a Bio Science degree course is chosen.
Resources	
Links to the national curriculum/specification	
Assessments	