



GCSE Biology Academic Overview 2018-19

Science						
	Term 1.1	Term 1.2	Term 2.1	Term 2.2	Term 3.1	Term 3.1
Year 9	Key Concepts in Biology	Key Concepts in Biology cont. Cells & Control	Cells & Control cont. Genetics	Genetics	Genetics	Natural Selection & Genetic Modification
Year 10	Natural Selection & Genetic Modification cont.	Health, Disease & The Development of Medicines	Plant Structures & Their Functions	Animal Co-ordination, Control & Homeostasis	Animal Co-ordination, Control & Homeostasis cont. Exchange & Transport in Animals	Exchange & Transport in Animals cont.
Year 11	Ecosystems & Material Cycles	Ecosystems & Material Cycles cont.	Exam Preparation	Exam Preparation	Exams	Exams



Year 9 GCSE Biology Curriculum Content Overview 2018-19

Knowledge and Skills Students will be taught to....	Reading, Oracy, Literacy and Numeracy	Assessment
<ul style="list-style-type: none"> □ Understand some of the central ideas in biology, including ideas about cells, microscopy, enzymes, nutriiton, diffusion, osmosis and active transport. □ Understand how plants and animals develop from single cells the size of full stops to become complex organisms made of many different types of cells, which all need to be controlled and coordinated. □ Understand how our DNA code produces our features, and the processes that allow features to be passed on from parents to their offspring. □ Understand how organisms are changed genetically by natural selection, and also through processes designed by humans, known as artifical selecton. □ Work scientifically by carrying out a series of ‘core practicals’, which you will be expected to know about for your examinations. □ Work mathematically, by developing and appling a variety of maths skills throughout the course. 	<p style="text-align: center;">Reading</p> <ul style="list-style-type: none"> • Edexcel combined science text book • Recommended reading texts • CGP revision guide • PLC checklists <hr/> <p style="text-align: center;">Numeracy</p> <ul style="list-style-type: none"> • Recall of key values and quantities • Recall, use and application of equations • Conversion between units • Working with numbers in standard form • Drawing appropriate graphs and tables with suitable scales/ headings and plotting/ recording data • Describing mathematical patterns in experimental data and explaining them using scientific concepts • Perform calculations based on extracting data from both tables and graphs <hr/> <p style="text-align: center;">Oracy and Literacy</p> <ul style="list-style-type: none"> • Key words • Writing a method for core practicals • Six mark questions 	<p style="text-align: center;">Formative</p> <ul style="list-style-type: none"> • Questioning in lessons • Live student performance in lessons followed by questions • Whole class feedback during lessons • Regular peer and self assessment • Book checks for general presentation, work completion and spellings • Low stakes quizzing • Learning checkpoints in between main assessments <p style="text-align: center;">Summative</p> <ul style="list-style-type: none"> • 3 cumulative assessments throughout the year



Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel Combined Science Biology Year 9 Assessment Phase 1
	Key Concepts in Biology
<ul style="list-style-type: none"> <input type="checkbox"/> Name an example of a eukaryotic and a prokaryotic cell and explain the differences. <input type="checkbox"/> Identify and describe the organelles found in animal, plant and bacteria cells. <input type="checkbox"/> Explain the functions and adaptations of sperm cells, egg cells and ciliated epithelial cells. <input type="checkbox"/> Describe the differences between light and electron microscopes. <input type="checkbox"/> Explain how to prepare a slide containing a biological specimen (e.g. onion cells). <input type="checkbox"/> Write out the formulas needed for all microscope related calculations. <input type="checkbox"/> Write out the units and relationships between millimetres, micrometres, nanometres and picometres. <input type="checkbox"/> Describe how to test for protein, carbohydrate, fat and reducing sugars in foods. <input type="checkbox"/> Explain how you could investigate the effects of pH on enzyme activity. <input type="checkbox"/> Outline how to calculate the rate of an enzyme-controlled reaction. <input type="checkbox"/> Define the term enzyme and explain enzyme action. <input type="checkbox"/> Explain the roles of carbohydrase's, proteases and lipases. <input type="checkbox"/> Define the terms diffusion, osmosis and active transport and explain their differences. <input type="checkbox"/> Explain how to investigate the effect of sugar solution concentration on osmosis in potato cells. <input type="checkbox"/> Outline how to calculate percentage change in mass for plant tissue (e.g. a piece of potato). 	<ul style="list-style-type: none"> <input type="checkbox"/> Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: animal, plant & bacteria <input type="checkbox"/> Explain how specialised cells are adapted to their functions, including: sperm, egg and ciliated epithelial cells <input type="checkbox"/> Explain how changes in microscope technology, including electron microscopy, have enabled us to see cell structures with more clarity and detail than in the past <input type="checkbox"/> Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used <input type="checkbox"/> Demonstrate an understanding of the relationship between quantitative units in relation to cells, including: milli, micro, nano & pico <input type="checkbox"/> HT ONLY: Complete calculations with numbers written in standard form <input type="checkbox"/> <i>Core Practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations</i> <input type="checkbox"/> Bio ONLY: Describe the tests which are used to identify the main substances in foods. <input type="checkbox"/> Explain the mechanism of enzyme action including the active site and enzyme specificity <input type="checkbox"/> Explain how enzymes can be denatured due to changes in the shape of the active site <input type="checkbox"/> Explain the effects of temperature, substrate concentration and pH on enzyme activity <input type="checkbox"/> <i>Core Practical: Investigate the effect of pH on enzyme activity</i> <input type="checkbox"/> Demonstrate an understanding of rate calculations for enzyme activity <input type="checkbox"/> Demonstrate an understanding of rate calculations for enzyme activity <input type="checkbox"/> Explain the importance of enzymes as biological catalysts in the synthesis and breakdown of carbohydrates, fats and proteins <input type="checkbox"/> Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport <input type="checkbox"/> <i>Core Practical: Investigate osmosis in potatoes</i> <input type="checkbox"/> Calculate percentage gain and loss of mass in osmosis



Key learning questions	Edexcel Combined Science Biology Year 9 Assessment Phase 2
	Cells & Control
<ul style="list-style-type: none"><input type="checkbox"/> Outline what happens during each stage of mitosis.<input type="checkbox"/> Describe when mitosis takes place and outline its key features.<input type="checkbox"/> Define the terms cell division & differentiation.<input type="checkbox"/> Describe growth in plants in terms of differentiation, elongation and cell division.<input type="checkbox"/> Explain how percentile charts are used to monitor growth in children.<input type="checkbox"/> Define the term stem cell.<input type="checkbox"/> Describe the differences between adult, embryonic & plant stem cells.<input type="checkbox"/> Explain the advantages & risks of using stem cells in medical treatment.<input type="checkbox"/> Outline the primary functions of the cerebral cortex, cerebellum and medulla oblongata.<input type="checkbox"/> Compare and contrast the uses of CT and PET scanning.<input type="checkbox"/> Explain why damage to the brain and spinal cord is difficult to treat.<input type="checkbox"/> Describe the roles of the different neurones in the nervous system.<input type="checkbox"/> Explain the structure and function of the CNS.<input type="checkbox"/> Describe the structure and function of a synapse.<input type="checkbox"/> Describe the structure and function of a reflex arc.<input type="checkbox"/> Draw and label the eye. Explain the role of each part.<input type="checkbox"/> Describe what causes the following; cataracts, long-sightedness, short-sightedness and colour blindness.<input type="checkbox"/> Explain how cataracts, long-sightedness and short-sightedness can be corrected.	<ul style="list-style-type: none"><input type="checkbox"/> Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis<input type="checkbox"/> Describe the importance of mitosis in growth, repair and asexual reproduction<input type="checkbox"/> Describe the division of a cell by mitosis in terms of cells formed and chromosome numbers<input type="checkbox"/> Describe cancer as the result of changes in cells that lead to uncontrolled cell division<input type="checkbox"/> Describe growth in plants and animals including: cell division, differentiation and elongation (plants only)<input type="checkbox"/> Explain the importance of cell differentiation in the development of specialised cell<input type="checkbox"/> Demonstrate an understanding of the use of percentiles charts to monitor growth<input type="checkbox"/> Describe the function of embryonic stem cells in animals and meristems in plants<input type="checkbox"/> Discuss the potential benefits and risks associated with the use of stem cells in medicine<input type="checkbox"/> Bio ONLY: Describe the structures and functions of the brain including the cerebellum, cerebral hemispheres and medulla oblongata<input type="checkbox"/> Bio & HT ONLY: Explain how the difficulties of accessing brain tissue inside the skull can be overcome by using CT scanning and PET scanning<input type="checkbox"/> Bio & HT ONLY: Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system<input type="checkbox"/> Explain the structure and function of the nervous system including neurones, synapses and neurotransmitters<input type="checkbox"/> Explain the structure and function of a reflex arc including sensory, relay and motor neurones<input type="checkbox"/> Bio ONLY: Explain the structure and function of the eye as a sensory receptor including the role of: cornea, lens, iris, rod and cone cells<input type="checkbox"/> Bio ONLY: Describe defects of the eye including cataracts, long-sightedness, short-sightedness and colour blindness<input type="checkbox"/> Bio ONLY: Explain how cataracts, long-sightedness and short-sightedness can be corrected



Key learning questions	Genetics Part 1
<ul style="list-style-type: none"> <input type="checkbox"/> Compare and contrast the advantages and disadvantages of asexual and sexual reproduction. <input type="checkbox"/> Define the key terms; gamete, zygote. <input type="checkbox"/> Describe what happens during fertilisation. <input type="checkbox"/> Outline how gametes are produced by the process of meiosis. <input type="checkbox"/> Describe the structure of DNA. <input type="checkbox"/> Define the key terms; gene, chromosome, polymer. <input type="checkbox"/> Explain the process used to extract DNA from fruit. <input type="checkbox"/> Describe the two stages of protein synthesis (transcription and translation)- you could draw diagrams. <input type="checkbox"/> Describe how a phenotype could be affected by coding and non-coding DNA. <input type="checkbox"/> Describe how Mendel was involved in discovering the basis of genetics. 	<ul style="list-style-type: none"> <input type="checkbox"/> Bio ONLY: Explain some of the advantages and disadvantages of asexual reproduction <input type="checkbox"/> Bio ONLY: Explain some of the advantages and disadvantages of sexual reproduction <input type="checkbox"/> Explain the role of meiotic cell division in terms of cells formed and chromosome numbers <input type="checkbox"/> Describe the structure of DNA in terms of bases and bonding <input type="checkbox"/> Describe what a genome and gene are and describe the role of a gene <input type="checkbox"/> Explain how DNA can be extracted from fruit <input type="checkbox"/> Bio & HT ONLY: Explain how the order of bases in a section of DNA decides the order of amino acids and how this determines the shape of the protein <input type="checkbox"/> Bio & HT ONLY: Describe the stages of protein synthesis, including transcription and translation: <input type="checkbox"/> Bio & HT ONLY: Describe how genetic variants in the non-coding DNA of a gene can affect phenotype <input type="checkbox"/> Bio & HT ONLY: Describe how genetic variants in the coding DNA of a gene can affect phenotype <input type="checkbox"/> Bio ONLY: Describe the work of Mendel in discovering the basis of genetics and recognise the difficulties of understanding inheritance before this discovery

Key learning questions	Edexcel Combined Science Biology Year 9 Assessment Phase 3
	Genetics Part 2
<ul style="list-style-type: none"> <input type="checkbox"/> Define the terms; allele, homozygous, heterozygous, dominant, recessive. <input type="checkbox"/> Describe the difference between genotype and phenotype. <input type="checkbox"/> Outline how a Punnett square can be used to show inheritance of alleles. <input type="checkbox"/> Explain how sex can be determined using a genetic diagram. <input type="checkbox"/> Define the term codominance and describe how this relates to the ABO blood groups. 	<ul style="list-style-type: none"> <input type="checkbox"/> Explain why there are differences in the inherited characteristics as a result of alleles <input type="checkbox"/> Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote <input type="checkbox"/> Explain monohybrid inheritance using genetic diagrams, Punnett squares and family pedigrees <input type="checkbox"/> Describe how the sex of offspring is determined at fertilisation, using genetic diagrams <input type="checkbox"/> Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits <input type="checkbox"/> Bio ONLY: Describe the inheritance of the ABO blood groups with reference to codominance and multiple alleles



- Define the term sex-linked disorder. Explain why men are therefore more likely to be colour blind than women.
- Explain the difference between genetic and environmental variation, using examples.
- Outline some ways in which genetic variation can come about.
- Describe what is meant by a mutation.
- Describe what the Human Genome Project is, and some of its implications on medicine.

- Bio & HT ONLY: Explain how sex-linked genetic disorders are inherited**
- State that most phenotypic features are the result of multiple genes rather than single gene inheritance
- Describe the causes of variation that influence phenotype: genetic/environmental variation and mutations
- Discuss the outcomes of the Human Genome Project and its potential applications within medicine
- State that there is usually extensive genetic variation within a population of a species and that these arise through mutations

Key learning questions

Natural Selection & Genetic Modification

- Explain Darwin's theory of evolution by natural selection.
- Describe how Darwin and Wallace developed the theory of evolution.
- Explain how antibiotic resistance provides evidence for evolution.
- Explain how fossils such as 'Ardi' and 'Lucy' provide evidence for the evolution of humans from ape ancestors.
- Explain how stone tools also provide evidence of evolution.
- Define the term 'pentadactyl limb' and describe how it provides evidence for evolution.
- Explain how advances in DNA and RNA sequencing led to the proposal of the three domain system of classification, instead of the five kingdom system.
- Outline the process of selective breeding and explain some benefits and risks.
- Describe how tissue culture is used in medicine and plant breeding.
- Outline the process of genetic engineering (HT: with use of enzymes, sticky ends etc) and explain some benefits and risks.
- Evaluate the advantages and disadvantages of GM.

- Explain Darwin's theory of evolution by natural selection
- Bio ONLY: Describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection and explain the impact of these ideas on modern biology**
- Explain how the emergence of resistant organisms supports Darwin's theory of evolution including antibiotic resistance in bacteria
- Describe the evidence for human evolution, based on fossils, including: Ardi, Lucy and Leakey's discovery of fossils
- Describe the evidence for human evolution based on stone tools, including: a) the development of stone tools over time b) how these can be dated from their environment
- Bio ONLY: Describe how the anatomy of the pentadactyl limb provides scientists with evidence for evolution**
- Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method
- Explain selective breeding and its impact on food plants and domesticated animals
- Bio ONLY: Describe the process of tissue culture and its advantages in medical research and plant breeding programmes**
- Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics
- HT ONLY: Describe the main stages of genetic engineering including the use of: restriction enzymes, ligase, sticky ends and vectors
- Evaluate the benefits and risks of genetic engineering and selective breeding in modern agriculture and medicine, including practical and ethical implications



Explain, using examples, the uses of fertilisers and biological control.

Bio ONLY: Explain the advantages and disadvantages of genetic engineering to produce GM organisms including the modification of crop plants

Bio ONLY: Explain the advantages and disadvantages of agricultural solutions to the demands of a growing human population, including use of fertilisers and biological control