



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 10 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 how organisms are changed genetically by natural selection, and also through processes designed by humans, known as artificial selection. □ Understand how we define health, and the effects of both communicable and non-communicable diseases and their treatments. □ Understand the factors which affect photosynthesis, and how leaves and plants are specially adapted to carry out their functions. □ Understand the importance of homeostasis and hormones, and their importance in regulating key processes in the body such as the menstrual cycle and blood glucose levels. □ Understand the importance of the digestive, circulatory and respiratory systems. □ 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 applying a variety of maths skills throughout the course. 	<div style="border-bottom: 1px solid black; padding-bottom: 5px;"> <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 </div> <div style="border-bottom: 1px solid black; padding: 5px 0 5px 5px;"> <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 </div> <div style="padding: 5px 0 5px 5px;"> <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 </div>	<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 10 Assessment Phase 1
	Natural Selection & Genetic Modification
<ul style="list-style-type: none"><input type="checkbox"/> Explain Darwin's theory of evolution by natural selection.<input type="checkbox"/> Describe how Darwin and Wallace developed the theory of evolution.<input type="checkbox"/> Explain how antibiotic resistance provides evidence for evolution.<input type="checkbox"/> Explain how fossils such as 'Ardi' and 'Lucy' provide evidence for the evolution of humans from ape ancestors.<input type="checkbox"/> Explain how stone tools also provide evidence of evolution.<input type="checkbox"/> Define the term 'pentadactyl limb' and describe how it provides evidence for evolution.<input type="checkbox"/> 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.<input type="checkbox"/> Outline the process of selective breeding and explain some benefits and risks.<input type="checkbox"/> Describe how tissue culture is used in medicine and plant breeding.<input type="checkbox"/> Outline the process of genetic engineering (HT: with use of enzymes, sticky ends etc) and explain some benefits and risks.<input type="checkbox"/> Evaluate the advantages and disadvantages of GM.<input type="checkbox"/>	<ul style="list-style-type: none"><input type="checkbox"/> Explain Darwin's theory of evolution by natural selection<input type="checkbox"/> 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<input type="checkbox"/> Explain how the emergence of resistant organisms supports Darwin's theory of evolution including antibiotic resistance in bacteria<input type="checkbox"/> Describe the evidence for human evolution, based on fossils, including: Ardi, Lucy and Leakey's discovery of fossils<input type="checkbox"/> 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<input type="checkbox"/> Bio ONLY: Describe how the anatomy of the pentadactyl limb provides scientists with evidence for evolution<input type="checkbox"/> Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method<input type="checkbox"/> Explain selective breeding and its impact on food plants and domesticated animals<input type="checkbox"/> Bio ONLY: Describe the process of tissue culture and its advantages in medical research and plant breeding programmes<input type="checkbox"/> Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics<input type="checkbox"/> HT ONLY: Describe the main stages of genetic engineering including the use of: restriction enzymes, ligase, sticky ends and vectors<input type="checkbox"/> Evaluate the benefits and risks of genetic engineering and selective breeding in modern agriculture and medicine, including practical and ethical implications<input type="checkbox"/> Bio ONLY: Explain the advantages and disadvantages of genetic engineering to produce GM organisms including the modification of crop plants<input type="checkbox"/> 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



Key learning questions	Health, Disease & The Development of Medicines
<ul style="list-style-type: none"> <input type="checkbox"/> Define the key terms; health, communicable disease, non-communicable disease. <input type="checkbox"/> Describe some of the risk factors for CVD. <input type="checkbox"/> Show how to calculate BMI and explain what this tells us. <input type="checkbox"/> Show how to calculate waist-to-hip ratio and explain what this tells us. <input type="checkbox"/> Outline and evaluate some of the treatments available for a patient with CVD. 	<ul style="list-style-type: none"> <input type="checkbox"/> Describe health as defined by the World Health Organization (WHO) <input type="checkbox"/> Describe the difference between communicable and non-communicable diseases <input type="checkbox"/> Explain why the presence of one disease can lead to a higher susceptibility to other diseases <input type="checkbox"/> Describe that many non-communicable human diseases are caused by the interaction of a number of factors <input type="checkbox"/> Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels including BMI, alcohol and smoking <input type="checkbox"/> Evaluate some different treatments for cardiovascular disease, including: life-long medication, surgical procedures and lifestyle changes

Key learning questions	Edexcel Combined Science Biology Year 10 Assessment Phase 2
	Health, Disease & The Development of Medicines cont.
<ul style="list-style-type: none"> <input type="checkbox"/> Name the four types of pathogen. <input type="checkbox"/> Name some examples of diseases caused by pathogens and describe how they are spread. <input type="checkbox"/> Explain how STI's, including HIV, are spread and how this can be prevented. <input type="checkbox"/> Describe the roles of the body's physical and chemical defences against infection. <input type="checkbox"/> Give some examples of physical and chemical defences that plants use against pathogens. <input type="checkbox"/> Give some of the physical signs to look for when a plant is diseased. <input type="checkbox"/> Draw a diagram to show both pathways of the life cycle of a virus. <input type="checkbox"/> Explain the specific immune response. <input type="checkbox"/> Explain how the body responds to an immunisation. <input type="checkbox"/> State some of the essential things to remember when working aseptically. 	<ul style="list-style-type: none"> <input type="checkbox"/> Describe a pathogen as a disease-causing organism, including viruses, bacteria, fungi and protists <input type="checkbox"/> Describe some common infections, including: cholera, tuberculosis, Chalaria ash dieback, malaria, HIV, stomach ulcers, Ebola and state the pathogen type and details of the symptoms <input type="checkbox"/> Explain how pathogens are spread and how this spread can be reduced or prevented, including: cholera, tuberculosis, Chalaria ash dieback, malaria, HIV, stomach ulcers, Ebola <input type="checkbox"/> Bio ONLY: Describe the lifecycle of a virus, including lysogenic and lytic pathways <input type="checkbox"/> Explain how sexually transmitted infections (STIs) are spread and how this spread can be reduced or prevented, including: Chlamydia and HIV <input type="checkbox"/> Bio ONLY: Describe how some plants defend themselves against attack from pests and pathogens by physical barriers <input type="checkbox"/> Bio ONLY: Describe how plants defend themselves against attack from pests and pathogens by producing chemicals and how some can be used to treat humans <input type="checkbox"/> Bio & HT ONLY: Describe different ways plant diseases can be detected and identified <input type="checkbox"/> Describe how the physical barriers and chemical defences of the human body provide protection from pathogens <input type="checkbox"/> Explain the role of the specific immune system of the human body in defence against disease, including ideas on antigens and lymphocytes



- Draw a flow chart to show how monoclonal antibodies are produced.
- Explain how monoclonal antibodies are used in pregnancy tests and in medical diagnosis.
- Describe the different stages of testing that a new medicine has to undergo.
- Explain why antibiotics only work on bacterial infections.

- Explain the body's response to immunisation using an inactive form of a pathogen
- Bio ONLY: Discuss the advantages and disadvantages of immunisation, including the concept of herd immunity**
- Bio ONLY: Explain the aseptic techniques used in culturing microorganisms in the laboratory**
- Bio ONLY: Core Practical: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures**
- Bio ONLY: Calculate cross-sectional areas of bacterial cultures and clear agar jelly using πr^2**
- Bio & HT ONLY: Describe the production of monoclonal antibodies**
- Bio & HT ONLY: Explain the use of monoclonal antibodies**
- Explain why antibiotics can only be used to treat bacterial infections
- Describe that the process of developing new medicines, including antibiotics, has many stages, including discovery, development, preclinical and clinical testing

Key learning questions

Plant Structures & Their Functions

- Write the word equation for photosynthesis and describe why its an endothermic reaction.
- Explain how light intensity, temperature and carbon dioxide concentration affect the rate of photosynthesis.
- Explain how to investigate the effect of light intensity on photosynthesis.
- Explain what is meant by the 'inverse square law'.
- Describe some of the adaptations of the xylem and the phloem vessels, and root hair cells.
- Explain how these adaptations allow them to carry out different processes effectively.
- Compare the processes of transpiration and translocation.
- Describe the role of the stomata in transpiration.
- Explain some of the factors that affect the rate of transpiration.
- Draw and label a cross section of a leaf and explain its adaptations.
- Explain how a cactus is adapted to survive in an extreme environment.

- Describe photosynthetic organisms as the main producers of food and therefore biomass
- Describe photosynthesis in plants and algae as an endothermic reaction and recall the reactants and products
- Explain the effect of temperature, light intensity and carbon dioxide concentration as limiting factors on the rate of photosynthesis
- HT ONLY: Explain the interactions of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis
- Core Practical: Investigate the effect of light intensity on the rate of photosynthesis
- HT ONLY: Explain how the rate of photosynthesis, including the use of the inverse square law calculation
- Explain how the structure of the root hair cells is adapted to absorb water and mineral ions
- Explain how the structures of the xylem and phloem are adapted to their function in the plant
- Describe how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata
- Describe how sucrose is transported around the plant by translocation
- Explain the effect of environmental factors on the rate of water uptake by a plant
- Demonstrate an understanding of rate calculations for transpiration
- Bio ONLY: Explain how the structure of a leaf is adapted for photosynthesis and gas exchange**
- Bio ONLY: Explain how plants are adapted to survive in extreme environments**



<ul style="list-style-type: none"> <input type="checkbox"/> Define the terms; phototropism, gravitropism, auxins. <input type="checkbox"/> Explain the role of auxins in plant growth. <input type="checkbox"/> State some artificial plant hormones and describe their commercial uses. 	<ul style="list-style-type: none"> <input type="checkbox"/> Bio ONLY: Explain how plant hormones control and coordinate plant growth and development, including the role of auxins <input type="checkbox"/> HT & Bio ONLY: Describe the commercial uses of auxins, gibberellins and ethene in plants
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Key learning questions	Edexcel Combined Science Biology Year 10 Assessment Phase 3
	Animal Coordination, Control & Homeostasis
<ul style="list-style-type: none"> <input type="checkbox"/> Define the terms; hormone, endocrine gland, target organ, negative feedback. <input type="checkbox"/> HT- Explain the role of adrenaline in the fight or flight response. <input type="checkbox"/> HT- Explain how thyroxine controls metabolic rate by negative feedback. <input type="checkbox"/> Describe the stages of the menstrual cycle, including the roles of oestrogen and progesterone. <input type="checkbox"/> HT- Explain the roles of FSH and LH in the menstrual cycle. <input type="checkbox"/> Compare types of hormonal and barrier methods of contraception. <input type="checkbox"/> HT- Explain how FSH and LH are used in ART. <input type="checkbox"/> Define the term homeostasis. <input type="checkbox"/> Define the term thermoregulation. <input type="checkbox"/> Explain how body temperature is maintained in extremely cold or hot external conditions. <input type="checkbox"/> Explain the role of insulin in controlling blood glucose levels. <input type="checkbox"/> HT-Explain the role of glucagon in controlling blood glucose levels. <input type="checkbox"/> Compare the causes and treatments for type 1 and type 2 diabetes. <input type="checkbox"/> Label a diagram on the urinary system <input type="checkbox"/> Explain the role of the nephron. 	<ul style="list-style-type: none"> <input type="checkbox"/> Recall where different hormones are produced and how they are transferred to their target organs <input type="checkbox"/> HT ONLY: Explain where adrenalin is produced and how it prepares the body for fight or flight <input type="checkbox"/> HT ONLY: Explain how thyroxine controls metabolic rate as an example of negative feedback <input type="checkbox"/> Describe the stages of the menstrual cycle, including the roles of the hormones oestrogen and progesterone, in the control of the menstrual cycle <input type="checkbox"/> HT ONLY: Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle <input type="checkbox"/> Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy <input type="checkbox"/> Evaluate hormonal and barrier methods of contraception <input type="checkbox"/> HT ONLY: Explain the use of hormones in Assisted Reproductive Technology (ART) including IVF and clomifene therapy <input type="checkbox"/> Explain the importance of maintaining a constant internal environment in response to internal and external change <input type="checkbox"/> Bio ONLY: Explain the importance of homeostasis, including: thermoregulation – effect on enzyme activity and osmoregulation – effect on animal cells <input type="checkbox"/> Bio ONLY: Explain how thermoregulation takes place, with reference to the function of the skin <input type="checkbox"/> Bio ONLY: Explain how thermoregulation takes place, with reference to: shivering <input type="checkbox"/> HT & Bio ONLY: Explain how thermoregulation takes place, with reference to: vasoconstriction and vasodilation <input type="checkbox"/> HT ONLY: Explain how blood glucose concentration is regulated by glucagon <input type="checkbox"/> Explain how the hormone insulin controls blood glucose concentration <input type="checkbox"/> Explain the cause of type 1 diabetes and how it is controlled <input type="checkbox"/> Explain the cause of type 2 diabetes and how it is controlled



- Explain the role of the hormone ADH, when a person is very hydrated, and when a person is dehydrated.
- Describe some of the treatments available for kidney failure.
- State where urea is produced in the body.

- Evaluate the correlation between body mass and type 2 diabetes including waist: hip calculations and BMI, using the BMI equation
- Bio ONLY: Describe the structure of the urinary system**
- Bio ONLY: Explain how the structure of the nephron is related to its function in filtering the blood and forming urine**
- HT & Bio ONLY: Explain the effect of ADH on the permeability of the collecting duct in regulating the water content of the blood**
- Bio ONLY: Describe the treatments for kidney failure, including kidney dialysis and organ donation**
- Bio ONLY: Recall what urea is produced from and where this occurs in the body**

Key learning questions

Exchange & Transport in Animals

- Describe how organisms take in useful substances and remove waste products.
- Outline how to calculate SA:V ratios.
- Explain some adaptations of the alveoli.
- Name the four components of the blood and explain how each one is adapted to carry out its function.
- Name the three types of blood vessel found in the body and explain how their structure allows them to carry out their function.
- Identify and describe three factors that affect the rate of diffusion.
- State how to calculate Fick's law.
- Draw and label the chambers and key structures in the heart. Explain how they are adapted to carry out their function.
- Outline how to calculate stroke volume and cardiac output.
- Write the word equations for aerobic and anaerobic respiration.
- Compare and contrast aerobic and anaerobic respiration.
- Explain how to investigate the rate of respiration in living organisms.

- Describe the need to transport substances into and out of a range of organisms, including oxygen, carbon dioxide, water, dissolved food molecules, mineral ions and urea
- Explain the need for exchange surfaces and a transport system in multicellular organisms including the calculation of surface area: volume ratio
- Explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries
- Bio ONLY: Describe the factors affecting the rate of diffusion, including surface area, concentration gradient and diffusion distance**
- Bio ONLY: Calculate the rate of diffusion using Fick's law: rate of diffusion = surface area x concentration difference / membrane thickness of membrane**
- Explain how the structure of the blood is related to its function: red blood cells (erythrocytes), white blood cells (phagocytes and lymphocytes), plasma and platelets
- Explain how the structure of the blood vessels is related to their function
- Explain how the structure of the heart and circulatory system is related to its function, including the role of major blood vessels, valves and thickness of chamber walls
- Describe cellular respiration as an exothermic reaction which occurs continuously in living cells to release energy for metabolic processes, including aerobic and anaerobic respiration
- Compare the process of aerobic respiration with the process of anaerobic respiration
- Core Practical: Investigate the rate of respiration in living organisms
- Calculate heart rate, stroke volume and cardiac output, using the equation cardiac output = stroke volume x heart rate