Biology Year 13 Curriculum Overview

What is the Year 13 Biology curriculum aiming to achieve?		
What do we want our Year 13 Biologists to be like?	How are we building on prior learning?	How can parents/carers support their child's learning?
• To develop essential knowledge and understanding of different areas of the subject and how they relate to each other • To develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods • To develop competence and confidence in a variety of practical, mathematical and problem solving skills • To develop interest in and enthusiasm for the subject, including developing an interest in further study and careers associated with the subject • To understand how society makes decisions about scientific issues and how Biology contribute to the success of the economy and society	• We will make links to and build on the Biology topics from AQA Combined Science or Biology and Year 12 A 'level Biology • We will build on our working scientifically skills in the areas of analysis, communication, enquiry and problem solving	• Talk to your child about what they are learning in lesson • Be curious about the world around you and discuss with your child • Support with homework tasks • Purchase Pearson OCR A level Biology Student book 2 • Purchase CGP revision guide

How are we organising the Year 13 Biology curriculum?						
Teacher 1	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Module 5 Photosynthesis	Respiration Module 6 Cellular control	Patterns of inheritance	Populations and sustainability	Completion of specification and revision	
Threshold Concepts	• Interrelationship between the processes of photosynthesis and respiration • The structure of a chloroplast and the sites of the two main stages of photosynthesis • The importance of photosynthetic pigments in photosynthesis • The light-dependent stage of photosynthesis • The fixation of carbon dioxide and the light-independent stage of photosynthesis • The uses of triose phosphate • The factors affecting photosynthesis	• Need for cellular respiration • The process and site of glycolysis • Structure of the mitochondrion • The link reaction and it's site in the cell • The process and site of the Krebs cycles • The importance of coenzymes in cellular respiration • The process and site of oxidative phosphorylation • The chemiosmotic theory • The process of anaerobic respiration in eukaryotes • The difference in relative energy values of carbohydrates, lipids and proteins as respiratory substrates • The use and interpretation of the respiratory quotient (RQ) • Transcriptional, post-transcriptional and post-translational control of gene expression, including the lac operon • Understand the role of Hox genes in controlling	• Genetic basis of continuous and discontinuous variation • Meiosis leading to variation • Contribution of both environmental and genetic factors to phenotypic variation • Genetic diagrams to show monogenetic, codominant, dihybrid, multiple allele, sex linked, autosomal linked and epistasis inheritance • Factors that can affect the evolution of a species • Principles and uses of artificial selection, and ethical considerations • Role of isolating mechanisms in the evolution of new species	• Ecosystems, which range in size, are dynamic and are influenced by both biotic and abiotic factors • Biomass transfers through ecosystems • Recycling within ecosystems • The process of primary succession in the development of an ecosystem • How the distribution and abundance of organisms in an ecosystem can be measured • The factors that determine size of a population • Interactions between populations • The reasons for, and differences between, conservation and preservation • How the management of an ecosystem can provide resources in a sustainable way • The management of environmental resources and the effects of human activities		

		body plan development, and know that homeobox gene sequences are highly conserved • Importance of mitosis and apoptosis as mechanisms controlling the development of body form • Genes that regulate the cell cycle can respond to internal and external cell stimuli • Types of gene mutations and their possible effects on protein function				
Skills	• TLC to separate photosynthetic pigments • Data recording, quantitative analysis and display • Maths: calculating Rf values • Practical investigations into factors affecting the rate of photosynthesis • Research skills - referencing and citations **PAG 6** Task 3 Thin layer chromatography **PAG 12** Task 3 Investigating limiting factors in pondweed	• Investigating respiratory rates in yeast, involving the use of a data logger • Maths: quantitative analysis of experimental results • Investigating factors affecting the rate of respiration, involving the use of a respirometer • Maths: calculating RQ values	• Use the chi-squared test to determine the significance of the difference between observed and expected results • Use the Hardy Weinberg • Principle to calculate allele frequencies in populations	• The use of sampling and recording methods to determine the distribution and abundance of organisms in a variety of ecosystems • Maths: quantitative analysis of results including use of statistical techniques **PAG 3** Task 2 Distribution and abundance of species		
Teacher 2	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Module 5 Hormonal communication Neuronal Communication	Excretion as an example of homeostatic control Animal responses	Plant responses Module 6 Manipulating genomes	Cloning and biotechnology	Completion of specification and revision	
Threshold Concepts	• The need for communication systems • The need for a constant internal state • Maintenance of a constant internal state by negative feedback • Cell signalling, including the first and second messenger • Structure and function of adrenal glands • Hormones secreted by the cortex and medulla of adrenal glands	• Definition of excretion • Gross structure, function and histology of the liver • Outline of the ornithine cycle and the detoxification of ethanol • Gross structure, function and histology of the kidney, including the detailed structure of a nephron • Mechanisms of action of the kidney, including ultrafiltration, selective	• Reflex actions, uses and examples • Explain the different types of plant responses, to abiotic stress, herbivory and the range of plant tropisms • Roles of plant hormones • Understand the experimental evidence for the role of auxins and gibberellin • Commercial use of plant hormones • Principles of PCR, electrophoresis,	• Natural clones in plants and animal species • Production of natural clones for use in horticulture • Production of artificial clones of plants by micropropagation and tissue culture • How artificial clones in animals can be produced by artificial embryo twinning or somatic cell nuclear transfer • Arguments for and against artificial cloning		

	• The roles of mammalian sensory receptors in converting different types of stimuli into nerve impulses • The structure and functions of sensory, relay and motor neurones • The generation and transmission of nerve impulses in mammals • The structure and roles of synapses	reabsorption and osmoregulation. • Effects of kidney failure and potential treatments • Excretory products used for analysis • Gross structure of the brain and functions of the cerebrum, hypothalamus, medulla oblongata, cerebellum and pituitary gland • Coordination of 'flight or fight' response and heart rate • Mechanism of muscular contraction • Supply of ATP in muscles • Structural and functional differences between skeletal, involuntary and cardiac muscle • Action of neuromuscular junctions	restriction enzymes and DNA profiling, and their application • Principles of genetic engineering • Ethical issues relating to the genetic manipulation of organisms • Principles of, and potential for, gene therapy • Differences between somatic cell gene therapy and germ line cell gene therapy, along with the ethical issues • Principles of and developments in DNA sequencing • Uses of gene sequencing • Contribution of bioinformatics and computational biology contribute to biological research	in plants and animals • Use of microorganisms in biotechnological processes • Advantages and disadvantages of using microorganisms to make food for human consumption • The importance of manipulating the growing conditions in batch and continuous fermentation in order to maximise the yield of product required • How to culture microorganisms • The standard growth curve of a microorganism in a closed culture • The uses of immobilised enzymes in biotechnology and the different methods of immobilisation		
Skills		• Identify and draw stained sections of the liver and the kidney using a microscope • Dissection of internal and external structures of the kidney • Monitor physical functions e.g. heart rate • Use Student's t-test to compare the means of two sets of data • Examination of stained sections of skeletal muscle	• Practical investigations into phototropism and geotropism • Practical investigations into the effect of plant hormones on growth • Know how to carry out electrophoresis **PAG 11** Task 1 Effect of pulse rate on exercise	• How to take plant cuttings • Carrying out serial dilutions of a broth culture development of aseptic technique • Investigations into the factors affecting the growth of microorganisms • Maths: serial dilutions and population calculations **PAG 7** Task 1 Effect of antibiotics on bacterial growth		
Enrichment within the curriculum	Biotechnology trip to University Worcester to carry out a number of advanced molecular biology techniques directly relevant to the concepts covered in the genetics module. The workshop covers techniques such as PCR and DNA gel electrophoresis					
Cross curricular links						
Extra-curricular opportunities	Biology clinics Biology drop in sessions					

What are the intended outcomes of the Year 13 Biology curriculum?						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2

Opportunities to show progress (Assessments)	End of unit tests Photosynthesis, Hormones and Nervous communication	End of unit tests Respiration and Excretion PPE 1	End of unit tests Patterns of inheritance, Plant hormones and Manipulating genomes PPE 2	End of unit tests Cloning and biotechnology and Population and sustainability	PPE 3	
Impact on personal development (SMSC)	Ethics of organ donation Ethics of somatic and germ line therapy Ethics of genetic modification of organisms The arguments for and against artificial cloning in plants and animals Ethics of selective breeding of pets The ethical use of living organisms in practical work					
Preparation for the next stage of education	A level qualification in Biology can lead to a further Biological study at university or even a degree in Biological sciences. There are also doors opened to medicine, veterinary medicine, animal health, midwifery, physiotherapy, nursing, agriculture and many more.					