

KS5 Curriculum Overview: Biology Year 12

Rationale:

In Key Stage 5 Biology is taught separately to Physics and Chemistry, by specialist teachers with the skills and experience required to deliver the curriculum at this level.

Biology helps us to understand the structure and function of organisms. It helps us discover how the world works, our place, impact, role and the responsibilities we have. Students explore how scientific ideas develop and how we learn by experimentation. We are committed to providing a stimulating, engaging and intellectually challenging learning environment to enable all our students to develop scientific consciousness, from the basic biological molecules of organisms to species interactions within ecosystems.

The Biology A-Level encourages students to become increasingly curious, to develop open mindedness to the suggestions of others and to make judgements based on evidence. Students realise that moral dilemmas are often involved in scientific developments (just because we can, does it mean that we should?). When considering the environment, the use of further natural resources and its effect on future generations is an important moral consideration.

At every opportunity, the curriculum is enhanced by relating content to current biological developments and news stories, or giving historical context, and teachers make every effort to link to career possibilities and higher education courses.

At Key Stage 5 we follow the OCR Biology A Scheme of Learning, in common with Physics and Chemistry. Depending on numbers of students and staff ratios, Year 12 Biology students are usually divided into two (sometimes three) mixed-ability classes (depending on option blocks).

Students begin by studying a unit building on students' prior knowledge of practical skills, so students are aware of the standards expected to pass the Practical Enhancement, and are explicitly taught the skills they need. The first module is called 'Foundations in Biology' and contains the basic knowledge, studied at GCSE but now covered in more detail, that students need to comprehensively understand before moving on to look at examples and different contexts in organisms in subsequent modules. A focus is given both to cell structure and biological molecules found in and produced by cells. The course then evolves to study transport systems, exchange surfaces and communicable diseases in both mammals and other organisms, in addition to other branches of biology such as classification and biodiversity. As far as is possible with separate topics, this sequence means that earlier material is revisited to support later material. Throughout the course, the scientific process is taught, with many opportunities to safely plan, risk assess, investigate, record, conclude and evaluate practical investigations, together with the relevant maths skills, and key subject-specific vocabulary that will enable students to be scientifically literate.

AS-Level exams are taken in the Summer term, in addition to concentrating on the Practical Endorsement, and beginning the Y13 SoL.

Reading in the curriculum: The Sciences offer many opportunities to develop and extend students' literacy skills. There is a large amount of new, subject-specific vocabulary, and so each unit includes a glossary which students will complete and learn during the unit. Students will use texts to find out information for themselves, using the functional layout of such texts, including index, contents and glossary sections of text books used in class, and also at home in an online format. Students will also review and connect information within topics, so knowledge organisers are provided for each topic.

Connected knowledge: Topics in the Sciences do not stand alone. Each topic connects to prior knowledge from primary school, other topics learnt or still to be learnt at this school both in the Sciences and in other subjects and also in the outside world. Connected knowledge is discussed in class, starting with the Context Summary which is shared with students at the start of each topic.

Diversity: Science belongs to everyone, regardless of background, and people from all walks of life contribute to its development and reap its benefits. This is reflected in the examples used in lessons and the Scientists whose work we consider.

Term / Length of Unit	Outline	Assessment	Home Learning	Resources	Knowledge/Skills End Points	Reading in the Curriculum
TEACHER 1 Year 12 Autumn Term 1 1.1 Practical Skills Module (6	Practical Skills in Biology Building upon practical skills developed at GCSE, higher level practical skills are	End of topic test	Home learning booklet of exam questions	SOL on science shared area, including PowerPoints, details of practical	<u>Skills (students develop the ability to)</u>	Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news

<p>lessons including 1x test and responding to feedback lesson)</p> <p>Year 12 Autumn Term 1 (and part of Autumn Term 2) 2.2 Biological molecules (19 lessons including 2x assessed practicals plus 3x tests and responding to feedback lessons</p>	<p>developed to allow students to work towards gaining practical endorsement</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams, planning, modelling, carrying out and assessment of various practical activities</p> <p>Biological Molecules</p> <p>Building upon biochemistry knowledge gained at GCSE, various biological molecules (water, carbohydrates, lipids, proteins and inorganic ions) are studied in depth.</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams, qualitative and quantitative practical tests for various biological molecules</p>	<p>2x mid-topic tests and ab end of topic test</p> <p>2x assessed practicals. PAG 6.1 and 9.1</p>	<p>Home learning booklet of exam questions</p>	<p>investigations and associated risk assessments, worksheets, home learning booklet and test. OCR Practical skills handbook, OCR Biological drawings handbook</p> <p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p>	<ul style="list-style-type: none"> • use, develop and critique risk assessments • collect, record and display qualitative and quantitative data in scientifically appropriate formats • create and critique biological drawings • correctly use citations and references in scientific reports <p><u>Knowledge</u></p> <ul style="list-style-type: none"> • monomers, polymers and molecular bonding • hydrogen bonding, properties of water and its role in living organisms • the structure, function and properties of carbohydrates • the structure, function and properties of lipids • the structure, function and properties of proteins • the key inorganic ions involved in biological processes • qualitative and quantitative tests for carbohydrates, proteins and fats • the principles of chromatography <p><u>Skills</u></p> <ul style="list-style-type: none"> • practical skills - quantitative and qualitative tests for carbohydrates, proteins and fats • practical skills - separation techniques • data recording and display • quantitative and quantitative analysis of data 	<p>and via the internet, and biological publications and journals such as biological science review.</p>
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<p>TEACHER 2</p> <p>Year 12 Autumn Term 1 2.1 Cell Structure (12 lessons including 2x tests and responding to feedback lessons</p> <p>Year 12 Autumn Term 1 (and part of Term 2) 2.4 Enzymes (7 lessons including a test and responding to feedback lesson)</p>	<p>Cell Structure</p> <p>Building upon cell structure knowledge gained at GCSE, animal and plant organelles are studied in depth, as well as theory and practical work increasing knowledge and competence in using microscopes.</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams and microscopy practicals.</p> <p>Enzymes</p> <p>Building upon cell enzyme knowledge gained at GCSE, the structure and function of enzymes are studied in depth, in addition to factors that affect enzyme function and practicals that investigate these factors.</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams and enzyme practicals.</p>	<p>A mid-topic test and an end of topic test</p> <p>End of topic test</p>	<p>Home learning booklet of exam questions</p> <p>Home learning booklet of exam questions</p>	<p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p> <p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> Function of eukaryotic and prokaryotic organelles Interrelationship between the organelles involved in protein synthesis Importance of the cytoskeleton Comparison of prokaryotic and eukaryotic cells <p><u>Skills</u></p> <ul style="list-style-type: none"> Use and manipulate the magnification formulae Understand term 'resolution' Use a microscope to calibrate a graticule and view and measure organelles Interpret photomicrographs Preparing slides to view with a microscope and understand the use of staining <p><u>Knowledge</u></p> <ul style="list-style-type: none"> Role of enzymes in intra and extracellular reactions Mechanism of enzyme action Factors affecting enzyme function Cofactors and coenzymes <p><u>Skills</u></p> <ul style="list-style-type: none"> Investigate the effects of pH and temperature on enzyme function Measure the rate of reaction Risk assessments Controlling variables Processing results Using graphs to calculate rate of reaction Series dilutions 	<p>Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.</p>
	<p>Nucleic Acids</p> <p>Building upon knowledge gained at GCSE of DNA, DNA structure, replication and</p>	<p>End of unit test</p> <p>PAG 10.1 Assessed practical activity</p>	<p>Home learning booklet of exam questions</p>	<p>SOL on science shared area, including PowerPoints,</p>		<p>Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books,</p>

<p>TEACHER 1</p> <p>Year 12 Autumn Term 2 2.3 Nucleic acids (5 lessons including 1x assessed practical plus 1x test and responding to feedback lesson)</p>	<p>protein synthesis are studied in depth.</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams and computer simulations as well as a DNA extraction practical.</p>	<p>(computer modelling)</p>		<p>details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> DNA structure as well as the synthesis and breakdown of polynucleotides semi-conservative DNA replication the nature of the genetic code and the synthesis of polypeptides <p><u>Skills</u></p> <ul style="list-style-type: none"> practical skills – DNA extraction qualitative analysis of results ICT skills – DNA computer modelling 	<p>scientific articles in the news and via the internet, and biological publications and journals such as biological science review.</p>
<p>Year 12 Autumn Term 2 (and part of spring term 1) 3.1 Exchange surfaces (6 lessons including 1x test and responding to feedback lesson)</p>	<p>Exchange Surfaces and Breathing</p> <p>Building upon knowledge gained at GCSE of exchange surfaces and the process of breathing, specialised exchange surfaces are studied in depth</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams, various dissections, microscope work as well as a spirometer practical</p>	<p>End of unit test</p>	<p>Home learning booklet of exam questions</p>	<p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> The features of an efficient exchange surface The structure, function and mechanisms of the mammalian gaseous exchange system The histology of exchange surfaces The relationship between vital capacity, tidal volume, breathing rate and oxygen uptake The mechanisms of ventilation and gas exchange in bony fish and insects <p>•</p> <p>•</p> <p><u>Skills</u></p> <ul style="list-style-type: none"> practical skills –microscopic examination of exchange surfaces practical skills – using a spirometer calculations of breathing rates and various other spirometer-related numerical values practical skills – dissection and examination of a bony fish 	

<p>test and responding to feedback lessons and 2x assessed practical lessons)</p>	<p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams, dissection and biological drawings</p>			<p>assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1. OCR Biological drawings handbook.</p>	<ul style="list-style-type: none"> • The external and internal structure of the mammalian heart • The cardiac cycle • The coordination of the cardiac cycle • The role of haemoglobin <p><u>Skills</u></p> <ul style="list-style-type: none"> • practical skills – heart dissection • biological drawing skills – heart dissection • pulse rate calculations 	<p>journals such as biological science review.</p>
<p>TEACHER 2</p> <p>Year 12 Spring Term 1 3.3 Transport in Plants (6 lessons including 1x test and responding to feedback lesson)</p> <p>Year 12 Spring Term 1 4.1 Communicable Diseases (9 lessons including 1x test and responding to feedback lesson)</p>	<p>Transport in Plants</p> <p>Building upon knowledge gained at GCSE of transpiration, and Y12 2.5 Biological Membranes and Biological Molecules, translocation and transpiration are studied in depth</p> <p>Teaching and learning methods include use of slideshows, video clips, annotated diagrams, and practicals investigating factors that affect transpiration.</p> <p>Communicable Diseases</p> <p>Building upon knowledge gained at GCSE of communicable diseases and pathogens, and Y12 2.6 Cell Division, pathogens, transmission of disease and the immune system and</p>	<p>End of Unit Test</p> <p>End of Unit Test</p>	<p>Home learning booklet of exam questions</p> <p>Home learning booklet of exam questions</p>	<p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1</p> <p>SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> • The need for transport systems in multicellular plants • Structure and function of the vascular system in roots, stems and leaves in dicots • Structure and function of xylem vessels, sieve tube elements and companion cells • Mechanism of water movement • Factors affecting transpiration rate • Adaptations of hydrophytes and xerophytes • Mechanism of translocation <p><u>Skills</u></p> <ul style="list-style-type: none"> • Examine and draw sections of plant tissue • Dissection of stems • Photometers to investigate factors that affect transpiration rate <p><u>Knowledge</u></p> <ul style="list-style-type: none"> • Pathogens that cause disease in plants and animals • Transmission of pathogens • Primary non-specific defences in animals • Defences against disease in plants • The immune system • Antibody structure • Primary and secondary immune responses • Vaccination 	<p>Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.</p>

	vaccination are studied in depth Teaching and learning methods include use of slideshows, video clips, annotated diagrams, and microscopy.			booklet and test. Pearson Biology A textbook 1	<ul style="list-style-type: none"> Autoimmune diseases Antibiotics and other medicines <u>Skills</u> <ul style="list-style-type: none"> Viewing and identifying WBC using microscopes 	
TEACHER 1 Year 12 Spring Term 2 4.3 Biological classification (10 lessons including 2x test and responding to feedback lessons)	Biological classification Building upon knowledge gained at GCSE of classification systems classification, phylogeny, natural selection and evolution are studied in depth Teaching and learning methods include use of slideshows, video clips, annotated diagrams and maths skills booklets.	Mid-point test and end of unit test	Home learning booklet of questions	SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1. OCR mathematical skills handbook. OCR mathematical skills online tutorials.	<u>Knowledge</u> <ul style="list-style-type: none"> The biological classification of species The binomial naming system The features used in classification The evidence used in classification The relationship between classification and phylogeny The evidence for natural selection The different types of variation The different types of adaptations of organisms to their environment Natural selection and evolution <u>Skills</u> <ul style="list-style-type: none"> Application of various statistical techniques 	Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.
TEACHER 2 Year 12 Spring Term 2 4.2 Biodiversity (6 lessons including 1x test and responding to feedback lesson)	Biodiversity Building upon knowledge gained at GCSE of biodiversity and how to study it, genetic biodiversity, factors affecting biodiversity and conservation methods are studied in depth Teaching and learning methods include use of	End of Unit Test	Home learning booklet of questions	SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test.	<u>Knowledge</u> <ul style="list-style-type: none"> Habitat, genetic and species biodiversity Factors affecting biodiversity Biodiversity and conservation <u>Skills</u> <ul style="list-style-type: none"> Sampling habitats including random and non-random methods Calculating species richness, species evenness and Simpson's Index of Biodiversity Risk assessments Assessing genetic biodiversity 	Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.

	slideshows, video clips, annotated diagrams and practicals involving surveying biodiversity.			Pearson Biology A textbook 1.		
BOTH TEACHERS Year 12 Summer Term 1	Revision and preparation for AS Biology Exams	AS Biology Exams	Home learning booklet of questions	Revision resources on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A textbook 1. OCR mathematical skills handbook. OCR mathematical skills online tutorials.	All of the above	Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.
BOTH TEACHERS Year 12 Summer Term 2	Completion of PAGs 5.1 Communication and Homeostasis Building upon knowledge gained at GCSE and AS Level of homeostasis, plasma membranes, structure of proteins and the action of enzymes are studied in depth Teaching and learning methods include use of	CPAC End of Unit Test	Home learning booklet of questions	SOL on science shared area, including PowerPoints, details of practical investigations, checklists and associated risk assessments, worksheets, home learning booklet and test. Pearson Biology A	<u>Knowledge</u> <ul style="list-style-type: none"> The need for communication systems The need for a constant internal state Maintenance of a constant internal state by negative feedback Temperature regulation in ectotherms and endotherms <u>Skills</u> <ul style="list-style-type: none"> Application of various statistical techniques Planning, implementing and analysing an investigation 	Glossary, context summary, knowledge organiser and guided reading opportunities. Students are encouraged to read other text books, scientific articles in the news and via the internet, and biological publications and journals such as biological science review.

	slideshows, video clips, annotated diagrams and maths skills booklets.			textbook 2. OCR mathematical skills handbook.	<ul style="list-style-type: none">• Research and referencing sources• Processing data• Aseptic techniques	
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