

## Yardleys Curriculum Aims

- To achieve academic excellence
- To educate the 'whole child' so they are ready for life
- To work collaboratively and ethically to provide education of the highest standard

## BIOLOGY – KEY STAGE 4

### Curriculum Overview

**INTENT:** Science helps students gain an understanding of the world around them, from the micro-level of particles and atoms to the macro-level of our expanding universe. It encourages students to question and enquire to learn more. We want our students to acquire the scientific knowledge and skills to meet their academic, practical and “real life” challenges of the future.

### Year 9

Year 9 builds on from cycles of life topic, which was taught at the end of Year 8. The focus of this topic is how organisms interact with each other and their environment and how humans can positively and negatively impact their environments. It then links to current issues that are affecting our environment and how we can address these issues and make our environments more biodiverse, reduce pollution and extinction. This follows on with the key concepts and the central ideas in biology such as cells, enzymes and how substances are transported in and out of plant and animal cells.

	Ecosystems and Material cycles	Key Concepts	Exchange and Transport in Animals	Plant Structures and their Functions
<b>SUBSTANTIVE KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>• Ecosystems</li> <li>• Pollution</li> <li>• Feeding relationships.</li> <li>• Biodiversity</li> <li>• Food security</li> <li>• Cycles</li> </ul>	<ul style="list-style-type: none"> <li>• Eukaryotic and prokaryotic cells</li> <li>• Virus structure and lifecycle</li> <li>• Microscopes</li> <li>• Enzymes</li> <li>• Testing foods.</li> <li>• Transporting substances</li> </ul>	<ul style="list-style-type: none"> <li>• The circulatory system</li> <li>• Cardiovascular disease</li> <li>• Treatments for cardiovascular disease</li> <li>• Cellular respiration</li> </ul>	<ul style="list-style-type: none"> <li>• Photosynthesis</li> <li>• Diffusion, osmosis, and active transport.</li> <li>• Plant tissue</li> <li>• Plant adaptations, defence and disease</li> <li>• Plant hormones</li> </ul>

<b>DISCIPLINARY KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>Identify patterns and trends and draw conclusions</li> <li>Interpreting data</li> <li>To make predictions and draw hypothesis</li> <li>Apply mathematical concepts</li> <li>Apply sampling techniques</li> </ul>	<ul style="list-style-type: none"> <li>Apply mathematical concepts</li> <li>To interpret observations and other data, including identifying patterns and trends, making inferences, and drawing conclusions</li> <li>Use scientific theories and explanations to make predictions</li> </ul>	<ul style="list-style-type: none"> <li>Use mathematical concepts</li> <li>Select appropriate equipment</li> <li>Evaluate risks</li> <li>Evaluate methods of treatment bearing in mind the benefits and risks.</li> <li>Interpret data</li> <li>Suggest improvements to scientific methods.</li> </ul>	<ul style="list-style-type: none"> <li>To use mathematical equations</li> <li>Select appropriate apparatus</li> <li>Present observations into tables and graphs and evaluate data and suggestions for improvements.</li> <li>Recognise patterns and trends, make inferences, and draw conclusions when carrying out a range of photosynthesis practicals.</li> </ul>
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## Year 10

Year 10 will gain an in depth understanding of the hormonal and nervous system in the body. Pupils will learn how hormones travel throughout the body and affect target organs. How the nervous system protects our body from harm and danger and how both systems coordinate actions in our bodies. This will be followed on by a topic on Health, disease, and development of medicine where students will be introduced to the distinct types of pathogens that can infect human and plant cells and the bodies defence against these pathogens. The topic will then delve into treatment methods such as vaccination and antibiotics and will conclude with the development of drugs. In the genetics topic, students will learn about the DNA code that produces our features and the processes that allow features to be passed on from parents to their offspring. Finally, pupils will gain an insight to how mutations are caused and the effect of these mutations. The topic will conclude with a lesson on the human genome project and how the information about a human genome could be useful in medicine.

	<b>Plant Structures and their Functions</b>	<b>Animal Coordination, Control and Homeostasis</b>	<b>Cells and Control</b>	<b>Health, Disease, and the Development of Medicines</b>	<b>Cells and Control</b>
<b>SUBSTANTIVE KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>Photosynthesis</li> <li>Diffusion, osmosis, and active transport</li> <li>Plant tissue</li> <li>Plant adaptations, defence and disease</li> <li>Plant hormones</li> </ul>	<ul style="list-style-type: none"> <li>Hormones</li> <li>Thermoregulation</li> <li>Osmoregulation</li> <li>The kidneys</li> </ul>	<ul style="list-style-type: none"> <li>Nervous system</li> <li>Brain</li> <li>Brain and Spinal cord problems and treatments</li> <li>The eye</li> </ul>	<ul style="list-style-type: none"> <li>Health and disease</li> <li>Pathogens</li> <li>Defence against pathogens</li> <li>Immune system.</li> <li>Antibiotics</li> <li>Development of new drugs</li> <li>Monoclonal antibodies</li> </ul>	<ul style="list-style-type: none"> <li>Stem cells</li> <li>Growth in plants and animals</li> <li>Mitosis</li> </ul>
<b>DISCIPLINARY KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>To use mathematical equations</li> <li>Select appropriate apparatus</li> <li>Present observations into tables and graphs and evaluate data and</li> </ul>	<ul style="list-style-type: none"> <li>Interpret observations and data from graphs.</li> <li>Use mathematical concepts</li> <li>Identify correlations</li> <li>Evaluate the findings and suggest</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate social and ethical issues.</li> <li>Use appropriate techniques and equipment.</li> <li>Record observations and evaluate the reliability of the method</li> </ul>	<ul style="list-style-type: none"> <li>Identify correlations and draw conclusions.</li> <li>Evaluate risks and ethical issues</li> <li>Apply mathematical concepts</li> <li>Making inferences and draw conclusions</li> </ul>	<ul style="list-style-type: none"> <li>Use percentile growth charts to interpret growth in children</li> <li>Apply mathematical concepts</li> <li>Evaluate the practical risks and benefits, as</li> </ul>

	suggestions for improvements <ul style="list-style-type: none"> <li>Recognise patterns and trends, make inferences and draw conclusions when carrying out a range of photosynthesis practical's</li> </ul>	improvements to a method	and suggest improvements <ul style="list-style-type: none"> <li>Interpret ray diagrams</li> </ul>	<ul style="list-style-type: none"> <li>Recognise the importance of peer review of results and of communication of results</li> </ul>	well as social and ethical issues
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## Year 11

In Year 11 students will learn about the development of the theory of evolution by natural selection. It will delve into how different methods including genetic analysis are being used to investigate evolution. Pupils will learn about the evidence for the theory of evolution such as the pentadactyl limb and antibiotic resistance bacteria. The journey then continues into how organisms are classified before and now. Students will then learn how humans can change the characteristics of animals via selective breeding and genetic engineering, how the processes are carried out, their benefits and drawbacks. Pupils will then learn how and why tissue culture, GMOs, and biological control are used in agriculture. The year will conclude with the Year 11s revisiting the core practicals and high frequency questions in Biology.

	Cells and Control and Genetics	Natural Selection and Genetic Modifications	Synoptic Revision and High Frequency Questions	
<b>SUBSTANTIVE KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>Stem cells</li> <li>Growth in plants and animals</li> <li>Mitosis</li> <li>Meiosis</li> <li>Reproduction</li> <li>DNA</li> <li>Protein synthesis</li> <li>Genetic variations</li> <li>Inheritance</li> <li>Gene mutation</li> </ul>	<ul style="list-style-type: none"> <li>Natural Selection</li> <li>Evidence for evolution</li> <li>Classification</li> <li>Selective breeding and Genetic Engineering</li> <li>GM and Agriculture</li> <li>Tissue Culture</li> <li>Fertiliser and Biological control</li> </ul>	<ul style="list-style-type: none"> <li>High frequency topic revision</li> <li>Experimental design revision</li> </ul>	
<b>DISCIPLINARY KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>Use and apply mathematical concepts</li> <li>Present observations and data using appropriate methods, including tables and graphs</li> <li>Extract and interpret information from genetic crosses and family trees</li> <li>Use percentile growth charts to interpret growth in children</li> <li>Apply mathematical concepts</li> </ul>	<ul style="list-style-type: none"> <li>Identify trends in the evolution of humans</li> <li>Interpret observations and collected data to classify organisms</li> <li>Use a timeline to predict how long-ago fossils inhabited the earth</li> <li>Recognise the importance of peer review of results and how Darwin's theory was accepted over time</li> <li>Interpret evolutionary trees</li> </ul>	<ul style="list-style-type: none"> <li>Apply mathematical concepts</li> <li>Identify patterns and trends and draw conclusions</li> <li>Interpret data</li> <li>To make predictions and draw hypothesis</li> </ul>	

	<ul style="list-style-type: none"><li>Evaluate the practical risks and benefits, as well as social and ethical issues</li></ul>			
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