

Biology Knowledge Sequencing

By the end of key stage FOUR we want all students of Biology to know and do the following key things: make confident use knowledge & understanding of key terms in Biology; have practical competency and knowledge for all required practical activities and experiments; interpret & analyse qualitative and quantitative data with reasoning; make coherent conclusions; make well-reasoned judgements; evaluate and refine practical procedure.

Prior Knowledge In KS4, students of Biology will build on the following prior learning: Key Stage Three understanding of key processes, such as fundamental biological reactions of photosynthesis and respiration, living organisms relating to cell structures, ecosystems and cell structures; Key Stage Three skills of analysis and evaluation; maths skills, including calculating percentages and averages; simple evaluation of practical procedure; knowledge of key equipment; consideration of variables.

Future Knowledge The Curriculum in KS4 Biology will prepare students for the following future learning: Utilise knowledge in well-reasoned explanations; independently refine and evaluate practical procedure; analysis utilising wider maths skills.

	Term	Key Knowledge	Assessment Focus
Year 10	1	Build on microbes and drugs and health modules to develop knowledge of prevention and treatment of communicable diseases. To include the development and trialling of drugs.	Vaccination long answer question Infection and response test.
	2	Build on cells and tissues and photosynthesis to develop knowledge of a range of non-communicable diseases. To include risk factors and consideration of correlation and causation. Develop knowledge & understanding, and well-reasoned judgements, about Bioenergetics: photosynthesis. Required Practical Photosynthesis interpretation and analysis of data and coherent conclusions, evaluate and refine RP procedure.	Non-communicable diseases long answer question. Non-communicable diseases test. Photosynthesis long answer question.
	3	Build on knowledge from units on Organisation and Infection and Response to develop knowledge on Bioenergetics: Respiration; confident knowledge and understanding, application to wider scenarios, depth of description. Focus on extended response.	Respiration long answer question Photosynthesis and respiration test.
	4	Build on knowledge from units on Organisation and cells to develop knowledge on the human nervous system. Practical skills: measuring reaction times. Maths skills: interpret data to develop conclusions. Further develop confident knowledge and understanding of cells and organisation, disease and bioenergetics.	Reflex arc long answer question. The human nervous system test. Year 10 examination
	5	Build on cells and non-communicable disease to develop knowledge on homeostasis, offering well-reasoned judgements. Relate medical intervention of dialysis to ethical considerations. Required Practical Germination to plan and utilise apparatus techniques.	Hormones long answer question
	6	Continue to develop knowledge & understanding about Homeostasis, offering well-reasoned judgements. Build on Cells and cell division to develop knowledge of reproduction and the genome.	Homeostasis test
Year 11	Term	Key Knowledge	
	1	Continue to develop knowledge & understanding of reproduction to include inheritance and the ethics of genetic screening.	Genetic screening long answer question Reproduction test
	2	Build on Inheritance and evolution to develop knowledge of variation and evolution. Model natural selection, consider data related to twin studies and consider the ethics of genetic engineering. Build on knowledge from units on Organisation and Infection and Response. Bioenergetics: Respiration; confident knowledge and understanding, application to wider scenarios, depth of description. Focus on extended response.	Natural selection long answer question. Y11 mock examination
	3	Build on reproduction, variation and evolution to develop knowledge of genetics and evolution. Consideration of evidence for scientific theories and classification.	Variation, genetics and evolution test.

	4	Build on environment and adaptation, variation, genetics and evolution to develop knowledge of ecology. Required Practical Field Investigations to plan, implement Apparatus and Techniques, develop sampling techniques and use them in more complex contexts, such as unfamiliar ecological habitats. Relate knowledge from previously learned topics to wider scenarios relating to Ecology. Focus on application of learned understanding. Concreting of learned understanding. Planning of possible extended response titles. Practice maths skills, with a focus on application of examination style questions. Practice apparatus and techniques application.	Quadrats long answer question Y11 Mock examination Ecology test	
	5	Focus on application of learned understanding. Concreting of learned understanding. Planning of possible extended response titles. Practice maths skills, with a focus on application of examination style questions. Practice apparatus and techniques application.	External examinations	
Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading		Links to British Values	Links to Careers	Links to Other Personal Development
<p>FROM THE LIBRARY</p> <p><i>Fighting Infectious Disease</i>; Sally Morgan-616.905</p> <p><i>Fighting Diseases</i>; Robert Sneddon-616.9</p> <p><i>Health and Disease</i>; Franklin Watts-301</p> <p><i>Loos save Lives</i>; Seren Boyd-363</p> <p><i>Story of the Human Body: The Evolution of Health and Disease</i>; Daniel Lieberman-612</p> <p><i>Breast Cancer</i>-362.1</p> <p><i>Kate Smokes</i>-613.8</p> <p><i>How Do Drink and Drugs Affect Me</i>-615</p> <p><i>The Body</i>-612</p> <p><i>Breathing</i>-612</p> <p><i>Evolve or Die</i>-500</p> <p><i>Lungs</i>-612</p> <p><i>Complete Book of The Brain</i>-612</p> <p><i>Inner Workings Of The Grey Matter</i>-612</p>		<p>Mutual respect: Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints respectfully.</p> <p>Rule of law: When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of everyone in the laboratory. When conducting experiments involving animals, we have to abide by laws to ensure that animals are not treated cruelly. When using radioactive sources, certain members of</p>	<p>Links to a broad range of careers are made at the start of each new topic area. They are given to students on their learning objectives sheets and projected on the introductory slide of each new topic.</p>	<ul style="list-style-type: none"> • Developing a healthy lifestyle. • Developing healthy relationships. • Develop a set of positive personal traits, dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate consistently well with others. • Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy. • An inclusive environment that

<p><i>Bulging Brains-500</i> <i>Hormones-612.405</i> <i>Hormones-612.4</i> <i>Diabetes-362.1</i> <i>Living With Diabetes-362.1</i> <i>Everything You Ever wanted To Know About Periods-613</i> <i>Amazing Voyage Of The Cucumber Sandwich-612.3</i> <i>Digesting-612.3</i> <i>Dictionary Of Human Anatomy-612</i> <i>Eating-613.2</i> <i>Disgusting Digestion-612</i> <i>Fertility and Reproduction-176</i> <i>Making Life-612</i> <i>Cells, Division and Genetics-571.84</i> <i>Celle and Systems-574</i> <i>Darwin-576</i> <i>Darwin For Beginners-576</i> <i>Evolution-576</i> <i>Origin Of Species-576</i> <i>Life-576</i> <i>Origin Of Species and the Voyage of the Beagle-576</i> <i>Benefits of Bacteria-616</i> <i>Evolve or Die-500</i> <i>Fighting Infectious Disease-616.9</i> <i>Our Changing population-305</i> <i>Planet under Preasure-363</i></p>	<p>the department are trained as Radiation Protection Supervisors to comply with Health and Safety laws.</p> <p>Tolerance: Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints.</p> <p>Democracy: Science is a democratic discipline. When developing new theories, it has to be accepted by a wide number of scientists before it is consider a scientific theory. Similarly, all experimental work has to be</p>		<p>meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.</p>
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<p><i>Poulation-910</i> <i>Global Waste-363.72</i> <i>Waste Issues-363</i></p>	<p>peer reviewed by others before it is accepted.</p> <p>Individual liberty: Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.</p>		
<p>Extra-Curricular and Co-Curricular Opportunities</p>		<p>Links with other subjects in the curriculum</p>	
<p>Lego league</p> <p>Rotary tech challenge</p> <p>Arkwright scholarship</p> <p>Nancy Rothwell award competition</p> <p>Science week activities and poster competition.</p> <p>Kerboodle – additional resources and textbooks</p> <p>Educake</p>	<p>Maths - classifying, counting, measuring, calculating, estimating, tables, graphs, statistics, algebra</p> <p>Geography – Combustion, pollutants, environmental impacts, clean drinking water, product life cycles, food chains, biodiversity, climate change</p> <p>Philosophy and ethics – ethical discussions around reproduction, vaccination, stem cells, genetic testing</p> <p>History – development of microscopes, medicines</p> <p>Design and technology – Healthy diet</p> <p>Personal development – healthy eating, impact of drugs and smoking</p> <p>English and MFL: etymology of words</p>		

Biology Knowledge Sequencing

By the end of key stage FIVE we want all students of Biology to know and do the following key things: Confidently know & understand high-level scientific ideas; apply concepts to wider scenarios; analyse qualitative & quantitative data with reasoning; write coherent conclusions; offer well-reasoned judgements; evaluate & refine practical procedures independently.

Prior Knowledge In KS5, students of Biology will build on the following prior learning: GCSE knowledge and understanding of scientific terms and concepts; practical procedures; justification of scientific processes and variables; GCSE mathematical skills; evaluation of data; offering extended responses and justified conclusions; analysing data; explaining trends; using key apparatus and techniques.

Future Knowledge The Curriculum in KS5 Biology will prepare students for the following future learning: Undergraduate scientific study; an appreciation of wider scientific reading and linked theory in journals and publications; independent practical investigations.

	Term	Key Knowledge	Assessment Focus
Year 12	1	Developing knowledge & understanding of Cells, and Biological Molecules, applying knowledge to wider scenarios. Required Practical on membrane permeability. Develop competency for analysis of data, drawing conclusions. Developing an independent study mind-set.	Common practical assessments. Cells test
	2	Cells, Biological Molecules, Transport across membranes, immunology; developing knowledge & understanding; application to wider scenarios; depth of description; link key processes. Conduct and evaluate Required Practical on Osmosis, Mitosis and Enzymes.	Y12 assessment on cells and biological molecules. Common practical assessments. Enzyme test. Transport across membranes and mitosis test
	3	Immunology, Exchange and transport, genetic variation and diversity; Independently apply knowledge & understanding to wider scenarios; increasing depth of description; developing Apparatus and Techniques Competencies. Causation & correlation. Embed independent study & skills of self-reflection.	Immunology test Gas exchange test
	4	Exchange and transport, genetic variation and diversity; independent application to wider scenarios with increasing depth of description. Required Practicals on Dissection of Animal or Plant and Antimicrobial Substances. Apparatus Techniques. Independently make judgements; and evaluate practical procedures.	Common practical assessments. Exchange and transport test Genetic variation and diversity test
	5	Inherited change and populations in ecosystems. Independent application to wider scenarios with increasing depth of description' Link key processes; complete statistical tests. Required Practical investigating factors that affect the distribution of species.	Y12 interim examinations Common practical assessments
	6	Inherited change, populations and energy transfer. Independent application to wider scenarios with increasing depth of description.	Y12 interim examinations
Year 13	Term	Key Knowledge	
	1	Photosynthesis, respiration, energy and ecosystems. Demonstrate confident knowledge & understanding, application to wider scenarios, and depth of description. Required practical on chromatography and rate of dehydrogenase activity. Re-visit Apparatus and Techniques skills. Complete statistical tests & draw coherent conclusions. Utilise independent study and self-assessment skills.	Common practical assessments Photosynthesis test. Energy transfer test.
	2	Respiration, energy and ecosystems, Response to stimuli, gene expression. Required practicals on rate of respiration and animal movement. Analyse and interpret data and correlations; evaluate, making well-reasoned judgements - applying to scenarios. Essay writing practice.	Common practical assessments Y13 assessment.

	3	Nervous co-ordination and muscles, Recombinant DNA technology. linking key processes. Honing the ability to analyse and interpret data and correlations; evaluate, making well-reasoned judgements - applying to a range of relevant scenarios. Hone self-study and independent study skills. Essay writing practice.	Nerves and muscles test Gene expression and technology test. Y13 assessment.	
	4	Homeostasis. Required practical calibration curve for glucose. Essay writing practice. Focus on the application of key knowledge independently. Compose possible essay titles. Further Practice mathematical & statistical skills. Apparatus and Technique application.	Common practical assessments Timed essay practice	
	5	Synthesising all parts and components of the course to attempt any examination questions.	External examinations	
Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading		Links to British Values	Links to Careers	Links to Other Personal Development
<p>Richard Dawkins:</p> <ul style="list-style-type: none"> The Selfish Gene The Blind Watchmaker. Unweaving the Rainbow Climbing Mount Improbable The Ancestor's Tale <p>Steve Jones:</p> <ul style="list-style-type: none"> Y: The Descent of Men In the Blood: God, Genes and Destiny Almost Like a Whale: The 'Origin of Species' Updated The Language of the genes <p>Matt Ridley</p> <ul style="list-style-type: none"> Genome: The Autobiography of a Species in 23 Chapters The Red Queen: Sex and the Evolution of Human Nature The Language of Genes <p>Francis Crick:</p> <ul style="list-style-type: none"> Discoverer of the Genetic Code 		<p>Mutual respect: Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints respectfully.</p> <p>Rule of law: When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of everyone in the laboratory. When conducting experiments involving animals, we have to abide by laws to ensure that animals are not treated cruelly. When using radioactive sources, certain members of the department are trained</p>	<ul style="list-style-type: none"> Higher education opportunities signposted in lessons, on Teams and permanent displays. Pupils are regularly supported and provided with guidance on necessary grades required for University courses and subsequent careers. 	<ul style="list-style-type: none"> Developing a healthy lifestyle. Developing healthy relationships. Develop a set of positive personal traits, dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate consistently well with others. Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy.

<ul style="list-style-type: none"> • Nature Via Nurture: Genes, Experience and What Makes Us Human <p>James Watson:</p> <ul style="list-style-type: none"> • DNA: The Secret of Life • The Double Helix: Personal Account of the Discovery of the Structure of DNA <p>Lewis Thomas: The Lives of a Cell: Notes of a Biology Watcher.</p> <p>Brian Cox:</p> <ul style="list-style-type: none"> • Wonders of Life • Human Universe • Ben Goldacre: • Bad Science • Bad Pharma <p>Charles Darwin: The origin of species</p> <p>Armand Marie Leroi: Mutants: On the Form, Varieties and Errors of the Human Body</p> <p>David S. Goodsell: The Machinery of Life</p> <p>Ernst Mayr: This Is Biology: The Science of the Living World</p> <p>George C. Williams: Plan and Purpose in Nature</p> <p>Steve Pinker: The Language Instinct</p> <p>Edward O Wilson: The Diversity of Life</p> <p>Richard Leaky: The Origin of Humankind</p> <p>Bill Bryson: A Short History of Nearly Everything</p> <p>George Monbiot: Rewilding</p>	<p>as Radiation Protection Supervisors to comply with Health and Safety laws.</p> <p>Tolerance: Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints.</p> <p>Democracy: Science is a democratic discipline. When developing new theories, it has to be accepted by a wide number of scientists before it is consider a scientific theory. Similarly, all experimental work has to be</p>		<p>An inclusive environment that meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.</p>
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<p>Yuval Noah Harari: Sapiens A Brief History of Humankind</p>	<p>peer reviewed by others before it is accepted.</p> <p>Individual liberty: Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.</p>		
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