

Beths Grammar School KS4 Biology Curriculum Map – Year 9

Key: **Green shading** = sustainability in context (Summer 3A).

Big question = a conversation starter for home.

Key maths skills (M) and **Working scientifically (WS)** = OCR skill codes linked to the statements taught.

Term	INTENT	IMPLEMENTATION	IMPACT
GCSE OCR Biology A Gateway Science Suite	Substantive Knowledge This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	Disciplinary Knowledge (Skills) This is the action taken within a particular topic in order to gain substantive knowledge.	Assessment opportunities What assessments will be used to measure student progress? Evidence of how well students have learned the intended content.
Autumn Term 1A Year 9 Weeks 1–8 (Sept – Oct)	Intent Why is this taught now? <i>Cells are the building blocks of all living things, so we start here. This secures KS3 knowledge and microscope skills that every later topic depends on.</i> B1.1 – Cell Structures Big question: <i>What are living things made of, and how do we see it?</i> From KS3 Science, learners should be familiar with cells as the fundamental unit of living organisms, and with the use of light microscopes to view cells. They should also be familiar with some sub-cellular structures, and the similarities and differences between plant and animal cells. They will build on this knowledge and develop their understanding of the function of the organelles of a cell, introducing a bacterial cell too. They will also learn the different types of microscopes that are used to visualise cells and their sub-cellular structures, and how to visualise them practically with a light microscope.	B1.1a - describe how light microscopes and staining can be used to view cells. B1.1b - explain how the main sub-cellular structures of eukaryotic cells (plants and animals) and prokaryotic cells are related to their functions. B1.1c - explain how electron microscopy has increased our understanding of sub-cellular structures. Core practical: PAG B1 – Microscopy Use a light microscope to observe plant and animal cells, produce labelled scientific drawings and calculate magnification. Key maths skills M1b – use standard form in magnification calculations (calculating in standard form is HT only) M1d / M2h – estimate and make order of magnitude comparisons of cell sizes M2a – use an appropriate number of significant figures Working scientifically WS1.1a – how electron microscopy changed scientific understanding (B1.1c) WS1.2c – select appropriate apparatus, e.g. microscope, stains (B1.1a) WS1.4c–e – use SI units and prefixes (mm, µm, nm) and convert between them WS2a–d – carry out experiments safely, record and present observations, and communicate findings (microscopy, PAG B1)	• B1.1 Assessment • Year 9 End of Year Exam (w/c 21 Jun) • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

Beths Grammar School KS4 Biology Curriculum Map – Year 9

Autumn Term 1B Year 9 Weeks 9–15 (Nov – Dec)	Intent Why is this taught now? <i>B1.1 is completed and assessed first. B1.2 then builds directly on organelles: the nucleus holds DNA and ribosomes make proteins.</i> B1.1 – Cell Structures (completed) and B1.2 – Inside Cells (begins) <i>Big question: How do cells use DNA to make proteins?</i> From KS3 Science, learners should have a simple understanding of the double helix model of DNA and be familiar with the idea of enzymes as biological catalysts. They will build on this knowledge and learn that life processes depend on biological molecules whose structure is related to their function. They will learn how cells use genetic material to code for and make proteins.	B1.1 – complete and consolidate (weeks 9–10) B1.1a – c (see Autumn 1A) B1.2 – begins (from w/c 16 Nov) B1.2a - describe DNA as a polymer. B1.2b - describe DNA as being made up of two strands forming a double helix. B1.2c - describe that DNA is made from four different nucleotides; each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar. B1.2d - recall a simple description of protein synthesis. (HT) B1.2e - explain simply how the structure of DNA affects the proteins made in protein synthesis. (HT) Key maths skills M1b / M1d – revisit magnification and size calculations (B1.1) Working scientifically WS1.4a – use scientific vocabulary accurately: polymer, nucleotide, complementary base (B1.2a, c) WS2a–d – carry out experiments safely, record and present observations, and communicate findings (3D DNA models; DNA extraction, B1.2c)	• B1.1 Assessment • Year 9 End of Year Exam • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities
Spring Term 2A Year 9 Weeks 16–21 (Jan – Feb)	Intent Why is this taught now? <i>Enzymes are proteins, so they follow protein synthesis. Students need enzymes to understand respiration and photosynthesis, which come next. B1.1 and B1.2 are then assessed together.</i> B1.2 – Inside Cells (continued) <i>Big question: How do enzymes control the reactions in our cells?</i> Learners continue B1.2 by building on the importance of enzymes as proteins in biology, how different factors affect the	B1.2 – continued B1.2f - describe experiments that can be used to investigate enzymatic reactions. B1.2g - explain the mechanism of enzyme action. Core practical: PAG B4 – Rates of enzyme-controlled reactions Investigate factors that affect the rate of enzyme activity, e.g. the effect of temperature or pH on amylase. Key maths skills M1a / M1c – carry out rate calculations using decimals, ratios and percentages M3d – solve simple equations, e.g. rate = 1 / time	• B1.1 and B1.2 Assessment • Year 9 End of Year Exam • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

Beths Grammar School KS4 Biology Curriculum Map – Year 9

	rate of the reactions they are involved in, and how to measure this practically.	M2g / M4b – use scatter graphs and linear relationships to describe enzyme activity Working scientifically WS1.2b / WS1.2c – plan an enzyme investigation and select apparatus WS1.1h – evaluate risks in practical work WS1.3a–g – present, analyse and evaluate data (accuracy, precision, repeatability) WS1.2e – evaluate methods and suggest improvements WS2a–d – carry out experiments safely, record and present observations, and communicate findings (PAG B4)	
Spring Term 2B Year 9 Weeks 22–26 (Feb – Mar)	Intent Why is this taught now? <i>Builds on enzymes from B1.2. Respiration releases the energy (ATP) every cell needs, and learning it first makes photosynthesis easier to compare.</i> B1.3 – Respiration Big question: <i>Where does the energy for life come from?</i> From KS3, learners should have some underpinning knowledge of respiration. This should include that respiration involves the breakdown of organic molecules to enable all the other chemical processes necessary for life. They will also have an understanding of the different biological molecules in an organism's diet and their function. Learners should be able to recall the word equation for respiration. They will build on this knowledge and learn that metabolic processes are controlled by enzymes and organic compounds are used as fuels. They will further their understanding by looking at key	B1.3a - describe cellular respiration as a universal chemical process, continuously occurring that supplies ATP in all living cells. B1.3b - describe cellular respiration as an exothermic reaction. B1.3c - compare the processes of aerobic respiration and anaerobic respiration. B1.3d - explain the importance of sugars in the synthesis and breakdown of carbohydrates. B1.3e - explain the importance of amino acids in the synthesis and breakdown of proteins. B1.3f - explain the importance of fatty acids and glycerol in the synthesis and breakdown of lipids. Core practical: PAG B2 – Testing for biological molecules Use qualitative reagents to test foods for sugars, starch, proteins and lipids. Key maths skills <i>None specified for these statements – focus on key terms.</i> Working scientifically WS1.2a – use scientific theories to develop hypotheses (B1.3a) WS1.2b – plan experiments, e.g. showing respiration is exothermic (B1.3b) WS1.4a – use the terms monomer and polymer correctly (B1.3d–e)	• Year 9 End of Year Exam (w/c 21 Jun) • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

Beths Grammar School KS4 Biology Curriculum Map – Year 9

	biological molecules and how to identify them practically. They will also develop their understanding of aerobic and anaerobic respiration in plants and animals and be able to compare them.	WS2a-d – carry out experiments safely, record and present observations, and communicate findings (fermentation in yeast, B1.3c; food tests, PAG B2)	
Summer Term 3A Year 9 Weeks 27–33 (Apr – May) Sustainability in limiting factors lesson	Intent Why is this taught now? <i>Taught straight after respiration so students can compare the two reactions (endothermic vs exothermic). Enzyme and rate work from B1.2 explains limiting factors, and the limiting factors lesson is extended to explore sustainable food production (see Implementation).</i> B1.4 – Photosynthesis Big question: <i>How do plants make the food that all life depends on?</i> From KS3, learners should have some underpinning knowledge of photosynthesis. They should have an understanding that plants make carbohydrates in their leaves by photosynthesis and be able to recall the word equation for photosynthesis. They will build on this knowledge to understand that this is controlled by enzymes and that there are factors that affect the speed at which this happens. They will learn how we can measure this practically too. The B1 Assessment takes place at the end of this half term.	B1.4a - describe photosynthetic organisms as the main producers of food and therefore biomass for life on Earth. B1.4b - describe the process of photosynthesis. B1.4c - describe photosynthesis as an endothermic reaction. B1.4d - describe experiments to investigate photosynthesis. B1.4e - explain the effect of temperature, light intensity, and carbon dioxide concentration on the rate of photosynthesis. B1.4f - explain the interaction of temperature, light intensity, and carbon dioxide concentration in limiting the rate of photosynthesis. (HT) Core practical: PAG B5 – Photosynthesis Investigate factors that affect the rate of photosynthesis, e.g. light intensity and oxygen production by pondweed (Cabomba). Key maths skills M1a / M1c – calculate rate of photosynthesis as a compound measure M1c (HT) – use inverse proportion – the inverse square law for light intensity M4a / M4c – plot two variables, choosing scales and axes, and translate between graphs and numbers M2c / M2g – interpret tables, charts and scatter graphs of limiting factors Working scientifically WS1.2b / WS1.2c – plan a rate of photosynthesis investigation and select apparatus WS1.3a–g – present, analyse and evaluate data, including limiting factor graphs (B1.4f) WS1.2e – evaluate methods and suggest improvements WS1.4e – interconvert units	• B1 Assessment (begins w/c 24 May) • Year 9 End of Year Exam (w/c 21 Jun) • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

Beths Grammar School KS4 Biology Curriculum Map – Year 9

		WS2a–d – carry out experiments safely, record and present observations, and communicate findings (PAG B5) SUSTAINABILITY IN CONTEXT – extension of the B1.4e–f limiting factors lesson Once students can explain how temperature, light intensity and CO₂ limit the rate of photosynthesis, they apply this to commercial greenhouses: • Apply: explain how growers raise light, temperature and CO₂ to increase crop yield. • Evaluate: is it sustainable? Weigh the extra food against the energy used (e.g. burning fuel for heat and CO₂) and the cost once a factor is no longer limiting. Working scientifically: WS1.1e – applications of science; WS1.1f – evaluate social, economic and environmental implications. Looking ahead: B4.1 Ecosystems (carbon cycle) and B6 Global challenges (feeding the human race).	
Summer Term 3B Year 9 Weeks 34–40 (Jun – Jul)	Intent Why is this taught now? <i>With all of B1 taught, students complete the B1 Assessment. They then begin B2 with how substances move into and out of cells (B2.1a), which builds on diffusion from KS3. The End of Year Exam checks what students have retained from across the year.</i> B1 Assessment, B2.1a and End of Year Exam Big question: <i>How do substances get into and out of cells?</i> Learners complete the B1 Assessment, then begin B2 Scaling Up. From KS3, learners should be familiar with the role	B1 Assessment – completed and feedback. End of Year Exam - completed and feedback. B2 Scaling Up B2.1a - explain how substances are transported into and out of cells through diffusion, osmosis, and active transport. Key maths skills M1c – calculate percentage gain and loss of mass M1d – make estimates of the results of simple calculations Working scientifically	• B1 Assessment • Year 9 End of Year Exam • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

Beths Grammar School KS4 Biology Curriculum Map – Year 9

	of diffusion in the movement of materials in and between cells. They will build on this to learn how substances move into and out of cells by diffusion, osmosis and active transport. The End of Year Exam follows, with buffer time at the end of term for consolidation and feedback.	WS2a–d – carry out experiments safely, record and present observations, and communicate findings (e.g. osmosis in vegetable chips)	
--	--	--	--