

Beths Grammar School KS4 Biology Curriculum Map – Year 10

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 10 Weeks 1–8 (Sept – Oct)	Intent Why is this taught now? <i>Starts with how cells grow, divide and specialise, building on transport into and out of cells from Year 9. This leads into why large multicellular organisms need exchange surfaces and transport systems (B2.2).</i> B2.1 – Supplying the Cell (completed) B2.2 – The Challenges of Size (begins) Big question: <i>How do cells divide, specialise and get what they need?</i> In Year 9, learners studied how substances move into and out of cells. They will build on this and learn that multicellular organisms grow by mitosis, and that cells differentiate to become specialised. They will also learn where stem cells are found, what they do, and how embryonic and adult stem cells differ.	B2.1 – Supplying the Cell B2.1a – Explain how substances are transported into and out of cells through diffusion, osmosis and active transport. (revisited from Year 9) B2.1b – Describe the process of mitosis in growth, including the cell cycle. B2.1c – Explain the importance of cell differentiation. B2.1d – Recall that stem cells are present in embryonic and adult animals, and meristems in plants. B2.1e – Describe the functions of stem cells in embryonic and adult animals, and meristems in plants. B2.1f – Describe the difference between embryonic and adult stem cells in animals. Core practical: PAG B8 – Transport in and out of cells Investigate the effect of different sugar or salt concentrations on the mass of potato chips (osmosis). B2.2 – begins (after the B2.1 Assessment) B2.2a – Explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area : volume ratio. B2.2b – Describe some of the substances transported into and out of a range of organisms in terms of the requirements of those organisms. B2.2c – Describe the human circulatory system. B2.2d – Explain how the structure of the heart and the blood vessels are adapted to their functions. B2.2e – Explain how red blood cells and plasma are adapted to their transport functions in the blood.	• B2.1 Assessment • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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		Practical – Heart Dissection Key maths skills M1c – calculate percentage gain and loss of mass (osmosis) and surface area : volume ratios M1d – make estimates of the results of simple calculations Working scientifically WS1.1e / WS1.1f / WS1.1h – applications, implications and risks of stem cell use (B2.1e) WS1.4d–f – use prefixes, convert units and use significant figures in SA : V calculations (B2.2a) WS2a–d – carry out experiments safely, record and present observations, and communicate findings (PAG B8; heart dissection, B2.2d)	
Autumn Term 1B Year 10 Weeks 9–15 (Nov – Dec)	Intent Why is this taught now? <i>Completes B2 with transport in plants, which mirrors transport in animals from 1A. B3.1 then begins organism level systems, starting with the nervous system, which is the fastest way the body coordinates responses.</i> B2.2 – The Challenges of Size (completed) B3.1 – The Nervous System (begins) Big question: <i>How do plants move water, and how does the body respond to change?</i> Learners complete B2.2 by studying transport in plants: water uptake, transpiration and translocation, and how to measure water uptake practically. B2 is then assessed and B3.1 begins. From KS3 Science, learners	B2.2 – continued B2.2f – Explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their function. B2.2g – Describe the processes of transpiration and translocation. B2.2h – Explain how the structure of the xylem and phloem are adapted to their functions in the plant. B2.2i – Explain the effect of a variety of environmental factors on the rate of water uptake by a plant. B2.2j – Describe how a simple potometer can be used to investigate factors that affect the rate of water uptake. B3.1 – begins (after the B2 Assessment) B3.1a – Describe the structure of the nervous system. B3.1b – Explain how the components of the nervous system can produce a coordinated response. B3.1c – Explain how the structure of a reflex arc is related to its function. B3.1d – Explain how the main structures of the eye are related to their functions. B3.1e – Describe common defects of the eye and explain how some of these problems may be overcome.	• B2 Assessment • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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	should understand the hierarchical organisation of multicellular organisms from cells to tissues, organs, systems and organisms. They will learn that the nervous system is an important part of how the body communicates with itself and receives information from its surroundings.	Core practical: PAG B6 – Physiology, responses and respiration (ruler drop) Measure reaction times using the ruler drop test and investigate factors that affect them. Key maths skills M1a / M1c / M3d – calculate rate of water uptake and percentage change in mass M4a–d – plot and interpret graphs, including slope and intercept (B2.2j) M2g – use scatter diagrams to identify correlations M1d / M2c – estimate and interpret reaction time data (B3.1c) Working scientifically WS1.2b / WS1.2c / WS1.2e – plan a potometer investigation, select apparatus and evaluate the method WS1.3a–g – present, analyse and evaluate data WS2a–d – carry out experiments safely, record and present observations, and communicate findings (potometer; ruler drop, PAG B6)	
Spring Term 2A Year 10 Weeks 16–21 (Jan – Feb)	Intent Why is this taught now? <i>Completes the nervous system, then compares it with the slower hormonal system of control. Learning both together helps students compare nervous and hormonal coordination.</i> B3.1 – The Nervous System B3.2 – The Endocrine System (begins) Big question: <i>How do hormones control the body?</i> Learners complete B3.1 by studying the brain and the challenges of investigating and treating it. B3.1 is then assessed and B3.2 begins. From KS3 Science, learners should be aware of a number of hormones including adrenaline and	B3.1 – continued B3.1f – Describe the structure and function of the brain. B3.1g – Explain some of the difficulties of investigating brain function. (HT) B3.1h – Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system. (HT) B3.2 – begins (after the B3.1 Assessment) B3.2a – Describe the principles of hormonal coordination and control by the human endocrine system. B3.2b – Explain the roles of thyroxine and adrenaline in the body. (HT) B3.2c – Describe the role of hormones in human reproduction including the control of the menstrual cycle. B3.2d – Explain the interactions of FSH, LH, oestrogen and progesterone in the control of the menstrual cycle. (HT) B3.2e – Explain the use of hormones in contraception and evaluate hormonal and non-hormonal methods of contraception. B3.2f – Explain the use of hormones in modern reproductive technologies to treat infertility. (HT)	• B3.1 Assessment • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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	the male and female sex hormones. They will build on this knowledge and learn that hormones are chemical messengers, transported in the blood to target tissues and organs, with roles including controlling reproduction.	Key maths skills M2c / M4a – extract and interpret data on hormone levels and contraception from graphs, charts and tables M2g – use graphs to show how hormone levels change across the menstrual cycle (B3.2d) Working scientifically WS1.1d / WS1.1e / WS1.1f / WS1.1h – discuss ethical issues, applications and risks: brain research, contraception and fertility treatment WS1.3b / WS1.3e – translate and interpret hormone data (B3.2c)	
Spring Term 2B Year 10 Weeks 22–26 (Feb – Mar)	Intent Why is this taught now? <i>Plant hormones complete the endocrine system. B3.3 then brings nervous and hormonal control together to explain homeostasis.</i> B3.2 – The Endocrine System (completed) and B3.3 – Maintaining Internal Environments (begins) Big question: <i>How does the body keep conditions inside it constant?</i> Learners complete B3.2 with plant hormones, which regulate plant growth and development and are used in agriculture. B3.2 is then assessed. B3.3 builds on coordination and control from B3.1 and B3.2: learners will learn that homeostasis is crucial to the regulation of internal environments. Internal temperature, blood sugar levels and osmotic balance are regulated by a number of organs and systems working together.	B3.2 – continued B3.2g – Explain how plant hormones are important in the control and coordination of plant growth and development, with reference to the role of auxins in phototropisms and gravitropisms. B3.2h – Describe some of the variety of effects of plant hormones, relating to auxins, gibberellins and ethene. (gibberellins and ethene HT) B3.2i – Describe some of the different ways in which people use plant hormones to control plant growth. (HT) B3.3 – begins (after the B3.2 Assessment) B3.3a – Explain the importance of maintaining a constant internal environment in response to internal and external change. B3.3b – Describe the function of the skin in the control of body temperature. B3.3c – Explain how insulin controls blood sugar levels in the body. B3.3d – Explain how glucagon interacts with insulin to control blood sugar levels in the body. (HT) B3.3e – Compare type 1 and type 2 diabetes and explain how they can be treated. Key maths skills M2c – extract and interpret data from graphs, charts and tables M2g – interpret blood glucose graphs (B3.3c) Working scientifically	• B3.2 Assessment • Year 10 trial exam • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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		WS1.4a – use key terms accurately, e.g. homeostasis, negative feedback (B3.3a) WS2a–d – carry out experiments safely, record and present observations, and communicate findings (phototropism in seedlings; cooling effect of sweating; testing artificial urine for glucose)	
Summer Term 3A Year 10 Weeks 27–33 (Apr – May) Sustainability in carbon cycle lesson	Intent Why is this taught now? <i>Osmotic balance completes homeostasis before the trial exams. B4 then moves from the organism to the community level, starting with how materials cycle through ecosystems. The carbon cycle lesson is extended to explore sustainability (see Implementation).</i> B3.3 – Maintaining Internal Environments (completed) B4 – Ecosystems (begins) Big question: <i>How does the body control water, and how are materials recycled in nature?</i> Learners complete B3.3 by studying osmotic balance and the kidneys, before the Year 10 trial exams. B4 then begins. From KS3 Science, learners should be familiar with food webs and recognise that organisms affect their environment and are affected by it. They will learn that microorganisms play an important role in the continuous cycling of chemicals in ecosystems.	B3.3 – continued B3.3f – Explain the effect on cells of osmotic changes in body fluids. B3.3g – Describe the function of the kidneys in maintaining the water balance of the body. B3.3h – Describe the gross structure of the kidney and the structure of the kidney tubule. B3.3i – Describe the effect of ADH on the permeability of the kidney tubules. (HT) B3.3j – Explain the response of the body to different temperature and osmotic challenges. (HT) Year 10 trial exams B4.1 – Ecosystems (begins) B4.1a – Recall that many different materials cycle through the abiotic and biotic components of an ecosystem. B4.1b – Explain the role of microorganisms in the cycling of materials through an ecosystem. B4.1c – Explain the importance of the carbon cycle and the water cycle to living organisms. Key maths skills M2c – extract and interpret data from graphs, charts and tables Working scientifically WS1.3b – translate data between forms, e.g. urine volume and concentration (B3.3g) WS2a–d – carry out experiments safely, record and present observations, and communicate findings (effect of osmosis on cells; kidney dissection)	• Year 10 trial exams • B3 Assessment • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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		SUSTAINABILITY IN CONTEXT – extension of the B4.1c carbon cycle lesson Once students can explain how carbon cycles through photosynthesis, respiration, decomposition and combustion, they apply this to human activity: • Apply: explain how burning fossil fuels and deforestation increase carbon dioxide in the atmosphere. • Evaluate: which actions best help keep the carbon cycle in balance, e.g. protecting forests, reducing fossil fuel use, composting food waste? Working scientifically: WS1.1e – applications of science; WS1.1f – evaluate social, economic and environmental implications. Links: Year 9 photosynthesis (B1.4) and B6 Global challenges in Year 11.	
Summer Term 3B Year 10 Weeks 34–40 (Jun – Jul)	Intent Why is this taught now? <i>After trial exam feedback, B4 takes up most of the half term. It uses ideas from B1 (photosynthesis, respiration) and B3 to explain how whole ecosystems work.</i> Trial Exam Feedback B4 – Ecosystems (continued) <i>Big question: How do living things depend on each other and their environment?</i> After trial exam feedback, learners spend most of the half term on B4. They will learn that biotic and abiotic factors interact in an ecosystem and affect communities. Living organisms form populations, communities and ecosystems, are interdependent and show adaptations to their environment. Feeding relationships reflect the	Trial exam feedback B4.1 – Ecosystems (continued) B4.1d – Explain the effect of factors such as temperature, water content and oxygen availability on rate of decomposition. B4.1e – Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem. B4.1f – Explain how abiotic and biotic factors can affect communities. B4.1g – Describe the importance of interdependence and competition in a community. B4.1h – Describe the differences between the trophic levels of organisms within an ecosystem. B4.1i – Describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels. B4.1j – Calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of trophic levels in a food chain. Key maths skills M1c – calculate rate of decay, percentage of mass and efficiency of biomass transfer M4a / M4c – plot graphs, selecting appropriate scales and axes M2c / M4a – extract and interpret data from charts, graphs and tables	• B4 Assessment • Year 11 trial exam • In-class formative assessment activities e.g. recall • Homework activities

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	stability of an ecosystem and show the flow of biomass through it.	M3a – understand and use the symbols =, <, <<, >>, >, α, ~ (B4.1f) Working scientifically WS1.1b – use models, e.g. food webs and pyramids of biomass WS1.2b / WS1.2c / WS1.2e – plan a decomposition investigation and evaluate the method (B4.1d) WS1.3a–h – present, analyse and evaluate data, including sources of error WS2a–d – carry out experiments safely, record and present observations, and communicate findings (composting conditions; sampling techniques)	
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