



# Wanstead High School

Education with Character

## Biology Curriculum Content 2024 - 25

Key Stage 4 - Year 10 & 11  
Key Stage 5 - Year 12 & 13



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# GCSE Biology - Year 10 and 11

## Pupils receive 4 lessons of Biology each fortnight.

The importance of Biology in the curriculum: Biology holds a paramount position within our curriculum, serving as a cornerstone of scientific exploration and understanding. Through the lens of biology, pupils embark on a journey to unravel the intricate mechanisms of life, from the microscopic intricacies of cells to the vast ecosystems that shape our planet.

Central to our curriculum is the recognition that biology is not merely a subject of study but a pathway to developing Education with Character. By engaging with biological concepts, pupils cultivate resilience, curiosity, and an appreciation for the wonders of the natural world. They are challenged to think critically, question assumptions, and approach problems with ingenuity and perseverance.

Furthermore, the study of biology equips pupils with essential skills that transcend the classroom. From problem-solving to logical reasoning, biology fosters the development of analytical thinking and prepares pupils to navigate the complexities of the modern world with confidence and insight.

Our shift towards an integrated approach, where one teacher guides pupils through biology, chemistry, and physics, reflects our commitment to providing a holistic science education. By exploring the interconnectedness between scientific disciplines, pupils gain a deeper understanding of the principles that govern the universe. This sequential approach allows for a more profound exploration of each subject, laying a robust foundation of knowledge that extends beyond the confines of the classroom.

In essence, biology is not just a subject; it is a gateway to discovery, enlightenment, and personal growth. Through the study of biology, pupils embark on a transformative journey of exploration, understanding, and empowerment, preparing them to excel academically and thrive in an ever-changing world.

What is taught	When is it taught (Terms or Half Terms)	Reading list and Literacy focus	Where the curriculum is ambitious
<b>Cells and organisation</b>	<b>Term 1, Year 10</b>	The Immortal Life of Henrietta Lacks by Rebecca Skloot	In Biology Paper 1, Topics 1 and 2 delve into fundamental concepts such as Cell Biology and Organisation. To infuse ambition into these Topics, we can introduce pupils to advanced research beyond the curriculum. This could involve exploring recent breakthroughs in cell biology, such as CRISPR gene editing or regenerative medicine. Additionally, we can offer opportunities for independent research projects where pupils investigate real-world applications of cellular processes, fostering critical thinking and scientific curiosity. By challenging pupils to engage with cutting-edge science, we aim to inspire a deeper understanding and passion for the subject.
<b>Disease and bioenergetics</b>	<b>Term 2 and 3, Year 10</b>	The Emperor of All Maladies: A Biography of Cancer by Siddhartha Mukherjee The Vital Question: Energy, Evolution, and the Origins of Complex Life by Nick Lane	In Biology Paper 1, Topic 3 explores Infection and Response, a crucial area where ambition can be instilled. Beyond the core curriculum, pupils can be exposed to advanced research on infectious diseases, including emerging pathogens and antibiotic resistance. This could involve analysing case studies of global health crises or exploring the development of vaccines and treatments. Furthermore, pupils can engage in debates on ethical considerations surrounding disease control measures or participate in simulations of epidemiological investigations. By delving into complex issues and real-world applications, we aim to cultivate a deeper appreciation for the complexities of microbiology and public health.  In Biology Paper 1, Topic 4 delves into Bioenergetics, presenting ample opportunities for ambition. Beyond the standard curriculum, pupils can explore advanced concepts such as metabolic pathways, thermodynamics

			of cellular processes, and the role of enzymes in energy transfer. Ambitious tasks may include designing experiments to investigate factors affecting enzyme activity or analysing data from biochemical studies. Additionally, pupils can delve into current research on bioenergetics, such as metabolic adaptations in extreme environments or the development of biofuels. By engaging with cutting-edge science, pupils can develop a deeper understanding of the fundamental processes driving life.
<b>Biological responses</b>	<b>Term 1, Year 11</b>	The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma by Bessel van der Kolk	In Biology Paper 2, Topic 5, Homeostasis, pupils can be challenged to explore the complex mechanisms that maintain internal balance in living organisms. Beyond the basics of homeostatic control systems, pupils can investigate advanced Topics such as feedback mechanisms, hormonal regulation, and the role of homeostasis in health and disease. Ambitious tasks may include designing experiments to investigate the effects of external stimuli on physiological processes or analysing data to understand the relationship between homeostasis and various health conditions. Furthermore, pupils can explore interdisciplinary connections between homeostasis and other biological processes, such as metabolism, reproduction, and immune function, gaining a holistic understanding of the interconnected nature of living systems. By engaging with advanced concepts and real-world applications, pupils can develop a deeper appreciation for the complexity and resilience of living organisms.
<b>Genetics and reproduction</b>	<b>Term 1 Year 10 and Term 2, Year 11</b>	The Selfish Gene by Richard Dawkins	Moving on to Topic 6, Inheritance, Variation, and Evolution, pupils can explore the mechanisms of heredity and the processes that drive evolutionary change. Ambitious tasks may involve investigating genetic mutations, genetic disorders, and the role of natural selection in shaping biodiversity. Pupils can analyse real-world data sets to study patterns of inheritance and the evolutionary relationships between species. Furthermore, they can explore contemporary issues in genetics and evolution, such as genetic engineering and antibiotic resistance. By grappling with these complex Topics, pupils develop critical thinking skills and a deeper understanding of the mechanisms that underpin biological diversity and adaptation.
<b>Ecology</b>	<b>Term 3, Year 11</b>	The Sixth Extinction: An Unnatural History" by Elizabeth Kolbert.	For Topic 7, Ecology, pupils can be challenged to understand the intricate relationships between organisms and their environment. Ambitious tasks may involve investigating complex ecosystems and analysing the impact of human activities on biodiversity. Pupils can explore advanced ecological concepts such as succession, nutrient cycling, and population dynamics. Additionally, they can engage in fieldwork opportunities to collect data and develop their investigative skills. By studying ecology in depth, pupils gain a deeper appreciation for the interconnectedness of life on Earth and the importance of environmental stewardship.

<b>How are pupils informally and formally assessed?</b>	Fortnightly tests Challenge week assessments End of Year assessments, including Challenge Weeks
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	In lesson exam questions Homework Teacher questioning Work in exercise books
<b>Developing Independent and Home Learning Skills</b>	“Prep booklet” - a booklet containing exam questions which help Pupils prepare for the fortnightly test at Key Stage 4. The use of online learning platforms such as Oak national academy and YouTube channels such as: Cognito.edu, Fuse School and free science lessons.
<b>Useful e-Learning Resources (e.g., web links)</b>	<a href="https://www.physicsandmathstutor.com/">https://www.physicsandmathstutor.com/</a> - Physics and Maths Tutor <a href="https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7">https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7</a> - Triple Biology <a href="https://www.bbc.co.uk/bitesize/Topics/zthssrd">https://www.bbc.co.uk/bitesize/Topics/zthssrd</a> - Combined Biology <a href="https://senecalearning.com/en-GB/blog/gcse-biology-revision/">https://senecalearning.com/en-GB/blog/gcse-biology-revision/</a> - Seneca
<b>Equipment for lessons</b>	Black or blue pen, green pen, pencil, rubber, ruler, highlighter, calculator, glue stick.
<b>Enrichment activities</b>	Research tasks and after school activities.
<b>Careers curriculum</b>	NHS cadets after school once a week for 39 weeks.
<b>Head of Department and email contact</b>	Mr M Hadden <a href="mailto:m.hadden@wansteadhigh.co.uk">m.hadden@wansteadhigh.co.uk</a>



# A Level Biology - Year 12 and 13

**Pupils receive 9 to 10 lessons each fortnight in Year 12 and Year 13.**

Studying Biology at A Level is a vital component of our curriculum, significantly enhancing pupils' knowledge and understanding of the natural world. It equips pupils with the tools to comprehend and interpret complex biological systems, laying a strong foundation for navigating everyday challenges that require scientific literacy.

A Level Biology fosters the development of Education with Character by promoting resilience, critical thinking, and independent learning. It challenges pupils to think deeply about biological concepts, encouraging them to solve problems, reason logically, and analyse data effectively.

Moreover, A Level Biology cultivates a range of skills essential for real-world applications. Pupils will develop advanced problem-solving abilities, analytical thinking, and practical laboratory skills, preparing them to tackle real-world problems with confidence and efficacy.

Studying A Level Biology provides a comprehensive understanding of key biological principles, from cellular processes and genetics to ecology and evolution. This depth of knowledge not only prepares pupils for higher education in biological sciences and related fields but also provides a strong foundation for careers in medicine, environmental science, biotechnology, and more.

Overall, A Level Biology offers an ambitious and rigorous curriculum that inspires curiosity, fosters academic excellence, and prepares pupils for their future academic and professional endeavours.

What is taught	When is it taught (Terms or Half Terms)	Reading list and Literacy focus	Where the curriculum is ambitious
Biological molecules  <b>Cells including the immune system</b>	<b>Term 1 Year 12</b>	"The Immortal Life of Henrietta Lacks" by Rebecca Skloot	Ambition in studying cells and the immune system can be achieved by exploring advanced cellular processes, such as cell signalling and the role of cell surface receptors. Pupils can be challenged with in-depth investigations of immune responses, including the mechanisms of pathogen recognition and the development of immunological memory. Projects that involve researching recent advancements in immunotherapy or studying the impact of emerging infectious diseases can further stretch their understanding.
Exchange  <b>Mass transport</b>	<b>Term 2 Year 12</b>	"The Machinery of Life" by David S. Goodsell  "Oxygen: The Molecule that Made the World" by Nick Lane	To add ambition in the topic of exchange, pupils can delve into the intricacies of gas exchange systems in a variety of organisms, including unusual adaptations in extreme environments. Challenging tasks might involve comparing the efficiency of different respiratory systems or designing experiments to measure gas exchange rates under varying conditions. Additionally, exploring the latest research on artificial lungs or advancements in respiratory medicine can provide further depth.  Ambition in mass transport can be fostered by examining the complex mechanisms of transport systems in plants and animals. Pupils can be stretched by investigating the molecular basis of transport proteins and their role in homeostasis. Detailed case studies on cardiovascular diseases or the impact of genetic disorders on transport systems can provide practical applications of their knowledge, encouraging critical thinking and problem-solving.

<p>Genetic information, variation and relationships between organisms</p> <p>Photosynthesis</p> <p><b>Respiration</b></p>	<p><b>Term 3 Year 12</b></p>	<p>"The Gene: An Intimate History" by Siddhartha Mukherjee</p> <p>"Life Ascending: The Ten Great Inventions of Evolution" by Nick Lane</p> <p>"Power, Sex, Suicide: Mitochondria and the Meaning of Life" by Nick Lane</p>	<p>In this topic, ambition can be achieved by exploring the latest techniques in genetic engineering and genomics. Pupils can be challenged with projects that involve analysing genetic data to identify evolutionary relationships or investigating the ethical implications of genetic modifications. Engaging with cutting-edge research on CRISPR technology or population genetics can further enhance their understanding and critical thinking skills.</p> <p>To add ambition in the study of photosynthesis, pupils can explore the biochemistry of the light-dependent and light-independent reactions in detail. Challenging tasks might include designing experiments to measure photosynthetic rates under different environmental conditions or investigating the impact of climate change on photosynthesis in various ecosystems. Exploring recent advancements in artificial photosynthesis and its potential applications in renewable energy can provide additional depth.</p> <p>Ambition in the topic of respiration can be fostered by examining the detailed biochemical pathways of aerobic and anaerobic respiration. Pupils can be stretched by analysing the efficiency of different metabolic pathways and their regulation. Projects that involve investigating the effects of exercise on respiration or the adaptations of organisms to hypoxic environments can provide practical applications of their knowledge, encouraging deeper understanding and engagement.</p>
<p>Energy and ecosystems</p> <p><b>Response to stimuli</b></p>	<p><b>Term 1 Year 13</b></p>	<p>"The Serengeti Rules: The Quest to Discover How Life Works and Why It Matters" by Sean B. Carroll</p> <p>"The Man Who Mistook His Wife for a Hat" by Oliver Sacks</p>	<p>In this topic, ambition can be achieved by exploring the complex interactions within ecosystems and the flow of energy through trophic levels. Pupils can be challenged with projects that involve modelling ecosystem dynamics or investigating the impact of human activities on energy transfer in ecosystems. Engaging with current research on ecosystem services and conservation strategies can further stretch their understanding and critical thinking skills.</p> <p>Ambition in studying responses to stimuli can be achieved by exploring the neural and hormonal mechanisms underlying behaviour. Pupils can be challenged with detailed investigations into sensory perception and signal transduction pathways. Projects that involve researching the effects of pharmaceuticals on the nervous system or the adaptations of organisms to extreme environments can provide practical applications and deepen their understanding of physiological processes.</p>
<p>Genetics, populations, evolution and ecosystems</p>	<p><b>Term 2 Year 13</b></p>	<p>Application feature - A royal disease - haemophilia.</p>	<p>To add ambition in this topic, pupils can explore advanced concepts in evolutionary biology and population genetics. Challenging tasks might include analysing genetic data to study population dynamics or investigating the impact of genetic drift and natural selection on allele frequencies. Engaging with recent research on speciation, adaptive radiation, and the role</p>

			of epigenetics in evolution can provide further depth and encourage critical thinking.
The control of gene expression	<b>Term 2 and 3 Year 13</b>	"The Selfish Gene" by Richard Dawkins	<p>Ambition in the study of gene expression can be fostered by examining the molecular mechanisms of transcriptional and post-transcriptional regulation. Pupils can be stretched by investigating the role of non-coding RNAs and epigenetic modifications in gene expression. Projects that involve researching the implications of gene expression in cancer biology or the development of gene therapies can provide practical applications and deepen their understanding of this complex topic.</p> <p>These ambitious tasks and projects aim to stretch pupils' understanding and skills, preparing them not only for their exams but also for further studies and careers in science.</p>

<b>How are pupils informally and formally assessed?</b>	<p>End of unit tests</p> <p>Assessment tasks, including Challenge Weeks</p> <p>End of year assessments</p> <p>Retrieval tasks</p> <p>Homework</p> <p>Verbal questioning</p> <p>Work in exercise books</p>
<b>Developing Independent and Home Learning Skills</b>	<p>Online homework</p> <p>All lesson content is shared via presentations and worksheets on the Google Classrooms</p> <p>Exam practice and past papers</p> <p>Revision resources</p>
<b>Useful e-Learning Resources (e.g., web links)</b>	<p><a href="https://www.physicsandmathstutor.com/">https://www.physicsandmathstutor.com/</a> - Physics and Maths Tutor</p> <p><a href="https://www.bbc.co.uk/bitesize/subjects/zm6tyrd">https://www.bbc.co.uk/bitesize/subjects/zm6tyrd</a> - BBC Bitesize</p> <p><a href="https://senecalearning.com/en-GB/blog/gcse-biology-revision/">https://senecalearning.com/en-GB/blog/gcse-biology-revision/</a> - Seneca</p>
<b>Equipment for lessons</b>	Black or blue pen, green pen, pencil, rubber, ruler, highlighter, calculator, glue stick.
<b>Enrichment activities</b>	<b>Research tasks and after school activities.</b>
<b>Careers curriculum</b>	<b>NHS cadets after school once a week for 39 weeks.</b>
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