



Wanstead High School

Education with Character

Chemistry Curriculum Content 2024 - 25

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



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GCSE Chemistry - Year 10 and 11

Pupils receive 4 lessons of Chemistry each fortnight.

Chemistry is a cornerstone of our curriculum, essential for shaping a well-rounded understanding of the world. It empowers pupils with the tools to decipher the intricate mechanisms governing matter and its transformations, providing a lens through which they can navigate the complexities of the natural world.

The study of chemistry not only fosters scientific literacy but also nurtures vital skills such as problem-solving, logical reasoning, and analytical thinking. By grappling with chemical concepts and phenomena, pupils develop the cognitive agility needed to tackle real world challenges with confidence and efficacy.

In our integrated curriculum, where biology, chemistry, and physics are taught sequentially by a single teacher, chemistry plays a pivotal role in illuminating the interconnectedness of scientific disciplines. This holistic approach enables pupils to appreciate the synergy between different branches of science, fostering a deeper and more nuanced understanding of the world around them.

By embracing chemistry as a fundamental part of their education, pupils are not only better prepared for academic success but also equipped with the critical thinking skills and scientific acumen necessary to thrive in an increasingly complex and interconnected global society.

Skills developed in Chemistry are analytical, mathematical, logical. Pupils also develop their skills through performing a range of chemical practical's.

What is taught	When is it taught (Terms or Half Terms)	Reading list and Literacy focus	Where the curriculum is ambitious
Atomic Structure and the Periodic Table	Term 1, Year 10	"The Disappearing Spoon: And Other True Tales of Madness, Love, and the History of the World from the Periodic Table of the Elements" by Sam Kean	Ambition in the curriculum for Atomic Structure and the Periodic Table can be found by delving into advanced atomic models and the quantum mechanical nature of atoms. To stretch pupils, we can introduce topics such as electron configuration beyond the basics, exploring orbitals and subshells, and investigating the historical development of the periodic table and its future evolution. Encouraging independent research on cutting-edge discoveries in atomic theory and the synthesis of new elements can also deepen their understanding.
Bonding, Structure and the Properties of Matter	Term 2 Year 10	"Stuff Matters: The Strange Stories of the Marvellous Materials that Shape Our Man-made World" by Mark Miodownik "The Elements of Murder: A History of Poison" by John Emsley	To add ambition in Bonding, Structure, and the Properties of Matter, pupils can explore the intricacies of intermolecular forces, metallic bonding, and advanced material science. Tasks such as comparing the properties of novel materials like graphene and carbon nanotubes with traditional materials can stretch their analytical skills. Additionally, challenging pupils to design experiments that investigate the relationship between molecular structure and physical properties can enhance their practical and critical thinking abilities.
Quantitative Chemistry	Term 3, Year 10	"Uncle Tungsten: Memories of a Chemical Boyhood" by Oliver Sacks	Ambition in Quantitative Chemistry can be fostered by tackling complex stoichiometry problems and exploring industrial applications of chemical calculations. Pupils can be stretched by engaging in projects that require precise quantitative analysis, such as titration experiments to determine concentrations in unknown samples. Introducing real-world scenarios where quantitative chemistry is crucial, such as pharmaceutical dosages or environmental monitoring, can also deepen their appreciation and understanding of the topic.

Chemical Changes	Term 4 Year 10	"The Alchemy of Air: A Jewish Genius, a Doomed Tycoon, and the Scientific Discovery that Fed the World but Fueled the Rise of Hitler " by Thomas Hager	In the area of Chemical Changes, adding ambition involves investigating redox reactions, electrochemistry, and the principles of chemical equilibrium. Pupils can be challenged by designing and conducting experiments on electroplating or battery construction. Encouraging pupils to explore the applications of chemical changes in industry, such as corrosion prevention and energy storage, can also enhance their grasp of the subject's real-world relevance.
Energy Changes	Term 5, Year 10	"Sustainable Energy – Without the Hot Air" by David JC MacKay	To stretch pupils in Energy Changes, we can delve into the thermodynamics of chemical reactions, including enthalpy, entropy, and Gibbs free energy. Ambitious tasks may involve calculating energy changes in complex reactions and exploring endothermic and exothermic processes in-depth. Pupils can also investigate the application of these principles in renewable energy technologies and the development of energy-efficient processes, fostering a deeper understanding of sustainability in chemistry.
The rate and extent of chemical change	Term 6, Year 10	"Ignition! An Informal History of Liquid Rocket Propellants" by John D. Clark	Ambition in studying the Rate and Extent of Chemical Change can be achieved by exploring reaction kinetics, mechanisms, and dynamic equilibria. Pupils can be challenged to model reaction rates mathematically and conduct experiments to determine the effects of various factors on reaction speed. Investigating real-world applications, such as the role of catalysts in industrial processes and enzyme kinetics in biological systems, can also deepen their comprehension and appreciation for the subject.
Organic Chemistry	Term 1, Year 11	"Molecules: The Elements and the Architecture of Everything" by Theodore Gray	In Organic Chemistry, ambition can be added by exploring complex reaction mechanisms, stereochemistry, and synthetic pathways. Pupils can be stretched by investigating the synthesis and properties of organic compounds, including pharmaceuticals and polymers. Engaging pupils in projects that involve designing multi-step synthesis or exploring the impact of organic chemistry on biotechnology and medicine can enhance their understanding and inspire further interest in the field.
Chemical Analysis	Term 2, Year 11	"The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York" by Deborah Blum	To add ambition to Chemical Analysis, pupils can explore advanced analytical techniques such as chromatography, spectroscopy, and mass spectrometry. Challenging tasks may include interpreting complex data sets from these techniques and understanding their applications in forensic science, environmental monitoring, and quality control. Encouraging pupils to design and carry out their analytical experiments can also develop their practical skills and analytical thinking.
Chemistry of the Atmosphere	Term 3, Year 11	"The Weather Makers: Our Changing Climate and What It Means for Life on Earth" by Tim Flannery	In Chemistry of the Atmosphere, ambition can be found by investigating the chemical processes that govern atmospheric composition and climate change. Pupils can be challenged to analyse the impact of human activities on the atmosphere, exploring topics such as greenhouse gases, ozone depletion, and air pollution. Engaging in projects that involve modelling atmospheric changes or developing strategies for

			mitigating environmental impact can also deepen their understanding and commitment to sustainability.
Using Resources	Term 4, Year 11	"The Ends of the World: Volcanic Apocalypses, Lethal Oceans, and Our Quest to Understand Earth's Past Mass Extinctions" by Peter Brannen	Ambition in Using Resources can be added by exploring the principles of sustainable chemistry and resource management. Pupils can be challenged to analyse the life cycle of products, investigate renewable resources, and develop methods for recycling and waste reduction. Projects that involve assessing the environmental impact of different materials or designing sustainable processes can foster critical thinking and a deeper appreciation for the role of chemistry in addressing global issues.
Revision for paper 1 and 2	Term 5, Year 11		Use data, collected from challenge weeks and end of topic tests and all other assessments, to provide targeted revision.
Revision for paper 1 and 2	Term 6, Year 11		Use data, collected from challenge weeks and end of topic tests and all other assessments, to provide targeted revision.
How are pupils informally and formally assessed?	<p>Fortnightly tests</p> <p>Challenge week assessments</p> <p>End of Year assessments, including Challenge Weeks.</p> <p>In lesson exam questions</p> <p>Homework</p> <p>Teacher questioning</p> <p>Work in exercise books</p>		
Developing Independent and Home Learning Skills	<p>"Prep booklet" - a booklet containing exam questions which help pupils prepare for the fortnightly test at Key Stage 4.</p> <p>The use of online learning platforms such as Oak national academy and YouTube channels such as: Cognito.edu, Fuse School and free science lessons.</p>		
Useful e-Learning Resources (e.g., web links)	<p>https://www.physicsandmathstutor.com/ - Physics and Maths Tutor</p> <p>https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7 - Triple Biology</p> <p>https://www.bbc.co.uk/bitesize/topics/zthssrd - Combined Biology</p> <p>https://senecalearning.com/en-GB/blog/gcse-biology-revision/ - Seneca</p>		
Equipment for lessons	Black and blue pen, green pen, pencil, rubber, ruler, highlighter, calculator, glue stick.		
Enrichment activities	Research tasks and after school activities.		
Careers curriculum	NHS cadets after school once a week for 39 weeks.		
Head of Department and email contact	<p>Mr M Hadden</p> <p>m.hadden@wansteadhigh.co.uk</p>		

A Level Chemistry - Year 12 and 13

Pupils receive 9 or 10 lessons each fortnight.

The importance of Chemistry as an A Level, providing pupils with a comprehensive understanding of the fundamental principles that govern the natural world. It equips pupils with the skills to analyse and interpret complex chemical processes, laying a strong foundation for navigating scientific challenges and making informed decisions in everyday life.

A Level Chemistry fosters the development of Education with Character by promoting resilience, critical thinking, and independent learning. Pupils are encouraged to tackle challenging problems, engage in rigorous experimentation, and develop logical reasoning skills. These experiences prepare them to approach real-world issues with confidence and creativity.

Furthermore, A Level Chemistry cultivates essential skills such as problem-solving, analytical thinking, and quantitative analysis. Pupils learn to design and conduct experiments, interpret data, and apply their knowledge to various contexts, from healthcare and environmental science to industrial processes and technology.

Our curriculum is designed to promote a holistic understanding of science, integrating concepts across biology, chemistry, and physics. This approach helps pupils see the interconnectedness of scientific disciplines, allowing for a deeper and more nuanced understanding of each subject. By studying Chemistry in this integrated manner, pupils build a robust knowledge base that prepares them for further education and diverse career paths in science, engineering, medicine, and beyond.

Overall, A Level Chemistry offers a rigorous and ambitious curriculum that inspires curiosity, fosters academic excellence, and equips pupils with the skills and knowledge needed to succeed in their future endeavours.

What is taught	When is it taught (Terms or Half Terms)	Reading list and Literacy focus	Where the curriculum is ambitious
Atomic structure, Quantitative, Energetics	Half Term 1	"The Disappearing Spoon: And Other True Tales of Madness, Love, and the History of the World from the Periodic Table of the Elements" by Sam Kean "Uncle Tungsten: Memories of a Chemical Boyhood" by Oliver Sacks "Sustainable Energy – Without the Hot Air" by David JC MacKay	1. Atomic Structure Ambition in Atomic Structure can be achieved by exploring advanced topics such as quantum mechanics and the Schrödinger equation. Pupils can be stretched by examining the principles of atomic orbitals, electron configurations in complex atoms, and the effects of relativistic speeds on electron behaviour. Engaging with current research in atomic physics can further deepen their understanding. 2. Quantitative To add ambition in Quantitative Chemistry, pupils can tackle complex stoichiometric calculations involving multi-step reactions and limiting reagents. Challenging tasks might include titration experiments with unknown concentrations, requiring precise analytical skills. Pupils can also explore real-world applications, such as pharmaceuticals and industrial processes, to understand the importance of quantitative accuracy.
Energetics	Half Term 2	"Sustainable Energy – Without the Hot Air" by David JC MacKay	Ambition in Energetics can be fostered by delving into thermodynamics, including entropy and Gibbs free energy. Pupils can be stretched by calculating enthalpy changes in advanced reactions and exploring the principles of endothermic and exothermic processes in various contexts. Investigating the role of energetics in chemical engineering and sustainable energy solutions can provide additional depth.
Rates and Equilibria	Half Term 3	"Ignition! An Informal History of Liquid Rocket Propellants" by John D. Clark	In the Rates of Reaction topic, ambition can be added by exploring reaction mechanisms and the Arrhenius equation. Pupils can be challenged to design and conduct experiments that investigate the factors

		<p>"The Joy of Chemistry: The Amazing Science of Familiar Things" by Cathy Cobb and Monty L. Fetterolf</p> <p>"Le Chatelier's Principle: A Study Guide" by Amy Wiegand</p>	<p>affecting reaction rates, such as temperature, concentration, and catalysts. Analysing complex data sets to determine rate laws and reaction order can further enhance their analytical skills.</p> <p>Ambition in Equilibria can be achieved by studying Le Chatelier's principle in depth and exploring dynamic equilibria in complex systems. Pupils can be stretched by investigating industrial applications, such as the Haber process and the production of sulfuric acid. Engaging in projects that involve modelling equilibrium shifts under different conditions can deepen their understanding of this fundamental concept.</p>
Redox	Half Term 4	"Electrochemical Methods: Fundamentals and Applications" by Allen J. Bard and Larry R. Faulkner	To add ambition in Redox Chemistry, pupils can explore electrochemical cells, electrode potentials, and redox titrations. Challenging tasks might include designing and constructing galvanic cells or investigating the principles of electrolysis in various industrial processes. Understanding the role of redox reactions in biological systems and environmental chemistry can provide practical applications of their knowledge.
Kinetics KS5 Exam practice	Half Term 5 and 6	"Chemical Kinetics: The Study of Reaction Rates in Solution" by Keith J. Laidler	Ambition in Kinetics can be fostered by examining the molecular dynamics and collision theory in detail. Pupils can be challenged to model reaction kinetics mathematically and investigate the effect of catalysts on reaction pathways. Exploring advanced techniques such as spectroscopy to study reaction mechanisms can provide additional depth and context.

How are pupils informally and formally assessed?	<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>
Developing Independent and Home Learning Skills	<p>Online homework</p> <p>All lesson content PPT, information and worksheets</p> <p>Exam practice and past papers</p> <p>revision resources</p>
Useful e-Learning Resources (e.g., web links)	<p>Google classroom, Chemsheets, BBC bitesize</p> <p>https://www.physicsandmathstutor.com/</p> <p>https://www.scisheets.co.uk/</p> <p>https://www.bbc.co.uk/bitesize/topics/z88jity</p>
Equipment for lessons	Black pen, green pen, pencil, rubber, ruler, highlighter, calculator, glue stick.
Enrichment activities	Research tasks and after school interventions and a KS5 educational visits.
Head of Department and email contact	<p>Mr M Hadden</p> <p>m.hadden@wansteadhigh.co.uk</p>