



Newport Girls' High School Curriculum Summary

Faculty:	Science	Subject:	Chemistry
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Our Vision

Faculty Vision

The Science Faculty teaches Biology, Chemistry and Physics as separate sciences from year 7. We aim to create and develop enthusiastic, informed, inquisitive and ultimately successful scientists. Students who study sciences at NGHS should be curious about the universe around them and enjoy learning how scientific models can be used to explain observations from the very large to the very small. We are committed to establishing a learning environment that encourages students to develop their observational, experimental, problem solving, critical thinking and evaluation skills so that they become confident at analysing and interpreting information and data. Students will be offered many opportunities to apply and expand on their mathematical and communication skills in the context of the different sciences. Students will become aware of the ethical implications of scientific advances and gain opportunities to independently extend their skills beyond the classroom. Fundamentally, our team want to inspire, foster and nurture a love of science and use scientific knowledge and skills to make informed decisions about the communication, application, and implications of science as these relate to their own lives and cultures and to the sustainability of the environment.

Subject Vision

Have you ever wondered what is in that sandwich you ate for lunch? Or what is in your bottle of water as well as the water? Or what is in anything come to that? Chemistry will give you the opportunity to find out by understanding about the properties of substances and how atoms can be joined together to make different things. By studying Chemistry at NGHS you will be challenged to use Mathematics, practical investigation, logical analysis and imagination to help you understand the materials that surround us every day. You will learn why things behave the way they do, and how chemists play a role in all aspects of our lives. Practical work is at the centre of all our courses and you will acquire knowledge and understanding of chemical patterns and principles which you will learn to apply to familiar and unfamiliar situations.

Curriculum Intent

Our KS3 and KS4 Schemes of Work encourage the creation of engaging lessons and promotes teaching for understanding rather than covering fragmented content. It also provides a method to follow student progress as their understanding develops. Our students study a wide range of topics which will enable them to

- Analyse patterns
- Discuss limitations
- Draw conclusions
- Present data
- Communicate ideas
- Construct explanations
- Critique claims
- Justify opinions
- Collect data
- Devise questions
- Plan variables
- Test hypotheses

- Estimate risks
- Examine consequences
- Review theories
- Interrogate sources

The passion and belief of the Department ensures that students enjoy their Chemistry lessons and make excellent progress from their starting points. Whilst we cover the National Curriculum, we believe it is important to go beyond this to instil a love of our subject.

At KS4, we follow the AQA syllabus and topics studied at KS3 are reinforced and developed at KS4. Practical skills enhanced with the delivery of required practical and additional experiments where appropriate.

At KS5, students continue to study the central concepts but in greater detail. The department aims to foster an interest in Chemistry such that our students appreciate the work of chemists in a quest for innovation, enhancement and improving efficiency and ultimately we want all students to consider pursuing further study or careers in STEM subjects. Further interest in the subject is cultivated by taking students to 6th form lectures at Birmingham University along with participation in the Cambridge Chemistry Challenge and the Chemistry Olympiad.

Curriculum Sequencing Rationale & Implementation

KS3

As with Physics and Biology, in years 7 and 8, we focus on giving pupils the laboratory skills to be able to work safely in a lab. Most topics have a hands-on component that allows pupils to explore the concepts directly through experimentation, observation and analysis. The aim is to develop their observational and reasoning skills. In year 7, the above are addressed through the study of acids and alkalis, separation techniques, particle theory and the historical development of the periodic table. In year 8 we seek to further ground them in the basics of the subject and to start to see its relevance in the ecological, economic and social spheres. The students deal with the history and philosophy of the subject through looking at elements, mixtures and compounds, air and the atmosphere, formulae and equations, the reactivity series and energy changes. All of these topics will be developed further in KS4.

KS4

Our GCSE Chemistry course starts in Year 9, but builds on the important foundation knowledge studied across Year 7 and Year 8. Students revisit their understanding of atomic structure, going back in time to discover where and when we as a species began to think about atoms and then this follows on to look at how those atoms bond together to give all the substances that surround us. Real life links are given throughout the teaching to ensure students have a concrete understanding. We then move away from atomic structure and move onto more applied chemistry in the analysis and organic chemistry topics. Year 9 concludes with an introduction to the quantitative chemistry students pick up when they return in Year 10. They will gain a background knowledge of moles, mass and how mathematics govern the chemical reactions we see.

In Year 10, students continue their journey through the quantitative chemistry course, and more challenging concepts are introduced which pair with the more challenging mathematics they are studying elsewhere in school. We look at how ratio between reactants links to how much product we can make and also how we can calculate the sustainability of a reaction without doing any experimentation. Several practical topics follow, including chemical changes (acids and alkalis, reactions of metals and electrolysis), reaction energetics (why reactions get hotter or colder) and then reaction kinetics (why some reactions are fast or slow). All required practical work could be assessed in final exams so we ensure that practical work is modelled clearly and students are given opportunities to test their understanding with practice practical questions. At the end of Year 10, students pick up where they left off on the organic chemistry they learned in Year 9, reviewing the past material and then exploring in more depth.

In Year 11, students return in September and are immediately immersed in the exciting world of organic chemistry, exploring the positives and negatives of products from crude oil and how our bodies are organic chemistry powerhouses in the form of DNA replication, amino acids and more. Continuing on from this, students explore the incredibly topical atmosphere and chemical resources topics where they have the opportunity for in depth discussion and debate about the human impact on the planet and the natural world and how chemistry will solve many of these challenges. At the very end of Year 11, students will complete several modelled exam papers (in exam conditions or teacher lead) to ensure they are prepared for their final exams. Ultimately, our GCSE course forms the bedrock for further A-Level study and many of our Year 11s continue onto study the popular A-Level chemistry course at NGHS.

KS5

The A-level course is divided into two parts: physical and inorganic and organic chemistry. In Year 12, physical chemistry starts with refining student understanding of the atomic model with particular attention to the electronic structure - some aspects of quantum chemistry are introduced which will be necessary for later topics. Atomic structure is used as the basis to develop an understanding of the proceeding topics including bonding, rates, equilibrium and redox. In inorganic periodicity studied as a way to further explore the trends and patterns across the periodic table. Organic chemistry introduces homologous series and reaction mechanisms, again aspects of interparticle forces are involved together with some of the quantum chemistry in the formation and shape of molecular orbitals. Practical skills are developed through normal lab work. All A-Level Sciences involve a separate practical endorsement, and students are assessed by teachers across 12 practical's (6 in each year). Practical questions are included in examination papers so a lot of emphasis is put on learning practical techniques and explaining the rationale of choosing specific methods or equipment.

In Year 13, physical chemistry starts with thermodynamics introducing the concept of entropy along with Born-Haber cycles and Gibbs Free Energy. Students develop a rich understanding of why reactions happen (and sometimes why they do not). Rates, equilibria and electrode potentials follow developing on GCSE and Year 12 topics with the final topic being acids, bases and buffer solutions. The second year of the A-level course develops several higher-level mathematical skills (e.g. logarithms for pH) which are taught as necessary. The inorganic chemistry in Year 13 involves learning in greater depth about the transition metals and complex formation, along with a particular focus on the properties of Period 3 elements. Organic chemistry in Year 13 is both incredibly challenging and rewarding, with students often finding the subject "coming together" as they complete their personal organic reaction maps. Areas covered include reactions of aromatic compounds, esterification, organic analysis (NMR and chromatography) and multi-step organic synthesis. Practical work in Year 13, also includes greater depth with students synthesising aspirin and devising rate equations from experimental rate data. By the conclusion of their A-Level course, students will have explored chemistry to new depths and improved their understanding of the natural world. Many of our chemists go onto study pure chemistry courses at university alongside chemical engineering, dentistry and medicine.