Subject Curriculum Overview for Academic Year 2022/2023

Subject: A Level Chemistry	Subject Leader: Abigail Harker	Year Group: 12	AUTUMN TERM

Topic	Key Learning Points	Key Vocabulary	Assessments
Formulae, Equations and Amounts of Substance	*End Point: Know how to use the mole to calculate mass, volume, concentration & formula.* • Know how to calculate the empirical/molecular formulae • Write balanced full and ionic equations (including state symbols) for chemical reactions • Calculate reacting masses, reacting volumes of gases and concentration of solutions • Calculate percentage yield and atom economy and use the ideal gas equation pV=nRT	• Avogadro constant • Concordant • Titre • Mole, yield	**Formative Assessment:** • Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. **Summative Assessment:** • Year 12 students have test weeks in late October, mid-December and late February. • They also have internal Summative Exams in late June of Y12. **Homework and Independent study:** • Student's complete tutorial questions for each topic, based on the content delivered in lesson and workshops where they apply their knowledge to exam-style questions. • Students complete write up and discussion of practical work in their lab book.
Atomic Structure and the Periodic Table	*End Point: Know how the model of the atom has changed over time and understand the evidence for the existence of quantum shells, subshells and orbitals.* • Know what an isotope is and understand how mass spectrometry can be used • Know what an atomic orbital is, draw p & s orbitals and write electronic configurations • Know what is meant by ionisation energy and explain trends across a period/down a group	• Hund's rule • Isotope • Orbital • Quantum shell • Ionisation • Group, Period	
Chemical Bonding and Structure	*End Point: Understand the nature of metallic, ionic, covalent, polar covalent, dative covalent bonding and intermolecular interactions. Explain the physical properties of substances.* • Describe metallic, ionic and covalent bonding and intermolecular interactions • Understand the relationship between bond length and bond strength for covalent bonds • Understand electronegative and polar bonds, predict the shapes of and bond angles in simple molecules and ions • Know about the different types of giant lattice (giant metallic, giant ionic, giant covalent)	• Bond length • Dipole • Electronegativity • Hydrogen bond • Metallic, Ionic, Covalent • Lattice	
Reaction Kinetics and Chemical Equilibrium	*End Point: Know how different factors affect the rate of reaction, including the concept of activation energy. Understand how the position of equilibrium can be changed.* • Explain how changes in concentration of a solution, pressure of a gas, surface area of a solid, temperature and addition of a catalyst can affect rate and position of equilibrium • Understanding the Maxwell-Boltzmann distribution and economic benefits in industry • Deduce an expression for the equilibrium constant, K_c	• Activation energy • Exothermic, Endothermic • Heterogeneous, Homogeneous	
Organic Chemistry	*End Point: Use different types of formulae to represent organic compounds and use reaction mechanisms to understand how organic reactions occur.* • Represent organic molecules using displayed formulae, molecular formulae, skeletal formulae, empirical formulae and structural formulae and name compounds using the rules of IUPAC nomenclature, including explaining what isomerism is and how it arises • Know the general formula of alkanes & alkenes, describe their bonding, uses and reactivity	• Aldehyde • Alkane • Alkene • Alcohol • Carboxylic acid • Cracking • Curly arrows	

Subject Curriculum Overview for Academic Year 2022/2023

Subject: A Level Chemistry	Subject Leader: Abigail Harker	Year Group: 12	SPRING TERM
Topic	**Key Learning Points**	**Key Vocabulary**	**Assessments**
Chemical Bonding and Structure Continued	*End Point: Understand the nature of metallic, ionic, covalent, polar covalent, dative covalent bonding and intermolecular interactions. Explain the physical properties of substances.* • Understand the physical properties of molecules and choice of solvents in terms of intermolecular interactions • Predict the type of structure and bonding present and the physical properties of a substance	• Solvent • Properties • Structure • Bonding • Intermolecular	**Formative Assessment:** • Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. **Summative Assessment:** • Year 12 students have test weeks in late October, mid-December and late February. • They also have internal Summative Exams in late June of Y12. **Homework and Independent study:** • Student's complete tutorial questions for each topic, based on the content delivered in lesson and workshops where they apply their knowledge to exam-style questions. • Students complete write up and discussion of practical work in their lab book.
Redox Reactions	*End Point: Know how to calculate oxidation numbers and write ionic half-equations and full chemical equations to show oxidation and reduction.* • Know how to calculate the oxidation number of elements in an ion and a compound know how to write chemical formulae of ionic compounds when given the oxidation numbers • Know how to write ionic half-equations to show oxidation and reduction and know how to construct a full ionic equation from ionic half-equations	• Oxidation • Reduction • Disproportion-ation • Ionic • Equation	
Inorganic Chemistry and the Periodic Table	*End Point: Explain the trends in physical properties and chemical reactivity for the elements in group 2 and 7 of the periodic table* • Understand the reasons for the trend in ionisation energy down group 2 • Know the chemical reactivity and physical properties of the group 2 and group 7 elements • Know how to test for anions and cations, including conducting flame tests and explaining flame tests in terms of electron transitions	• Trend • Ionisation • Basic oxides • Halide • Anion • Cation • Thermal Stability	
Organic Chemistry Continued	*End Point: Know what is meant by the terms nucleophile and electrophiles and describe the common reactions of alkenes, alcohols and halogenoalkanes.* • Know that alkenes form addition polymers and identify the repeat units • Know how to draw the mechanism for the nucleophilic substitution reactions of halogenoalkanes and understand how to test for halide ions • Know the combustion, halogenation and dehydration reactions of alcohols and describe the conditions for the oxidation of alcohols and the products	• Halogenoalkane • Mechanism • Nucleophile • Electrophile • Combustion • Halogenation • Dehydration	
Modern Analytic Techniques	*End Point: Know how to use analytical techniques to determine the structure of an unknown organic compound.* • Know how to use data from a mass spectrometer to determine the relative molecular mass of an organic compound and to determine the possible structure using fragmentation • Know how to use data from infrared spectra to deduce functional groups in an organic molecule	• Mass Spectrometry • Infrared Spectroscopy • Fragmentation • Functional group	

Subject Curriculum Overview for Academic Year 2022/2023

Subject: A Level Chemistry	Subject Leader: Abigail Harker	Year Group: 12	SUMMER TERM
Topic	**Key Learning Points**	**Key Vocabulary**	**Assessments**
Chemical Energetics	*End Point: Know how to measure and calculate the enthalpy change that takes place in a chemical reaction, including using Hess cycles.* • Know how to calculate the enthalpy change for a reaction using the mean bond enthalpies • Know how to draw enthalpy profile diagrams for endothermic/exothermic reactions • Know how to measure and calculate the standard enthalpy of neutralisation • Know what is meant by Hess' Law and know how to use a Hess cycle to calculate the standard enthalpy change of formation and combustion	• Enthalpy • Bond Enthalpy • Hess' Law • Formation • Neutralisation • Combustion • Standard conditions	**Formative Assessment:** • Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. **Summative Assessment:** • Year 12 students have test weeks in late October, mid-December and late February. • They also have internal Summative Exams in late June of Y12. **Homework and Independent study:** • Student's complete tutorial questions for each topic, based on the content delivered in lesson and workshops where they apply their knowledge to exam-style questions. • Students complete write up and discussion of practical work in their lab book.
Further Equilibrium	*End Point: To understand the use of equilibrium constants, be able to calculate them and understand the factors affecting equilibrium constants.* • Deduce an expression for Kc and Kp for homogeneous and heterogeneous reactions • Use expressions for Kc and Kp to calculate their value and units • Explain the effects of temperature on the position of equilibrium and explain why changes in concentration, pressure or addition of catalysts do not affect the equilibrium constant	• Partial pressure • Homogeneous • Heterogeneous • Quotient • Catalyst • Equilibrium	
Further Kinetics	*End Point: To understand how to identify orders of reactions and select appropriate experimental techniques for both continuous rate methods and initial rate methods.* • Deduce the order with respect to a substance and for an overall reaction from: concentration-time graphs, initial rate methods, rate-concentration graphs. • Identify the rate determining step for a reaction from its rate equation and deduce the reaction mechanism for a reaction from its rate equation and balanced symbol equation • Use the Arrhenius equation to explain the effect of temperature on a rate constant.	• Rate of reaction • Rate equation • Order of reaction • Half-life • Initial-rates • Continuous	
Orbitals and Reactions in Organic Chemistry	*End Point: Know how two atomic orbitals can overlap to form a molecular orbital. Describe reactions mechanistically, referring to orbitals and areas of electron density.* • Describe the bonding in a C=C double bond and carbonyl C=O, referring to molecular orbitals • Understand the steps in the nucleophilic addition of carbonyl compounds and the electrophilic substitution of aromatic compounds and represent these with a mechanism • Describe the structure and bonding of benzene and understand how the electron donating and withdrawing effects of substituents can affect reactivity	• Carbonyl • Sigma bond • Pi bond • Nucleophile • Electrophile • Aromatic • Substituent	

Subject Curriculum Overview for Academic Year 2022/2023

How parents can support learning in the subject this academic year

All students are provided with their own copy of a text book for home and study room use but there are a variety of other good resources available including revision note books and revision guides. Please contact your child's Chemistry Teacher if you would like any direction to appropriate resources that you could buy.
Students in the sixth form are set at least 6 hours of homework and independent study per week for each subject. In Chemistry A level this takes the form of:

- Tutorial questions
- Workshop booklets
- Lab book work
- Reviewing notes from lessons

Parents can support learning by ensuring that students use their free time effectively and are completing all of the homework and independent study. In the event that students are struggling with independent work it is helpful if the teacher can be contacted as soon as possible to enable them to support your child to catch up.

Recommended Reading

Students are provided with two text books to support their learning, however they may find the following text books helpful to further extend their knowledge:

- Head start to A Level Chemistry – CGP Books
- Why chemical reactions happen – James Keeler
- Chemical Bonding – Mark J. Winter
- Introduction to Quantum Theory and Atomic Structure – P.A. Cox
- Foundations of Organic Chemistry - Michael Hornby, Josephine Peach

Please find below some further books that students may find interesting. These are linked to the topics that are covered in school and so may extend and strengthen their knowledge but are primarily focused on instilling a sense of curiosity and wonder:

- Chemistry for Breakfast: The amazing science of everyday life - Mai Thi Nguyen-Kim
- Periodic Tales: The Curious lives of Elements: Hugh Aldersey-Williams 2012
- Molecules : Peter Atkins 2003

Points to note

Chemistry A level is assessed using three written exams at the end of Y13.

1. Paper 1 - Advanced Inorganic and Physical Chemistry makes up 30% of the final grade, is 1hr 45min long and includes content from topics 1,2,3, 4, 5, 8, 10, 11, 12, 13, 14 and 15
2. Paper 2 - Advanced Organic and Physical Chemistry makes up 30% of the final grade, is 1hr 45min long and includes content from topics 2, 3, 5, 6, 7, 9, 16, 17, 18 and 19
3. Paper 3 - General and Practical Principles in Chemistry makes up 40% of the final grade is 2hr 30min long and may draw on any of the topics in the specification

The assessment of practical skills is a compulsory requirement of the course of study for A level chemistry. It will appear on all students' certificates as a separately reported result, alongside the overall grade for the qualification. Students' practical work will be assessed by teachers, using common practical assessment criteria (CPAC) that are consistent across exam boards. Overall, a minimum of 20% of the marks across the three papers will be awarded for mathematics at Level 2 or above.