

Science Department - Year 12 Chemistry

<p><i>The course helps to bring the subject to life and inspire students to achieve more. It is a teacher-friendly specification based on extensive research and engagement with the teaching community. The course is designed to be straightforward and accessible so that the delivery is tailored to suit the needs of the students. We aim to encourage learners to develop the basic skills required, to become responsible for their own learning, confident in discussing ideas, innovative and engaged.</i></p>						
 Shirley High Curriculum Map	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:
	Module 2: Atoms ions and compounds; Amount of substance; Compounds; acids & Redox	Module 2: Electrons and bonding; shapes of molecules and intermolecular forces; Module 4: Basic concepts of organic Chemistry	Module 3: Periodicity, Reactivity trends and Enthalpy Module 4: Alkanes, alkenes and alcohols	Module 3: Reaction rates Module 4: Haloalkanes, organic synthesis	Module 3: Equilibrium Module 4: Spectroscopy Revision	A2: Module 5: Rates of reaction Module 6: Aromatic Chemistry
Why now	Builds on GCSE Science developing fundamental concepts that underpins the study of Chemistry at A-level	Extends knowledge of chemistry principles and develops basic concepts of organic chemistry to be explored later	applications of energy use to everyday life and industrial processes; environmental concerns and sustainability	Economic and practical factors in industrial reactions; Applications of organic chemistry, to environmental	Industrial reactions and energy; Applications of analytical techniques in identification of unknown substances	extends the study of Modules 2, 3 & 4; building further quantitative and practical techniques
Fundamental Concepts	Transition from KS4-5; Fundamentals concepts of chemistry	Atomic Structure and bonding; intermolecular forces, and intro to organic chemistry	Inorganic and Physical chemistry; hydrocarbons and alcohols	Physical chemistry- Rates of reaction Organic Chemistry: Haloalkanes and organic synthesis	Physical chemistry- Dynamic Equilibrium, Le Chatelier's Principle Organic Chemistry: Principles of infrared and mass spectroscopy	Rates of reaction - Build on concepts of module 3 quantitatively and experimentally Aromatic Chemistry – Benzene and it's reactions
Students will...	Complete a transition unit to review and build on KS4 concepts and be introduced to the key mathematical principles for KS5 Chemistry Write chemical formulae, construct equations and calculate chemical quantities using the concept of amount of substance. Describe the role of acids, bases and salts in chemistry in the context of neutralisation reactions. Describe redox reactions within the context of oxidation number and electron transfer	Describe atomic structure in terms of atomic orbitals; and electron configurations, linked to the periodic table. Describe the central role of electrons in ionic and covalent bonding. Explain polarity and intermolecular forces. Explain how bonding and structure contribute to properties of substances. Describe types of structures used in organic chemistry, nomenclature, and the concepts of homologous series, functional groups, isomerism and reaction mechanisms using curly arrows.	Understand, describe, explain and apply: - periodic and group properties and trends - Redox and reactivity of group 2 metals and the reactions of group 2 compounds; - properties and reactions of halogens (including redox); reactions of halides and qualitative analysis. - Enthalpy changes and their determination (using bond enthalpies and Hess's Law cycles) - Properties and reactions of alkenes - including use of Markownikoff's rule. - Polymerisation of alkenes Properties and reactions of alcohols (including oxidation and qualitative analysis)	Understand, describe, explain and apply: -The concepts of rates of reaction – collision theory, catalyst and Boltzmann distribution reversible reactions - Synthesis and reactions of haloalkanes; - environmental issues surrounding the use of organohalogen compounds - Organic synthesis in terms of key practical skills, use of Quickfit apparatus, preparation and purification of an organic liquid. - Synthetic routes/ Two-step synthesis.	Understand, describe, explain and apply: - Le Chatelier's Principle; Explain the effects of temperature, concentration and pressure on equilibrium position; - Equilibrium constant and related calculations; consideration of energy and yield in improving sustainability - Principles and use of mass spectroscopy in structural elucidation including fragmentation patterns. - Principles and use of IR spectroscopy in identification of common functional groups; combining spectroscopic techniques.	Understand, describe, explain and apply: - Rate equations; Calculation of the rate constant; deducing orders from experimental data. - concentration-time graphs; determination of rate constant from half-life values; deducing orders from shape of graphs; - determination of rate constant for first order reactions from gradient; initial rate investigations and clock reactions; Arrhenius equation - Nomenclature of aromatic compounds; kekule structure and delocalised models for benzene; Electrophilic substitution mechanisms; chemistry of phenols; Directing groups
Language for Life (Key terms/Vocabulary)	Isotopes, relative atomic mass, relative formula mass, binary compounds, Avogadro's number, empirical formula, water of crystallisation; moles; ideal gas, stoichiometry,	Orbitals, dative/ coordinate bonding; Electronegativity; bond polarity; electron-pair repulsion; dipole, bond enthalpy, hydrocarbon, functional group, homologous series, aliphatic, isomerism, homolytic, heterolytic	Periodicity, ionisation; disproportionation, endothermic, exothermic, standard enthalpy, Free radical, initiation, propagation, termination, stereoisomerism, electrophile, hydrogenation, oxidation, dehydration	Homogeneous and heterogeneous catalysts; Boltzmann distribution Organohalogen compounds; reflux, distillation; nucleophile	dynamic equilibrium; Le Chatelier's principle; spectrometer, molecular ion, fragmentation,	Reaction, order, overall order, rate constant, half-life, rate-determining step ; Arenes; delocalisation; alkylation; acylation
Extended writing Opportunities	Description of acid base titration; PAG write-up	Description of the structures and bonding in different types of compounds	Description of acid base titration; Description of qualitative analysis to distinguish between 1°, 2° and 3° alcohols; PAG write-up;	Description of how rate of reaction can be determined experimentally; PAG write-up;	Explanation of the use of Le Chatelier's Principle Description of structural elucidation using spectroscopic techniques	Description and explanation of the structure and bonding in benzene
Maths Across the Curriculum	Use of Standard form, sig figs and SI units; changing subject of equation; using fractions, ratios; percentages and means	Using angles and shapes in regular 2-D and 3-D structures	Bond enthalpy calculations; Rate of reaction analysis: changing subject of equation; use of algebraic equations;	plotting graphs and drawing tangents to curves	changing subject of equation; use of algebraic equations; (calculations involving equilibrium constants)	Changing the subject of, substituting numbers into and solving algebraic equations; plotting two variables from experimental data; drawing and using the gradient of a tangent to a curve as a measure of rate of reaction; Finding logarithms and their inverse (Arrhenius equation)
Links to careers/ aspirations	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc.	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc	Chemist; research scientist; pharmaceuticals; engineering, manufacturing; environmental science; Food industry, etc
Cultural Capital						
Practical Application of Skills Module 1: Development of Practical Skills in Chemistry	Determination of water of crystallisation (PAG1) Acid-base titration (PAG 2); Redox reactions of metals with acids to form salts	Use of molecular models to show isomerism	observational skills required for analysis, and accurate quantitative techniques involved in determination of reaction rates. (PAGS 3, 4) Reactions of alkenes; oxidation and dehydration of alcohols. (PAG 7)	observational skills required for analysis, and accurate quantitative techniques involved in determination of and reaction rates. (PAG 9) Reactions and rate of hydrolysis of haloalkanes; Organic synthesis techniques (PAG 5 and 7)	Investigation of changes to the position of equilibrium (in qualitative terms) in response to changes in concentration, temperature and in the presence of a catalyst	Investigation of reaction rates using initial rate methods (clock reactions). Investigation of reaction rates using continuous monitoring methods. (PAG 9 & 10) Investigation of weak acidity of phenol.