KS5 Science Subject overview

Subject Rationale (Intent) linked to whole school curriculum mission

In brief (no more than four sentences)

The Science curriculum at St Edmund's is designed to bring science to everyday life, answering questions like 'why do apples fall from trees' or 'how are vaccines developed'? We want learners to be naturally inquisitive, independent and critical in their thinking. This will enable them to develop the substantive and disciplinary knowledge required to understand the world around them. We want to impart a love of the subject and for our students to use science to improve their own lives and the lives of others.

YEAR 12 Chemistry			
TERM	**Topic sequence** **(What are you teaching?)**	**Topic sequence rationale** **(Why are you teaching this? How does it link to prior learning? Any notable links to St Edmund's curriculum mission** **St Edmund's curriculum mission**	**Main method of assessment?**
Term 1:1	**Foundations in Chemistry** ● Atoms and reactions ● Atomic structure and isotopes ● Compounds, formulae and equations ● Amount of substance ● Acids ● Redox ● Electron structure ● Bonding and structure	This module acts as an important bridge to KS5 from the study of chemistry within science courses at GCSE level. It provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of Chemistry. This is a prerequisite for all further chemistry modules. It allows learners to develop important quantitative techniques involved in measuring masses, gas and solution volumes, using different apparatus. Learners are also able to develop their mathematical skills during their study of amounts of substance and when carrying out quantitative practical work. Practical skills are embedded throughout all the content of the KS5 curriculum. Learners will be required to develop a range of practical skills throughout the course in preparation for the written examinations.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 1:2	**Foundations in Chemistry cont.**		Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 2:1	**Periodic Table** ● Periodicity ● Group 2	The focus of this module is inorganic chemistry. Periodic trends are first studied to extend the understanding of structure and bonding. Group properties are then studied using Group 2 and the halogens as	Internally assessed Practical Endorsement

	● The halogens ● Qualitative analysis	typical metal and non-metal groups respectively, allowing an understanding of redox reactions to be developed further. Finally, this section looks at how unknown ionic compounds can be analysed and identified using simple test-tube tests.This module allows learners to develop important qualitative practical skills, especially observational skills required for analysis The content within this module builds upon knowledge and understanding of the chemical concepts developed in the first term.	Retrieval questions Self-assessment Composite tasks End of topic assessments
	Core Organic Chemistry ● Basic compounds and hydrocarbons ● Basic concepts of organic chemistry ● Alkanes ● Alkenes ● Alcohols ● Haloalkanes ● Organic synthesis ● Analytical techniques	This module introduces organic chemistry and its important applications to everyday life, including current environmental concerns associated with sustainability. The module assumes knowledge and understanding of the chemical concepts developed in the first term. The module provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of organic chemistry. This module also provides learners with an opportunity to develop important organic practical skills, including use of Quickfit apparatus for distillation, heating under reflux and purification of organic liquids. In the context of this module, it is important that learners should appreciate the need to consider responsible use of organic chemicals in the environment, including reducing demand for hydrocarbon fuels, processing plastic waste productively, and preventing use of ozone-depleting chemicals.	

Term 2:2	**Introduction to Physical Chemistry** ● Enthalpy changes ● Reaction rates ● Chemical equilibrium **Core Organic Chemistry cont.**	The focus of this module is physical chemistry, the applications of energy use to everyday life and industrial processes, and current environmental concerns associated with sustainability. Learners first learn about the importance of enthalpy changes, their uses and determination from experimental results including enthalpy cycles. This section then investigates the ways in which a change in conditions can affect the rate of a chemical reaction, in terms of activation energy, the Boltzmann distribution and catalysis. Reversible reactions are then studied, including the dynamic nature of chemical equilibrium and the influence of conditions upon the position of equilibrium. Finally, the integrated roles of enthalpy changes, rates, catalysts and equilibria are considered as a way of increasing yield and reducing energy demand, improving the sustainability of industrial processes. The content within this module assumes knowledge and understanding of the chemical concepts developed in the first term.This module allows learners to develop accurate quantitative techniques involved in determination of energy changes and reaction rates. There are opportunities for developing mathematical skills when studying enthalpy changes and reaction rates and when carrying out quantitative practical work.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 3:1	**Revision**	Students will review and revise all their KS5 work so far, using past examination papers.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks

			End of topic assessments
Term 3:2	**Rates and equilibrium** ● How fast? ● How far? **Organic chemistry** ● Aromatic compounds	The largely qualitative treatment of reaction rates and equilibria encountered in the previous term is developed within a quantitative and graphical context. This section also allows learners to develop practical quantitative techniques involved in the determination of reaction rates. There are many opportunities for developing mathematical skills when studying the content of this section and when carrying out quantitative practical work The content within this module assumes knowledge and understanding of the chemical concepts developed in the first two terms. In Year 12, we introduce students to Aromatic compounds, including the central role of delocalisation within the chemistry of arenes and phenols. Directing groups are also introduced, including their importance to organic synthesis. The rest of the organic chemistry module will be studied in Year 13.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments

YEAR 13 Chemistry			
TERM	**Topic sequence** **(What are you teaching?)**	**Topic sequence rationale** **(Why are you teaching this? How does it link to prior learning? Any notable links to St Edmund's curriculum mission**	**Main method of assessment?**
Term 1:1	**Organic chemistry and analysis** ● Carbonyl compounds ● Carboxylic acids and esters	This module introduces several new functional groups, extending the range encountered in Year 12, and emphasises the importance of organic synthesis. This module allows learners many opportunities to further develop their organic practical skills, especially in preparing and purifying organic solids, including recrystallisation and determination of melting points. In the first half term of Year 13, the important carbonyl compounds, aldehydes and ketones, are studied. This is followed by carboxylic acids and their related functional groups, acyl chlorides and esters. The importance of acyl chlorides in organic synthesis is emphasised.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
	pH ● Acids, bases and buffers	This section allows learners to develop their understanding of pH that was developed in Year 12. It includes practical quantitative techniques involved in the determination of pH. There are opportunities for developing mathematical skills, including use of logarithms and exponents.	
	Energy ● Lattice enthalpy ● Born-Haber and related enthalpy cycles ● Enthalpy and entropy ● Redox and electrode potentials	In this module, Born–Haber cycles are used as a theoretical model to illustrate the energy changes associated with ionic bonding. Entropy and free energy are then introduced as concepts used to predict quantitatively the feasibility of chemical change. Redox chemistry permeates chemistry and the introductory work in Year 12 is developed further within this section, including use of volumetric analysis for redox titrations and an introduction of electrochemistry in the context of electrode potentials.	
Term 1:2	**Organic chemistry and analysis** cont ● Nitrogen compounds, polymers and	This section focuses on organic nitrogen compounds, including amines, amides and amino acids. Chirality and optical isomerism is	Internally assessed Practical

	synthesis ● Amines ● Amino acids, amides and chirality ● Polyesters and polyamides **Transition elements** ● Transition elements ● Qualitative analysis **Energy cont.**	introduced. Condensation polymerisation is also introduced and compared with addition polymerisation. This section provides learners with a deeper knowledge and understanding of the periodic table within the context of the transition elements. This section includes the role of ligands in complex ions, stereochemistry, precipitation, ligand substitution and redox reactions. The colour changes and observations in these reactions increase the toolkit of qualitative inorganic tests for identifying unknown ionic compounds.	Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 2:1	**Organic chemistry and analysis** cont ● Carbon-carbon bond formation ● Organic synthesis ● Chromatography and qualitative analysis ● Spectroscopy	In this section, the importance of carbon–carbon bond formation in organic synthesis is stressed. Learners are also able to consider multi-stage synthetic routes towards an organic product. This section develops and complements the spectroscopic areas of organic chemistry previously encountered in Year 12. It demonstrates how analytical techniques (infrared spectroscopy, mass spectrometry and elemental analysis) may be used in combination with NMR spectroscopy to provide evidence of structural features in molecules. The instrumentation methods of analysis studied during the A level course provide learners with an important base of knowledge, understanding and awareness for further study in Higher Education and in many areas of employment in the broad scientific field. This section also looks at how unknown organic functional groups can be analysed and identified using simple test-tube tests.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 2:2	**Revision**	Students will spend this half term reviewing and revising all their A level work and revision for the 3 final papers using past examination papers.	Internally assessed Practical Endorsement

			Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 3:1	**Revision**	Students will spend this half term reviewing and revising all their A level work and revision for the 3 final papers using past examination papers.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments
Term 3:2	**Revision / Exams**	Students will spend this half term reviewing and revising all their A level work and revision for the 3 final papers using past examination papers. The A Level Chemistry course will prepare learners for progression to undergraduate courses in Chemistry, Biochemistry, Medicine, Dentistry, Engineering, Pharmacy, one of the other sciences or related subjects. For learners wishing to follow an apprenticeship route or those seeking direct entry into chemical science careers, this A level provides a strong background and progression pathway.	Internally assessed Practical Endorsement Retrieval questions Self-assessment Composite tasks End of topic assessments