Curriculum Mapping: Chemistry Year 12-13

St Martin's School
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Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 12	Module 2: Foundations in chemistry		Module 3: Periodic table and energy		Module 4: Core organic chemistry	
	Concepts/Tier 3 vocabulary **Atoms and reactions** Important basic chemical skills are developed: writing chemical formulae, constructing equations and calculating chemical quantities using the concept of amount of substance. The role of acids, bases and salts in chemistry is developed in the context of neutralisation reactions. Finally, redox reactions are studied within the context of oxidation number and electron transfer.	*Concepts/Tier 3 vocabulary* **Electrons, bonding and structure** This section introduces the concept of atomic orbitals and develops a deeper understanding of electron configurations linked to the periodic table. The central role of electrons in ionic and covalent bonding is then studied. The important role of molecules is studied, including an explanation of polarity and intermolecular forces. Finally, this section looks at how bonding and structure contribute to properties of substances.	*Concepts/Tier 3 vocabulary* **The periodic table** 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 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.	*Concepts/Tier 3 vocabulary* **Physical chemistry** 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	*Concepts/Tier 3 vocabulary* **Basic concepts and hydrocarbons** This section is fundamental to the study of organic chemistry. This section introduces the various types of structures used routinely in organic chemistry, nomenclature, and the important concepts of homologous series, functional groups, isomerism and reaction mechanisms using curly arrows. The initial ideas are then developed within the context of the hydrocarbons: alkanes and alkenes.	*Concepts/Tier 3 vocabulary* **Alcohols, haloalkanes and analysis** This section introduces two further functional groups: alcohols and haloalkanes, and considers the importance of polarity and bond enthalpy to organic reactions. Throughout this section, there are many opportunities for developing organic practical skills, including preparation and purification of organic liquids. Finally, the important techniques of infrared spectroscopy and mass spectrometry are used to illustrate instrumental analysis as a valuable tool for identifying organic compounds.

				considered as a way of increasing yield and reducing energy demand, improving the sustainability of industrial processes.		
	Justification: This module acts as an important bridge into AS and A Level Chemistry from the study of chemistry within science courses at GCSE level. This module provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of A Level Chemistry: • atomic structure • quantitative chemistry: formulae, equations, amount of substance and the mole • reactions of acids • oxidation number and redox reactions • bonding and structure. The importance of these basic chemical concepts is seen as a prerequisite for all further chemistry modules, and it is recommended that this	***Justification:*** ·	***Justification:*** This module provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of inorganic and physical chemistry: • the periodic table: periodic and group properties • enthalpy changes and their determination • rates of reaction • reversible reactions and chemical equilibrium • consideration of energy and yield in improving sustainability. This module allows learners to develop important qualitative practical skills, especially observational skills required for analysis, and accurate quantitative techniques involved in	***Justification:***	***Justification:*** The module provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of organic chemistry: • nomenclature and formula representation, functional groups, organic reactions and isomerism • aliphatic hydrocarbons • alcohols and haloalkanes • organic practical skills and organic synthesis • instrumental analytical techniques to provide evidence of structural features in molecules. This module also provides learners with an opportunity to develop important organic practical skills, including use of Quickfit apparatus for	***Justification***

	module should be studied first during this course. This module allows learners to develop important quantitative techniques involved in measuring masses, gas and solution volumes, including use of volumetric apparatus.		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.		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. Current trends in this context include reducing demand for hydrocarbon fuels, processing plastic waste productively, and preventing use of ozone-depleting chemicals.	
	Assessment: *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*
	Wider reading/Cultural capital *Students are expected to immerse themselves in*					
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 13	Module 5: Physical chemistry and transition elements		Module 6: Organic chemistry and analysis			**Course complete**

	Concepts/Tier 3 vocabulary **Rates, equilibrium and pH** The largely qualitative treatment of reaction rates and equilibria encountered in Module 3 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 and pH. There are many opportunities for developing mathematical skills, including use of logarithms and exponents, when studying the content of this section and when carrying out quantitative practical work.	*Concepts/Tier 3 vocabulary* **Energy** 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 Module 2 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.	*Concepts/Tier 3 vocabulary* **Transition elements** 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. **Aromatic compounds, carbonyls and acids** This section extends the range of functional groups encountered in Module 4. Aromatic compounds are first introduced, including the central role of delocalisation within the chemistry of arenes and phenols. Directing	*Concepts/Tier 3 vocabulary* **Nitrogen compounds, polymers and synthesis** This section focuses on organic nitrogen compounds, including amines, amides and amino acids. Chirality and optical isomerism is also introduced. Condensation polymerisation is also introduced and compared with addition polymerisation. 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 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.	*Concepts/Tier 3 vocabulary* **Analysis** This section develops and complements the spectroscopic areas of organic chemistry previously encountered. This section demonstrates how analytical techniques introduced in Module 4 (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	N/A

			groups are also introduced, including their importance to organic synthesis. The important carbonyl compounds, aldehydes and ketones, are then studied. Finally, carboxylic acids and their related functional groups, acyl chlorides and esters, are studied. The importance of acyl chlorides in organic synthesis is emphasised.		functional groups can be analysed and identified using simple test-tube tests.	
	Justification: The content within this module assumes knowledge and understanding of the chemical concepts developed in Module 2: Foundations in chemistry and Module 3: Periodic table and energy. This module extends the study of energy, reaction rates and equilibria, and the periodic table. The main areas of physical chemistry studied include: • rate equations, orders of	***Justification***	***Justification:*** The content within this module assumes knowledge and understanding of the chemical concepts developed in Module 2: Foundations in chemistry and Module 4: Core organic chemistry. This module introduces several new functional groups and emphasises the importance of organic synthesis. This module also adds NMR spectroscopy to the instrumentation techniques used in	***Justification:***	***Justification:***	N/A

	reaction, the ratedetermining step • equilibrium constants, Kc and Kp • acid–base equilibria including pH, Ka and buffer solutions • lattice enthalpy and Born–Haber cycles • entropy and free energy • electrochemical cells. The main areas of inorganic chemistry studied include: • redox chemistry • transition elements		organic and forensic analysis. The main areas of organic chemistry studied include: • aromatic compounds • carboxylic acids and esters • organic nitrogen compounds: amines and amino acids • polymerisation: addition polymers and condensation polymers • synthetic organic chemistry and further development of practical skills • the importance of modern analytical techniques in organic analysis.			
	Assessment: *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	***Assessment:*** *End of unit tests* *PAGS*	*N/A*
	Wider reading/Cultural capital 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					