

Key Stage 4 Subject Timeline Year 9 to 11

Subject: Chemistry

Exam Board: AQA

KS4 Chemistry - Year 9							
Autumn 1		Autumn 2		Spring 1	Spring 2	Summer 1	Summer 2
Topics	Atomic Structure and the Periodic Table <i>Atoms, Elements and arrangement in the Periodic Table</i>	Atomic Structure and the Periodic Table <i>Metals and Non-metals and Groups in the Periodic Table</i>	Structure, Bonding and the properties of matter <i>Types of bonding</i>	Structure, Bonding and the properties of matter <i>Types of giant molecules</i>	Energy Changes <i>Endothermic and Exothermic Reactions</i> <i>Reaction profiles</i>	Revision of Foundational Chemistry	
Key skills and Concepts	Key Concept – Atomic structure; protons, neutrons electrons and electron shells, and their relative masses, charges and sizes; relative atomic mass, charge and isotopes; how the theory of atomic structure has changed over time, structure and trends in the periodic table. Maths skill – Standard form and making estimates		Key Concept – Types of bonding (double/ single bonds; ionic/covalent) and how bonding relates to bulk properties, including in carbon allotropes. Relative strengths of intra and inter- molecular bonds as related to state changes. Compare the physical properties of materials. Maths skill – Visualise and represent 2D and 3D shapes		Key Concept - Bond breaking and making relates to exo- and endothermic reactions; reaction profiles. Relative bond energies as related to exo- and endothermic reactions Math skill – Drawing and interpreting reaction profile graphs, (higher) calculating bond enthalpies		
Threshold Concepts	Structure of the atom especially key concept of electron structure is a fundamental to the understanding of bonding and properties of materials		The understanding in this module supports the development of how chemicals react to form new materials by the breaking and forming of new bonds		Builds on the previous two topics to describe qualitatively energy changes and how they can be measured and visualised. Knowledge of covalent bonding is required		
Endpoints	<i>Understanding of the different models used to represent an atom?</i> Describe how the model of the atom developed? <i>How we can use different isotopes of Carbon to date natural materials</i>	<i>Why Group 8 elements are unreactive but Group 1 are very reactive?</i> What transition metal compound solutions look like? <i>Why transition metals good catalysts</i>	<i>What happens to particles as they change state?</i> Why is so much energy needed to melt some substances? <i>To be able to describe and explain the different types of bonding</i>	<i>To explain metals conduct electricity?</i> To explain why ionic compounds conduct electricity if they are molten or aqueous <i>Why are diamonds so hard and graphite is so soft?</i>	<i>To describe energy changes in a reaction</i> To know how to represent energy changes <i>To be able to explain the energy changes</i> To describe how fuel cells work		
Assessment	Chapter 1 Midpoint Assessment	Chapter 1 End of Chapter Assessment	Chapter 2 Midpoint Assessment	Chapter 2 End of Chapter Assessment	Chapter 5 End of Chapter Assessment	Year 9 PPE Exams	

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KS4 Chemistry - Year 10						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topics	Chemical Changes <i>Reactions of metals</i> <i>Acids and bases</i>	Chemical Changes <i>Reactivity Series</i> <i>Electrolysis</i> <i>Fuel Cells</i>	Quantitative Chemistry – Chemical Quantities and calculations <i>Moles</i>	Quantitative Chemistry – Chemical Quantities and calculations <i>Balancing equations, atom economy and % yield</i> Revision	The rate and extent of chemical change <i>Rates</i>	The rate and extent of chemical change <i>Equilibrium</i> Hydrocarbons <i>Introduction to Hydrocarbons</i>
Key skills and Concepts	<p>Key concept – Reactions take place via electron or proton transfer, or electron sharing. Reactions of acids. Difference between weak/strong acids and dilute/concentrated acids. Redox. Electrolysis. Hydrogen fuel cells.</p> <p>Required practical – Preparing a pure, soluble salt from an insoluble oxide or carbonate</p> <p>Required practical – Finding the reacting volumes of solutions of acid and alkali by titration</p> <p>Required practical – Investigating what happens when aqueous solutions are electrolysed using inert electrodes</p> <p>Maths skill – Make order of magnitude calculations</p>		<p>Key Concept – Quantitative interpretations of balanced equations and conservation of mass, relative formula masses. Calculating per cent yield, atom economy and theoretical yield. Moles and determining the stoichiometry of an equation</p> <p>Maths skill – Change the subject of an equation</p>		<p>Key Concept – Rates: factors that affect frequency and energy of collisions; activation energy; interpretation of simple rate graphs. Catalysts; how they affect activation energy. Principles of dynamic equilibrium. Predict how changing conditions leads to a changing equilibrium position</p> <p>Required Practical – Investigate how changes in concentration affect the rates of reaction</p> <p>Maths skill – Use the slope of a tangent as a measure of rate of reaction</p> <p>Key Concept – Carbon can form 4 covalent bonds. Functional groups in organic compounds.</p> <p>Maths skill – Visualise and represent 3D models</p>	
Threshold Concepts	Links the previous topics into a practical module which also develops the practical skills. Reinforces the ideas about electron transfer		Difficult mathematical concepts to quantify the changes that occur in chemical reactions in the previous topic		<p>- A secure understanding of the chemical reactions and the particulate nature of matter. This topic links and recaps work studied in physics. It also develops graph drawing and data handling linking to skills taught in maths</p> <p>- A specific type of chemical. Exemplifies the topics of bonding and structure of molecules first encountered in Year 9</p>	
Endpoints	<i>To understand why some metals are more reactive than others</i> How metals less reactive than carbon can be extracted by reduction	<i>Explain how acid and bases produce neutral salts</i> To explain the difference between strong and weak acids <i>To explain and why electrolysis is used</i>	<i>How and why mass conserved in chemical reactions?</i> What happens to mass changes when a gas is given off? <i>How we can measure amounts of substances</i>	<i>How can we calculate amounts needed in a chemical reaction?</i> How chemists maximise a chemical yield	<i>To describe how reaction rates can be measured</i> To describe and explain the factors that affect when a reaction ends <i>To calculate rates of reaction</i> To describe factors that affect reaction rate	<i>To explain how reactions can be in equilibrium</i> To apply Le Chateliers Principle to given reactions <i>To describe how crude oil and hydrocarbons are linked</i>
Assessment	Chapter 4 Midpoint Assessment	Chapter 4 End of Chapter Assessment	Chapter 3 Midpoint Assessment	Chapter 3 End of Chapter Assessment Year 10 PPEs	Chapter 6 Mid Point Assessment	Chapter 6 End of Chapter Assessment

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KS4 Chemistry - Year 11							
Autumn 1		Autumn 2		Spring 1	Spring 2	Summer 1	Summer 2
As ses	Topics	Hydrocarbons <i>Crude Oil</i> Hydrocarbons Alkenes Polymers	Revision Chemical Analysis Chromatography Tests for gases Flame tests Ion tests	The atmosphere <i>Development of Atmosphere</i> Human Activities Climate Change	Sustainable Development <i>Dealing with water</i> LCA Useful materials Haber Process	Revision	
	Key skills and Concepts	Key Concept – Carbon can form 4 covalent bonds. Functional groups in organic compounds. Functionality can be used to predict reactions. Fractional distillation and cracking. Principles of addition polymerisation. Condensation polymerisation. Maths skill – Visualise and represent 3D models	Key Concept – Melting points and chromatography to define if a substance is pure. Separation techniques. Analytical techniques; identification of common gases, flame tests, tests for aqueous ions. Required Practical – Investigate how paper chromatography can be used. Required practical – Chemical tests to identify ions in ionic compounds Maths skill – Use appropriate number of s.f.	Key Concept – Composition and evolution of the atmosphere; evidence, causes, prevention and effects of climate change and pollutants Maths skills – Use ratios, fractions and percentages	Key Concept – Extraction and purification in the industrial processes; including electrolysis and biological methods. Resources; recycling and life cycle assessments. Methods for obtaining potable water. Fertilisers; Haber process. Required Practical – Analysis and purification of water samples from different sources Maths skill – Translate information between graphical, tabular and numerical forms		
	Threshold Concepts	Development of earlier content. The use and chemistry of hydrocarbons links to sustainable development topic and atmosphere	Develops practical skills. Knowledge of chemical changes covered in Year 9 is required.	Strong links to the Biology topics taught at the same time. These tie together to explain how the different chemical processes affect ecosystems and biodiversity and how humans can ensure that fundamental resources are made more sustainable			
	Endpoints	<i>To describe the physical and chemical properties of hydrocarbons</i> To describe the uses and reactions of alcohols, carboxylic acids and polymers <i>To describe natural polymers such as DNA</i>	<i>How to confirm a substances purity</i> How to separate a substance to analyse it <i>How to analyse gases</i> How to analyse ions	<i>To describe and account for Earth's early atmosphere</i> To understand how and why the atmosphere changed <i>To consider the effects that human activity are having on the atmosphere and how we could negate these changes</i>	<i>Describe ways in which we could sustain resources for the future</i> Explain how water is made safe to drink <i>Describe ways in which the human race could be more sustainable</i> Describe chemical processes		
	Asses	End of Chapter 7 Assessment	Year 11 PPE Exams End of Chapter 8 Assessment	Year 11 PPE Exams End of Chapter 9 Assessment	End of Chapter 10 Assessment	External GCSE Exams	External GCSE Exams