# Science Department Programme of Study: CHEMISTRY A Level

| | Year 12 – Teacher 1 | Year 12 – Teacher 2 | Year 13 – Teacher 1 | Year 13 – Teacher 2 |
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| **Phase 1** | **DEVELOPING PRACTICAL SKILLS & FOUNDATION CHEMISTRY**<br>How to use apparatus and equipment to achieve reliable results to an appropriate level of accuracy and precision.<br>How to write an experimental aim and use it to determine if an investigation is valid.<br>The difference between a method and an outline.<br>How to display results in the most appropriate way.<br>How to mathematically manipulate results.<br>How to fully evaluate a method.<br>How to carry out redox titrations and represent redox reactions using half-equations, carrying out calculations related to the titre.<br>How our understanding of the atom has changed over time.<br>How the atomic mass of a substance can be determined and how the presence of isotopes affects this.<br>How to predict the formula of chemical compounds and ions and how to use them in balanced equations.<br>How to determine the number of moles in weighed substances, solutions and gases.<br>Why acids and bases behave as they do and how their behaviour is useful to us.<br>How percentage yields and atom economies are used to consider the efficiency of chemical reactions | How to use IUPAC naming conventions.<br>To recognise classes of chemicals and list their key features.<br>To be able to generate the structural formula for a variety of types of isomerism.<br>To use, recognise and generate different representations of the same molecule.<br>To use arrow pushing to model reaction mechanisms.<br>Crude oil and the petrochemical industry.<br>Alkanes: physical properties and reactivity. | **TRANSITION METALS**<br>Why transition metal compounds are coloured.<br>How a complex ion is formed and its shape.<br>Examples of uses of transition metal complexes.<br>How transition metals can act as a catalyst and industrial examples.<br>Ligand substitution reactions..<br>**ENERGETICS**<br>What lattice enthalphy is.<br>How to construct Born-Haber cycles.<br>How ionic size and charge impact on the energy changes associated with dissolving.<br>What entropy and free energy are and they are calculated.<br>**ELECTRODE POTENTIALS**<br>How the feasibility of a reaction can be predicted.<br>How to calculate cell potentials from electrode potentials.<br>What storage and fuel cells are and their possible uses<br>How a transition metal is different from a d-block element. | To be able to identify chiral centres and draw enantiomers.<br>To be able to draw a monomer, repeat unit and polymer unit for condensation polymers, including poly(aminoacids).<br>To be able to evaluate the environmental impact of using addition and condensation polymers.<br>To be able to explain, using a variety of evidence, why the model of benzene has changed over time.<br>How to use IUPAC naming conventions for aromatic compounds.<br>To use arrow pushing to model reaction mechanisms for aromatic compounds and predict the main product formed.<br>How to predict the effect of further reactions when a group has been substituted onto benzene.<br>To explain how NMR spectroscopy works.<br>To interpret spectra.<br>To describe simple laboratory tests to determine functional groups.<br>To explain how chromatography works. |
| **Phase 2** | **BONDING, SHAPE, STRUCTURE & PROPERTIES**<br>The use of oxidation numbers to describe what happens to electrons during reactions.<br>How electrons are found within orbitals around the nucleus.<br>How these orbitals are arranged in sub-shells and shells, and the relative energies of these.<br>What determines the type of bonding an element will undergo.<br>Intermolecular forces that occur between molecules.<br>The effect of bonding within molecules and between molecules on physical properties such as melting point and on shapes of molecules.<br>The shapes of molecules and how to represent these. | Alkenes: physical properties and reactivity.<br>To be able to evaluate the environmental impact of using addition and condensation polymers.<br>Halogenoalkanes: physical properties and reactivity.<br>To explain the basicity of related chemicals.<br>To describe how amines are made.<br>To be able to discuss the environmental impact of using organic chemicals<br><br>` | REVISION | To be able to suggest multi-stage synthetic routes.<br>To use multiple information to identify the structure of a given compound.<br><br>REVISION |
| **Phase 3** | **PERIODICITY & REDOX**<br>How the periodic table has changed over time.<br>How periodicity can be illustrated using trends such as those in melting point and ionisation energy.<br>The REDOX reactions of group 2 elements.<br>The reactions and some uses of group 2 compounds.<br>The reactions of the group 7 elements.<br>How to test for positive and negative ions. | Alcohols: physical properties and reactivity.<br>To explain how organic synthesis can be used to interconvert organic chemicals.<br>To explain how IR spectroscopy works.<br>To explain how MS works.<br>To interpret spectra.<br>To use multiple information to identify the structure of a given compound. | REVISION | REVISION |

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| **Phase 4** | **EQUILIBRIUM AND RATES**<br>Equilibrium and equilibrium constants.<br>Acids and bases, including how to determine their pH.<br>Titration curves and hoe these can be used to choose suitable indicators.<br>Orders of reactions: what are they and how are they determined.<br>How to interpret rate graphs, including how to determine the rate constant for first order reactions.<br>What a rate-determining step is, and how to predict rate equations that are consistent with it.<br>How to calculate further rate constants, including $K_p$, $K_a$ and $K_w$. | Carbonyl compounds: physical properties and reactivity.<br>Strategies to increase the length of a carbon chain.<br>Carboxylic acids: physical properties and reactivity.<br>Derivatives of carboxylic acids. | | |
| | **END OF YEAR EXAM** | | **STUDY LEAVE** | |