

# YEAR 12 CHEMISTRY CURRICULUM PROGRESSION OVERVIEW

## Subject Curriculum Intent

Pupils will build on their chemistry learning from KS4, extending their knowledge and understanding of physical chemistry, inorganic and organic and chemical analysis. They will build upon this learning by grasping more difficult concepts with increasingly complex organic homologous series, with such as thermodynamics, kinetics, acids and bases, equilibria and electrochemical cells in physical chemistry and groups 2,7, transition metals as well as periodicity in inorganic chemistry. Students will become competent at applying their learning in familiar and unfamiliar contexts, and in the interpretation and evaluation of experimental data, carrying out complex mathematical calculations of chemical concepts.

For some students, studying chemistry in key stage 5 provides the platform for more advanced studies, establishing the basis for a wide range of careers

	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
Topic	Atomic structure Basic organic	Bonding Amount of substance	Energetics, Alkenes Equilibria	Kinetics Redox Haloalkanes	Alcohols Group 2 Group 7 Instrumental techniques	Using resources
Core Knowledge/ Threshold Concept	<p><b>Basic skills transition</b> Writing formula, balancing equations, basic quantitative</p> <p><b>Atomic structure:</b> Fundamental particles, Mass number and isotopes, Electron configuration. TOFMS</p> <p><b>Basic organic:</b> naming, drawing structures, alkanes, crude oil</p>	<p><b>Amount of substance:</b> Relative atomic mass and relative molecular mass, The mole and the Avogadro constant, The ideal gas equation, Empirical and molecular formula:</p> <p><b>Bonding:</b> Ionic, covalent and metallic bonding, bond polarity and intermolecular forces, shapes of molecules</p> <p><b>Periodicity:</b> Patterns in physical properties of elements</p>	<p><b>Energetics:</b> Calorimetry, Hess's law, bond energies</p> <p><b>Chemical equilibria:</b> Le Chatelier's principle, K<sub>c</sub></p> <p><b>Alkenes:</b> Naming, preparations, properties and reactions mechanisms.</p>	<p><b>Kinetics:</b> Maxwell-Boltzman, collision theory, factors that effect rates of reaction.</p> <p><b>Redox reactions:</b> Oxidation numbers Oxidation states Redox equations</p> <p><b>Haloalkanes:</b> Naming, preparations, properties and reactions mechanisms.</p>	<p><b>Alcohols:</b> Naming, preparations, properties and reactions mechanisms. Oxidation of alcohols.</p> <p><b>Chemical analysis</b> Test tube reactions, mass spectroscopy, IR spec.</p> <p><b>Group 2 and 7</b> Properties and reactions of elements and compounds of halogens and alkaline metals</p>	<p><b>Periodicity:</b> patterns of elements, oxides and physical properties of period 3</p> <p><b>Isomerism:</b> Stereoisomerism, e/z and optical isomers</p> <p><b>Transition metals</b> Complexes, Shapes, coordination numbers,</p>

<b>Why this learning now?</b>	Begin Y12 with transition topic covering essential chemistry skills from KS4  Application of learning Topics which link most closely to GCSE prior learning are delivered in Y12 to ensure this learning is consolidated and extended.	Application of learning on fundamentals of bonding; learning underpins understanding of chemical bonding and the formation of compounds  Application of learning amount of substance; learning crucial for understanding most chemical calculations in the A level.	Alkenes - Application of learning on alkenes; learning supports understanding of the chemical mechanisms  Energetics – Application of learning energy transfers crucial for understanding energy calculations	Introduction to kinetics– Application of learning, understanding of rates of reactions linked to industry  Redox – Application of learning on how and why reactions occur; learning underpins understanding of electrochemical cells	Alcohols – Application of learning of alcohols; learning supports understanding of carbonyl compounds  Analysis – Application of learning about IR &MS spectroscopy; unit provides language and conceptual understanding to access further learning on spectroscopic techniques	Transition metals – Application of learning on developing greater understanding of periodic table  Isomerism- application of learning linked to stereoisomers  Periodicity-- application of learning linked to reactions of compounds of period 3
<b>Assessment Opportunities:</b>	Lessons have: - A recall starter – min 6/9 lessons per cycle, AfL tasks for whole class feedback Assessments are synoptic exam questions half termly. End of unit tests.					
<b>Learning at Home</b>	Homework will be set and teacher assessed once per cycle . Homework will be recall based and will be a mixture of: - Exam style questions (mainly) - Quizzes, e.g. Microsoft forms, Seneca					
<b>Key Vocabulary</b>	Free radical Polarity Homologous	Enthalpy Electronegativity	Electrophilic addition Dynamic equilibria	Nucleophilic substitution Oxidation states	Spectroscopy, Aldehydes, ketones	Complex ions Enantiomers Racemic mixture
<b>Spiritual, Moral, Social and Cultural concepts covered</b>	The Science curriculum provides students with the opportunity to learn about and discuss current issues in science, whilst developing their skills of enquiry and research. Students will be supported to be critical consumers of information, and will learn how to consider the relevance of where scientific information comes from, in order to assess its reliability and usefulness.					
<b>Links to careers and the world of work</b>	Research (cancer), Material science, Biopharmaceuticals , Medical studies, Dentistry, Veterinary, Engineering, Dietician, Law, Pharmacist, Chemical research					

# YEAR 13 CHEMISTRY CURRICULUM PROGRESSION OVERVIEW

## Subject Curriculum Intent

Pupils will build on their chemistry learning from Y12, extending their knowledge and understanding of physical chemistry, inorganic and organic and chemical analysis. They will build upon this learning by grasping more difficult concepts with increasingly complex organic homologous series, with such as thermodynamics, kinetics, acids and bases, equilibria and electrochemical cells in physical chemistry and transition metals as well as periodicity in inorganic chemistry. Students will become competent at applying their learning in familiar and unfamiliar contexts, and in the interpretation and evaluation of experimental data, carrying out complex mathematical calculations of chemical concepts.

For some students, studying chemistry in key stage 5 provides the platform for more advanced studies, establishing the basis for a wide range of careers

	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
<b>Topic</b>	Transition metals Aqueous ions Amines Amides	Carbonyls Kinetics Aromatics	Thermodynamics Acids and bases Kp	Electrochemical cells Polymers Amino acids	Instrumental techniques Revision	
<b>Core Knowledge/ Threshold Concept</b>	<p><b>Transition metals</b> Complexes, Shapes, coordination numbers</p> <p><b>Aqueous ions:</b> Reactions, colours and complex's of transition metals</p> <p><b>Amines:</b> naming, drawing structures, reactions and mechanisms</p> <p><b>Amides:</b> naming, drawing structures, reactions and mechanisms</p>	<p><b>Kinetics:</b> Factors effecting rate, methods of following rate. Rate equation. Orders of reactions</p> <p><b>Carbonyl compounds:</b> Aldehydes and ketones reactions, mechanisms</p> <p>Carboxylic acids and derivatives. Esters, acid chlorides, fats and oils</p> <p><b>Aromatics:</b> Benzene stability, reactions of aromatic compounds.</p>	<p><b>Thermodynamics:</b> Born Haber cycles, lattice enthalpies, entropy and Gibbs free energy</p> <p><b>Acid and Bases:</b> K<sub>a</sub>, pH, buffers, titration curves</p> <p><b>K<sub>p</sub>:</b> Calculations of gas equilibria</p>	<p><b>Electrochemical cells:</b> Redox, fuel cells Calculations of E.M.F.</p> <p><b>Polymer chemistry:</b> Addition polymers, condensation polymers</p> <p><b>Amino acids:</b> DNA and protein structure.</p>	<p><b>Instrumental techniques:</b> IR spec , carbon NMR Hydrogen NMR</p>	External Exams

<b>Why this learning now?</b>	<p><b>Transition metals</b> Continuing the study of elements and ions from the periodic table.</p> <p><b>Amines and amides</b> - more complex homologous series, learning supports the understanding of chemical mechanisms and uses.</p>	<p><b>Kinetics</b> - related to factors and speeds of reactions <b>Carbonyls</b> -focus on reactions of carboxylic acids, esters; learning supports understanding of the chemical reaction's mechanisms <b>Aromatic</b> chemistry- Benzene reactions mechanisms and stability</p>	<p><b>Thermodynamics</b> - Born Haber cycles, Entropy and Gibbs Free energy, learning supports understanding which and why reactions are feasible. <b>Acids and Bases</b> – Application of learning pH crucial for understanding buffers <b>Kp</b>- focus is gaseous reactions and equilibria calculations</p>	<p><b>Polymers</b>—related to the making and reactions of plastics, nylons etc learning linked to green chemistry <b>Electrochemical cells</b>- learning underpins understanding of cells and feasibility of reactions <b>Amino acids</b> —related to proteins, DNA structure, reactions and uses eg cic-platin</p>	<p><b>Analysis</b> – Application of learning about IR &amp; NMR spectroscopies; unit provides techniques to analyse and identify organic molecules.</p> <p><b>Synoptic Revision</b> of whole A level content</p>	
<b>Assessment Opportunities:</b>	<p>Lessons have: A recall starter – min 6/9 lessons per cycle, AfL tasks for whole class feedback Assessments are synoptic exam questions half termly. End of unit tests.</p>					
<b>Learning at Home</b>	<p>Homework will be set and teacher assessed once per cycle . Homework will be recall based and will be a mixture of:</p> <ul style="list-style-type: none"> <li>- Exam style questions (mainly)</li> <li>- Multi choice papers each cycle from term 2 in preparation for paper 3</li> </ul>					
<b>Key Vocabulary</b>	Nucleophilic addition elimination	Rate equation Benzene	Definitions of enthalpies Entropy	Amide / peptide bonds	Spectroscopy,	
<b>Spiritual, Moral, Social and Cultural concepts covered</b>	<p>The Science curriculum provides students with the opportunity to learn about and discuss current issues in science, whilst developing their skills of enquiry and research. Students will be supported to be critical consumers of information, and will learn how to consider the relevance of where scientific information comes from, in order to assess its reliability and usefulness.</p>					
<b>Links to careers and the world of work</b>	<p>Research (cancer), Material science, Biopharmaceuticals , Medical studies, Dentistry, Veterinary, Engineering, Dietician, Law, Pharmacist, Chemical research</p>					