

## **Intent:**

To give students an opportunity to build upon their GCSE studies and develop a broad understanding of the content and how chemistry shapes the world around us.

There are three fundamental areas that chemistry is split into:

- Physical Chemistry
- Inorganic Chemistry
- Organic Chemistry

These areas are revisited in the second year of the course where ideas are built on and extended to a more advanced level.

Students will develop technical expertise with a range of equipment, and knowledge of how science and technology impact society. Students will develop this competence and confidence in a variety of practical, mathematical and problem-solving skills through required practicals and a range of other practical activities.

As well as learning the content in each topic at A-level, the intention is to learn how to draw together different areas of knowledge and understanding within answers to questions. This breadth of knowledge is assessed across all three of the linear examinations at the end of the course.

Year 12	Half-Term 1	Half-Term 2	Half-Term 3	Half-Term 4	Half-Term 5
<b>Topic(s)</b>	<b>Atomic Structure</b> <ul style="list-style-type: none"> <li>Fundamental Particles</li> <li>Mass Number and Isotopes</li> <li>Electron Configuration</li> </ul> <b>Amount of Substance</b> <ul style="list-style-type: none"> <li>Relative atomic mass and relative molecular mass.</li> <li>The mole and Avogadro constant.</li> <li>The ideal gas equation</li> <li>Empirical and molecular formula</li> <li>Balanced equations and associated calculations.</li> </ul> <b>Bonding</b> <ul style="list-style-type: none"> <li>Ionic Bonding</li> <li>Nature of covalent and dative covalent bonds</li> <li>Bonding and physical properties.</li> </ul>	<b>Bonding</b> <ul style="list-style-type: none"> <li>Shapes of simple molecules and ions.</li> <li>Bond polarity</li> <li>Forces between molecules.</li> </ul> <b>Energetics</b> <ul style="list-style-type: none"> <li>Enthalpy Change.</li> <li>Calorimetry</li> <li>Application of Hess' Law</li> <li>Bond Enthalpies</li> </ul> <b>Kinetics</b> <ul style="list-style-type: none"> <li>Collision theory</li> <li>Maxwell-Boltzmann distribution</li> <li>Effect of temperature on reaction rate.</li> <li>Effect of pressure and concentration on reaction rate.</li> <li>Catalysts</li> </ul> <b>Chemical Equilibria</b> <ul style="list-style-type: none"> <li>Chemical Equilibria and Le Chatelier's Principle.</li> <li>Equilibrium constant <math>K_c</math> for homogeneous systems.</li> </ul>	<b>Introduction to Organic Chemistry</b> <ul style="list-style-type: none"> <li>Nomenclature</li> <li>Reaction mechanisms</li> <li>Isomerism</li> </ul> <b>Alkanes</b> <ul style="list-style-type: none"> <li>Fractional Distillation of crude oil</li> <li>Modification of alkanes by cracking</li> <li>Combustion of alkanes</li> <li>Chlorination of alkanes</li> </ul> <b>Halogenoalkanes</b> <ul style="list-style-type: none"> <li>Nucleophilic substitution</li> <li>Elimination</li> <li>Ozone depletion</li> </ul>	<b>Alkenes</b> <ul style="list-style-type: none"> <li>Structure, bonding and reactivity.</li> <li>Addition reactions of alkenes</li> <li>Addition polymers.</li> </ul> <b>Alcohols</b> <ul style="list-style-type: none"> <li>Alcohol production</li> <li>Oxidation of alcohols</li> <li>Elimination</li> </ul> <b>Organic Analysis</b> <ul style="list-style-type: none"> <li>Identification of functional groups by test-tube reactions.</li> <li>High resolution mass-spectrometry.</li> <li>Infrared spectroscopy.</li> </ul>	<b>Periodicity</b> <ul style="list-style-type: none"> <li>Classification</li> <li>Physical properties of Period 3 elements.</li> </ul> <b>Oxidation, Reduction and Redox Reactions</b> <ul style="list-style-type: none"> <li>Writing and combining half-equations</li> </ul> <b>Group 7, The Halogens</b> <ul style="list-style-type: none"> <li>Properties and reactivity of group 7 elements.</li> <li>Halogens as oxidising agents.</li> <li>Halides as reducing agents.</li> <li>Uses of chlorine and chlorate.</li> </ul> <b>Group 2, The Alkaline Earth Metals</b> <ul style="list-style-type: none"> <li>Properties and reactivity of group 2 elements.</li> <li>Properties and uses of group 2 hydroxides</li> <li>Properties and uses of group 2 sulfates.</li> </ul>
<b>Links to Prior Learning</b>	<b>Atomic Structure</b> Year 10 Chem – Atomic Structure and Periodic Table. Year 10 Physics – Atomic Structure and Radiation <b>Amount of Substance</b> Year 10 Chem – Quantitative Chemistry <b>Bonding</b> Year 10 Chem – Bonding, Structure and Properties of Matter	<b>Bonding</b> Year 10 Chem – Bonding, Structure and Properties of Matter <b>Energetics</b> Year 10 Chem – Energy Changes Year 10 Physics – Energy Year 10 Physics – Particle Model <b>Kinetics</b> Year 11 Chem – Rates of Reaction <b>Chemical Equilibria</b> Year 11 Chem – Rates of Reaction Year 11 Chem – Using Resources	<b>Introduction to Organic Chemistry</b> Year 11 Chem – Organic Chemistry  <b>Alkanes</b> Year 11 Chem – Organic Chemistry Year 11 Chem – Chemistry of the Atmosphere	<b>Alkenes</b> Year 11 Chem – Organic Chemistry  <b>Alcohols</b> Year 11 Chem – Organic Chemistry  <b>Organic Analysis</b> Year 11 Chem – Organic Chemistry	<b>Oxidation, Reduction and Redox Reactions</b> Year 10 Chem – Metals and Metal Extraction  <b>Group 7, The Halogens</b> Year 10 Chem – Atomic Structure and Periodic Table
<b>Key Practical Activities</b>	<b>Amount of Substance</b> Required Practical 1 – Make up a volumetric solution and carry out a simple acid-base titration.	<b>Energetics</b> Required Practical 2 – Measurement of an enthalpy change  <b>Kinetics</b> Required Practical 3 - Investigation of how the rate of a reaction changes with temperature.		<b>Alcohols</b> Required Practical 5 – Distillation of a product from a reaction  <b>Organic Analysis</b> Required Practical 6 – Tests for alcohol, aldehyde, alkene and carboxylic acid.	<b>Group 2, The Alkaline Earth Metals</b> Required Practical 4 – Carry out simple test-tube reactions to identify: <ul style="list-style-type: none"> <li><math>\text{NH}_4^+</math></li> <li>Group 2 ions</li> <li>Group 7 ions</li> <li><math>\text{OH}^-</math>, <math>\text{CO}_3^{2-}</math>, <math>\text{SO}_4^{2-}</math></li> </ul>
<b>Assessment</b>	<ul style="list-style-type: none"> <li>Formative assessments will regularly take place by staff within lessons, as well as weekly work reviews carried out based on past exam questions.</li> <li>Synoptic, summative assessments to take place at four points throughout the year (IAPs).</li> <li>Mock examinations to take place in January and July.</li> </ul>				

Year 13	Half-Term 1	Half-Term 2	Half-Term 3	Half-Term 4	Half-Term 5	Half-Term 6
Topic(s)	<b>Rate Equations</b> <ul style="list-style-type: none"> <li>Rate Equations.</li> <li>Determination of rate equations.</li> </ul>	<b>Thermodynamics</b> <ul style="list-style-type: none"> <li>Born-Haber Cycles</li> <li>Gibbs free-energy</li> <li>Entropy Change</li> </ul> <b>Equilibrium Constant, <math>K_p</math>, for homogeneous systems</b> <ul style="list-style-type: none"> <li>Calculating <math>K_p</math> in homogeneous systems</li> </ul> <b>Acids and Bases</b> <ul style="list-style-type: none"> <li>Definition and determination of pH.</li> <li>The ionic product of water, <math>K_w</math></li> </ul>	<b>Acids and Bases</b> <ul style="list-style-type: none"> <li>pH curves, titrations and indicators.</li> <li>Weak acids and bases</li> <li><math>K_a</math> for weak acids</li> <li>Buffer action</li> </ul> <b>Electrode Potentials and electrochemical cells</b> <ul style="list-style-type: none"> <li>Electrode potentials and cells</li> <li>Commercial applications of electrochemical cells.</li> </ul> <b>Optical Isomerism</b> <ul style="list-style-type: none"> <li>Drawing optical isomers</li> <li>Explain how racemic mixtures form.</li> </ul>	<b>Aldehydes and Ketones</b> <ul style="list-style-type: none"> <li>Nucleophilic addition</li> <li>Reduction of aldehydes and ketones</li> </ul> <b>Carboxylic acids and derivatives</b> <ul style="list-style-type: none"> <li>Carboxylic acids and esters</li> <li>Acylation</li> </ul> <b>Aromatic Chemistry</b> <ul style="list-style-type: none"> <li>Bonding</li> <li>Electrophilic Substitution</li> </ul> <b>Amines</b> <ul style="list-style-type: none"> <li>Preparation of amines</li> <li>Base properties of amines</li> <li>Nucleophilic properties of amines</li> </ul> <b>Polymers</b> <ul style="list-style-type: none"> <li>Condensation polymers.</li> <li>Biodegradability and disposal of polymers.</li> </ul> <b>Amino acids, proteins and DNA</b> <ul style="list-style-type: none"> <li>Amino acids</li> <li>Proteins</li> <li>Enzymes</li> <li>DNA</li> <li>The action of anti-cancer drugs</li> </ul>	<b>Organic Synthesis</b> <ul style="list-style-type: none"> <li>Organic synthesis</li> </ul> <b>NMR Spectroscopy</b> <ul style="list-style-type: none"> <li>Structure determination using H and C NMR spectroscopy</li> </ul> <b>Chromatography</b> <ul style="list-style-type: none"> <li>TLC</li> <li>Column chromatography</li> <li>GCMS</li> </ul> <b>Period 3 elements and their oxides</b> <ul style="list-style-type: none"> <li>Physical properties of period 3 oxides</li> <li>Reactions of period 3 oxides</li> </ul> <b>Transition Metals</b> <ul style="list-style-type: none"> <li>General properties of transition metals</li> <li>Substitution reactions</li> <li>Shapes of complex ions</li> </ul>	<b>Transition Metals</b> <ul style="list-style-type: none"> <li>Formation of coloured ions</li> <li>Variable oxidation states</li> <li>Catalysts</li> </ul> <b>Reactions of ions in aqueous solutions</b> <ul style="list-style-type: none"> <li>Identifying metal ions in test-tube reactions.</li> </ul>
Links to Prior Learning	<b>Rate Equations</b> Year 11 – Rates of reaction Year 12 - Kinetics	<b>Thermodynamics</b> Year 12 – Energetics Year 12 – Bonding  <b>Equilibrium Constant, <math>K_p</math>, for homogeneous systems</b> Year 11 – Rates of reaction Year 12 – Chemical equilibria  <b>Acids and Bases</b> Year 10 – Acids Year 12 – Chemical equilibria Year 12 – Amount of Substance	<b>Acids and Bases</b> Year 10 – Acids Year 12 – Chemical equilibria Year 12 – Amount of Substance  <b>Electrode Potentials and electrochemical cells</b> Year 10 – Metals and Metal Extraction Year 12 – Oxidation, reduction and redox reactions  <b>Optical Isomerism</b> Year 12 – Introduction to Organic Chemistry	<b>Aldehydes and Ketones</b> Year 12 – Alcohols  <b>Carboxylic acids and derivatives</b> Year 10 – Acids Year 11 – Organic Chemistry Year 12 – Alcohols  <b>Aromatic Chemistry</b> Year 12 – Bonding  <b>Amines</b> Year 12 – Halogenoalkanes Year 12 – Alkenes Year 12 – Alcohols  <b>Polymers</b> Year 12 – Alkenes Year 11 – Organic Chemistry  <b>Amino acids, proteins and DNA</b> Year 11 Bio – Inheritance, variation and evolution Year 11 Chem – Organic Chemistry	<b>Organic Synthesis</b> All organic chemistry topics from Y1+2  <b>Chromatography</b> Year 11 – Chemical Analysis  <b>Period 3 elements and their oxides</b> Year 12 – Periodicity  <b>Transition Metals</b> Year 12 – Atomic structure Year 12 - Bonding	<b>Transition Metals</b> Year 12 – Atomic structure Year 12 - Bonding

<b>Key Practical Activities</b>	<b>Rate Equations</b> Required Practical 7 – Measuring the rate of reaction by an initial rate method and continuous monitoring.	<b>Acids and Bases</b> Required Practical 9 - Investigate how pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base.	<b>Electrode Potentials and electrochemical cells</b> Required Practical 8 – Measuring the EMF of an electrochemical cell.	<b>Carboxylic acids and derivatives</b> Required Practical 10 – Preparation of a pure organic solid and test of its purity. Preparation of a pure organic liquid.	<b>Chromatography</b> Required Practical 12 – Separation of species by thin-layer chromatography.	<b>Reactions of ions in aqueous solutions</b> Required Practical 11 – Carry out simple test-tube reactions to identify transition metal ions in aqueous solution.
<b>Assessment</b>	<ul style="list-style-type: none"> <li>Formative assessments will regularly take place by staff within lessons, as well as weekly work reviews carried out based on past exam questions.</li> <li>Synoptic, summative assessments to take place at three points throughout the year (IAPs).</li> <li>Mock examinations to take place in July (end of Y12), December and March</li> </ul>					