

Curriculum Map Year 12 – Chemistry

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
			Throughout year 12 we encourage students to develop systems and work practices that are thorough. These often need teacher guidance, require extra time and adherence to their own independent work schedule. This allows them make progress towards their long term vision.	Year 11 into 12 transition work Year 12 Baseline Assessment
Half Term 1 Teacher A	Amount of Substance	RAM and Mole calculations using solids, liquids and solutions	Constructing and balancing more complex chemical equations. Application of key mathematical skills: Re-arranging more complex equations, standard form and significant figures, algebraic application to find unknowns. Precision and % error Practical skills and development of advanced apparatus use: Making a standard solution (Req Prac 1), Carrying out titrations (Req Prac 1),	Past paper questions Required Practical 1 Isaac Chemistry topics A, B & C Year 12 Baseline test
Half Term 1 Teacher B	Atomic Structure & Periodic Table	Detailed structure of atoms Isotopes, ionisation energies Principles of and the use of TOF Mass Spectrometry Electron configuration of elements up to Krypton	Application of key mathematical skills: Re-arranging more complex equations Interpretation of mass spectra	Past paper questions Isaac Chemistry topic D Year 12 Baseline test
Half Term 2 Teacher A	Amount of Substance Kinetics	RAM and Mole calculations using solids, liquids, solutions and gases Principles of and the use of the Ideal Gas Equation Empirical and Molecular formulae Collision theory & Effects of different variables on rate of reaction (GCSE recap) The Maxwell-Boltzmann distribution of energies Effect of temperature, concentration, pressure and the use of a catalyst on reaction rate	Constructing and balancing more complex chemical equations. Application of key mathematical skills: Re-arranging more complex equations, standard form and significant figures, algebraic application to find unknowns. Precision and % error Finding the Mr of a volatile liquid/gas using a gas syringe and inverted measuring cylinder, Finding the empirical formula of magnesium oxide, Finding the Mr of a hydrated salt by heating to constant mass Application of key mathematical skills: Translating information between graphical, numerical and algebraic forms. Drawing tangents and calculating gradients. Practical skills and development of advanced apparatus use: Investigating how rate of reaction varies with temperature (Req Prac 3) by two different methods: gas syringe and collection of gas over water.	Past paper questions Isaac Chemistry topics A, B & C Required Practical 3 Amount of Substance test

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 2 Teacher B	Bonding	Principles of ionic bonding and ionic compounds Principles of covalent and dative covalent bonds Principles of metallic bonding and metals Bonding, forces between molecules and physical properties Shapes of molecules and ions Bond polarity	The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them Use of molecular models Explanations of why substances have the properties they have. Applying electronegativity rules to determine bond polarities and overall molecular polarities	Past paper questions Atomic structure & Periodic table test
Half Term 3 Teacher A	Energetics	Enthalpy changes Principles of calorimetry and the use of $q = mc\Delta T$ Principles of and the use of Hess' Law Bond enthalpies	Practical skills and development of advanced apparatus use: Determination of ΔH by calorimetry, two different ways, combustion and displacement as a minimum (Req Prac 2) Application of key mathematical skills: Hess cycles and their manipulation. Plotting graphs from experimental data, extrapolation and interpolation	Past paper questions Required Practical 2 Isaac Chemistry topic F Energetics test
Half Term 3 Teacher B	Organic Chemistry – Alkanes & Haloalkanes	Principles of chemical nomenclature, formulae and naming Reaction mechanisms and the curly arrow Three types of structural isomerism Fractional distillation of crude oil Combustions and cracking alkanes Chlorination of alkanes Nucleophilic substitution reactions of haloalkanes Elimination reactions of haloalkanes Ozone depletion	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Constructing and balancing more complex chemical equations. Construction and use of reaction mechanisms	Past paper questions Bonding test
Half Term 4 Teacher A	Chemical Equilibria (Kc and Kp)	Chemical equilibria and Le Chatelier's principle Principles of and the use of the equilibrium constants, Kc and Kp	Predicting direction of change in reactions Application of key mathematical skills: Re-arranging more complex equations, standard form and significant figures, algebraic application to find unknowns, indices rules	Past paper questions Isaac Chemistry topic I End of topic test
	Redox	Oxidation states Half equations and combining half equations	Constructing and balancing more complex chemical equations including half equations.	Past paper questions Isaac Chemistry topic K Kc & Kp test

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 4 Teacher B	Alkenes	The carbon-carbon double bond and electrophilic addition reactions and mechanisms of alkenes Stereoisomerism in alkenes Polymerisation of alkenes	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction mechanisms	Past paper questions
	Alcohols	Synthesis of alcohols Oxidation of alcohols Elimination reactions of alcohols	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction mechanisms Practical skills and development of advanced apparatus use: The use of quickfit apparatus for heating under reflux and distillation. Distillation of ethanal after oxidation of ethanol. Researching and producing a risk assessment for a procedure (Req Prac 5)	Past paper questions Required Practical 5 Alkanes & Haloalkanes test
Half Term 5 Teacher A	Group 7 (17) The Halogens	Physical properties and trends in group 7 (17) Uses of chlorine and chlorate(I) Linking redox behaviour to halide ions, halogens and their compounds	Constructing and balancing more complex chemical equations including half equations. Practical skills and development of advanced apparatus use: Using a range of hazardous substance safely. Using a wide range of chemical tests and making detailed observations (Req Prac 4)	Past paper questions Required Practical 4 Isaac Chemistry topic K Halogens & Redox test
	Group 2	Physical properties and trends down group 2 Reactions of group 2 elements with water Solubility of group 2 sulfates and hydroxides	Describing the appearance of precipitates as a measure of solubility	Past paper questions
Half Term 5 Teacher B	Organic Analysis & Functional Groups	Identification of substances via test tube reactions Principles of and use of Mass Spectrometry Principles of and use of Infra-Red Spectroscopy	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Practical skills and development of advanced apparatus use: Test tube reactions to identify functional groups (Req Prac 6) Interpreting Mass spectra and Infra-red spectra	Past paper questions Required Practical 6 Alkenes & Alcohols test

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 6 Teacher A	Group 2	Physical properties and trends down group 2 Reactions of group 2 elements with water Solubility of group 2 sulfates and hydroxides	Describing the appearance of precipitates as a measure of solubility	Past paper questions Year 12 examination
	Period 3	Physical properties and trends across period 3	Applying bonding, physical properties and reactions rules to period 3 elements	Past paper questions
Half Term 6 Teacher B	Arenes	Evidence for and structure of benzene Electrophilic substitution reactions of arenes Nitration and acylation of benzene	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction mechanisms	Past paper questions Year 12 examination
Half Term 6	All topics covered			Year 12 examination

Curriculum Map Year 13 – Chemistry

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
			Throughout year 13 we build upon the systems and work practices that students have forged in year 12. They may need modification based upon their changing vision and post year 13 entry requirements. Students independent work schedule carries much more emphasis but still retains the close working relationships with teachers.	
Half Term 1 Teacher A	Period 3	Physical properties and trends across period 3 Physical and chemical properties of the oxides of elements in period 3	Applying bonding, physical properties and reactions rules to period 3 elements and their oxides	Past paper questions
	Rates and Rate Equations	Order of reaction and the rate constant Principles of and construction of rate equations Principles of and the use of the Arrhenius equation	Application of key mathematical skills: Processing data to reveal orders of reaction, substituting values into and solving algebraic equations, plotting data accurately into graphs constructed from scratch, interpreting graphs of rate and order of reaction, use of reciprocals, natural logs and the natural log form of the Arrhenius equation, Calculating positive and negative gradients and plotting lines of best fit. Practical skills and development of advanced apparatus use: Measurement of rate of reaction by two methods, initial rate using a gas syringe and collection of gas over water. (Req Prac 7)	Past paper questions Required Practical 7 Isaac Chemistry topic M Group 2 & Period 3 test
Half Term 1 Teacher B	Arenes	Evidence for and structure of benzene Electrophilic substitution reactions of arenes Nitration and acylation of benzene	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction mechanisms	Past paper questions Arenes test
	Optical isomerism Aldehydes & Ketones	Principles and representations of optical isomerism Oxidation and reduction of aldehydes and ketones Nucleophilic addition reactions of aldehydes and ketones	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction mechanisms Explanations of the origin of optical isomerism, especially via nucleophilic addition reactions of carbonyl compounds and how to identify optical isomers. How to identify aldehydes and ketones as well as their reactions and mechanisms and the origin of optical isomerism within their reaction products.	Past paper questions

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 2 Teacher A	Thermodynamics	Principles and use of Born-Haber cycles Entropy and entropy changes Principles and the use of the equation $\Delta G = \Delta H - T\Delta S$	Knowledge of and application of a wide range of standard enthalpy changes Application of key mathematical skills: Born-Haber cycles and their manipulation, Re-arrangement and interpretation of $\Delta G = \Delta H - T\Delta S$ and it's graphical representation in the form $y = mx + c$,	Past paper questions Isaac Chemistry topics F, G & H Rates of reaction test Thermodynamics test
Half Term 2 Teacher B	Carboxylic acids and their derivatives	Reactions of carboxylic acids Formation of and reactions of esters Oils, soaps and biofuels Acylation reactions	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and use of reaction equations and mechanisms Practical skills and development of advanced apparatus use: Preparation and testing of aspirin including determination of melting point and preparation of ethylethanoate (Req Prac 10).	Past paper questions Required Practical 10 Carboxylic acids & derivatives test
Half Term 3 Teacher A	Acids & Bases	Brønsted-Lowry theory of acids & bases Calculating pH of strong acids and bases, weak acids and acidic buffer solutions Principles of and the use of K_w and K_a pH curves, titrations and indicators	Explanation of pH and neutrality. Determination of pH of a wide range of solutions of strong acids and bases, weak acids and acidic buffers. Conversion of K_a to pK_a and K_w to pK_w and their interconnectivity. Production and interpretation of a range of pH curves Explanations of buffer action Application of key mathematical skills: Use of logs, powers and exponential functions, Re-arranging more complex equations, standard form and significant figures, algebraic application to find unknowns, indices rules Practical skills and development of advanced apparatus use: Measure changes in pH during an acid-base titration using a pH probe (Req Prac 9)	Past paper questions Required Practical 9 Isaac Chemistry topic J

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 3 Teacher B	Amines	Synthesis and uses of amines Base strength of amines Reactions of amines	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and application of acylation reaction mechanisms Be able to identify reagents and conditions for the production of specific amines and quaternary ammonium salts. Identify amines base strength	Past paper questions
	Amino acids, Proteins & DNA	Condensation polymers Biodegradability and disposal of polymers Amino acids and zwitterions Proteins, the peptide link and hydrolysis of peptides Enzymes Chemical structure of DNA and how anti-cancer drugs interact with DNA	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent condensation polymers. Use of molecular models. Construction and application of reaction mechanisms Identifying and explaining different protein structures including enzymes and their method of action Consideration of the socio-economic impacts of polymer use and recycling	Past paper questions
	Polymers	Structure, repeating units and uses of a range of condensation polymers Forces between polymer molecules Hydrolysis reactions of polymers	Fluency in the use of IUPAC nomenclature regarding organic molecules (polymers) Application of intermolecular forces to polymer molecules Construction and application of reaction mechanisms	Past paper questions
Half Term 3	All content covered so far			Year 13 examinations

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 4 Teacher A	Transition metals	Properties of transition metals Ligands and ligand substitution reactions Shapes of complex ions and isomerism within them Coloured ions and colourimetry	Application of rules governing transition metal elements, complex formation, denticity, 3D complex shapes and isomerism. Colourimetry and interpretation of associated graphs and data Application of key mathematical skills: Re-arrangement and interpretation of $\Delta E = h\nu (=hc/\lambda)$ and it's graphical representation via practical colorimetry.	Past paper questions Required Practical 11 Acids & Bases test
	Transition metals variable oxidation states	Reactions which depend on the variable oxidation states of transition metal ions Catalysts Reactions of transition metal ions in aqueous solution including amphotericism	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Application of chemical testing, redox potentials and variable oxidation states of transition metal ions to a variety of contexts. Application of variable transition oxidation states to their role as catalysts. Writing transition metal substitution reactions and applying them to a wide range of reactions and observations of transition metal ion solutions. Practical skills and development of advanced apparatus use: Carrying out redox titrations (Req Prac 11).	

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 4 Teacher B	Amino acids, Proteins & DNA	Condensation polymers Biodegradability and disposal of polymers Amino acids and zwitterions Proteins, the peptide link and hydrolysis of peptides Enzymes Chemical structure of DNA and how anti-cancer drugs interact with DNA	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent condensation polymers. Use of molecular models. Construction and application of reaction mechanisms Identifying and explaining different protein structures including enzymes and their method of action Consideration of the socio-economic impacts of polymer use and recycling	Past paper questions Amino acids, Proteins & DNA test
	Organic Analysis	Nuclear Magnetic Resonance Spectroscopy Thin Layer, Column and Gas Chromatography	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Construction and application of reaction mechanisms Analysis and interpretation of NMR spectra, paper, thin layer (Req Prac 12) and column chromatograms. Combining information from other spectroscopic techniques to allow structure elucidation.	Past paper questions Required Practical 12
	Electrode Potentials	Electrode potentials, the use of the electrochemical series and the prediction of cell EMF Commercial applications of electrochemical cells	Use of the electrochemical series to determine the direction of chemical changes and how changing conditions affect E° values Application of key mathematical skills: Practical skills and development of advanced apparatus use: set-up of simple and more complex electrochemical cells	Past paper questions Required Practical 8 Isaac Chemistry topic L
Half Term 5 Teacher A	Transition metals variable oxidation states Exam preparation	Reactions which depend on the variable oxidation states of transition metal ions Catalysts Reactions of transition metal ions in aqueous solution including amphotericism	Fluency in the use of IUPAC nomenclature regarding organic molecules. The relationship between 2D displayed and actual 3D shapes of molecules and the ability to represent them. Use of molecular models. Application of chemical testing, redox potentials and variable oxidation states of transition metal ions to a variety of contexts. Application of variable transition oxidation states to their role as catalysts. Writing transition metal substitution reactions and applying them to a wide range of reactions and observations of transition metal ion solutions. Practical skills and development of advanced apparatus use: Carrying out redox titrations (Req Prac 11).	Past paper questions Required Practical 11 Transition metals test External examinations

	Topic	Key Knowledge <i>What will students know by the end of this topic?</i>	Key Skills <i>What skills will students have developed by the end of this topic?</i>	Assessment Opportunities <i>How will student progress be measured? What are the key assessment pieces?</i>
Half Term 5 Teacher B	Electrode Potentials	Electrode potentials, the use of the electrochemical series and the prediction of cell EMF Commercial applications of electrochemical cells	Use of the electrochemical series to determine the direction of chemical changes and how changing conditions affect E° values Application of key mathematical skills: Practical skills and development of advanced apparatus use: set-up of simple and more complex electrochemical cells	Past paper questions Required Practical 8 Isaac Chemistry topic L Electrochemistry test
	Organic Synthesis Exam preparation	Synthetic routes to make a wide range of compounds	Fluency in the use of all IUPAC nomenclature, reactions and mechanisms learned throughout the course. Devising synthetic routes to make a variety of organic compounds	Past paper questions External examinations