KAA Curriculum Overview	Chemistry	Year 13	EOY Exam	Sequencing and Progression	
Rationale *Give an overview of what students are studying this year and why. Link directly to your overall curriculum intent.* *In broad terms Chemistry at KS5 is the study of the movement of electrons:* *How many?* *Why do they move?* *How do they move?* *And the resulting changes in energy and configuration.* *In year 13 there is a strong focus on big concepts such as the feasibility of chemical reactions which requires students to compare thermodynamic and kinetic information. The real world application of chemistry is made overt particularly through the study of buffers, structure determination techniques, and the use of optically active compounds and transition metal complexes in medicine.* *Students will learn and develop a significant set of practical skills related to carrying out, recording, and reflecting on a series of experiments designed to fit in with the curriculum. These include: quantifying the rate of a chemical reaction, synthesising and purifying a pure solid and a pure liquid, and creating a calibration curve using an acid base titration.* *Through the above we aim to ensure that all students have an excellent foundation for studying the physical / medical / life sciences or engineering. Or that students have an excellent foundation for entering work or an apprenticeship in a science or engineering setting.*			*What content and skills will be assessed in the EOY exam?* *All listed below:* *https://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405/specification-at-a-glance* *Link to model exam papers here.* *https://filestore.aqa.org.uk/sample-papers-and-mark-schemes/2019/june/AQA-74051-QP-JUN19.PDF* *https://filestore.aqa.org.uk/sample-papers-and-mark-schemes/2019/june/AQA-74052-QP-JUN19.PDF* *https://filestore.aqa.org.uk/sample-papers-and-mark-schemes/2019/june/AQA-74053-QP-JUN19.PDF*	*How does this year build on what they've learnt last year?* *There is a linear progression from some topics studied at year 12, for example:* *Energetics → Thermodynamics* *Redox → Electrode potentials* *Periodicity AS → Periodicity A2* *Alkenes → Aromatic* *However other topics are elaborations of concepts studied at GCSE, but tend to require some of the skills learned in year 12, for example:* *Acids. Bases, and buffers* *Transition metals* *Structure determination*	*How will it benefit them as they move forward next year?* *Fluency in applying amount of substance calculations to a wide range of scenarios is a requisite for all physical and natural sciences degree courses, as well as medicine, pharmacy and dentistry.* *A thorough understanding of the bonds and forces involved in amino acids, proteins, and DNA is essential for any natural or medical sciences degrees.* *The deductive reasoning skills developed through the course are transferrable to a range of situations.*

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Sum 1	Sum 2
Link to MTP Overview						
Topic studied & Fertile Question	**Thermodynamics** How can we work out if a reaction happens spontaneously? **Aromatic chemistry** How is benzene different to cyclohexa-1,3,5-triene? **Amines** What makes an amine a good base?	**Electrode potentials** How can we predict the direction of a redox reaction? **Acids, bases, and buffers** How can we find the pH of a buffer solution after a small volume of strong acid is added? **Polymerisation** What makes a polymer biodegradable? **Amino acids, proteins, and DNA** What does the structure of DNA look like on the atomic level?	**Periodicity** Why are some P3 oxides basic, others acidic, and some amphoteric? **Transition metals** Why are transition metals: a) coloured? b) good catalysts? **Organic synthesis and analysis** How can you make butylamine from 1-bromopropane, and how could you tell your synthesis had been successful? **Structure determination** What does the ^{1}H NMR spectrum of propyl ethanoate look like? And	**Reactions of inorganic compounds in aqueous solution** What happens when solid iron(III) chloride is added to excess water? What is the colour of the resulting solution and why is it acidic? **Revision**	**Revision**	

			how quickly does propyl ethanoate move through a chromatography column?			
Adjustments following last assessments / evaluation.	Use particle diagrams to support thermodynamic definitions, and link these to Born Haber cycles. Use enthalpy diagram to support teaching of thermodynamic stability of benzene. Ensure students have the Lewis and Bronsted-Lowry definitions of acids and bases secured when teaching about amines.	Use drawings to model both the make-up of a buffer solution and the changes that happen to a buffer when acids or bases are added.	Use drawings to help reduce the cognitive load of redox titration questions, and help students find the starting point for their calculation. Dual coding for mechanisms.	For revision we have introduced a few strategies to promote metacognition. - Core questions for active recall, giving students an opportunity to monitor their own progress - Tree diagrams for topics where decisional knowledge is important (energetics, thermodynamics, acids, bases, and buffers, mechanisms) - Structured small group lessons where students work to solve high mark questions and feedback to the class, with opportunities for other groups to comment and critique		
Key knowledge and skills students need to have gained by the end of the unit	How to use a Born Haber cycle to solve an enthalpy change value from data. Explain discrepancies in values of ΔH lattice formation using ideas about ionic radius or covalent character. Describe the bonding and structure in benzene. Use data to explain why benzene is more stable than cyclohexa-1,3,5-triene. Explain the relative base strengths of primary, secondary, and phenyl amines. Draw a mechanism and structure of the product formed when excess halogenoalkane is reacted with an amine.	Describe every part of a standard hydrogen electrode. How to calculate an E^o cell value from data. How to deduce the feasible reaction and equation from half equations and E^o data. Explain how a fuel cell generates a current using E^o data and half equations. Describe the details and reactions in a lithium cell. How to calculate the pH of: weak acid, strong acid, base, buffer (2 types), buffer after addition of acid or base. How to deduce a repeat unit or monomer from a section of polymer (and vice versa). Explain why polyesters and polyamides can be hydrolysed but polyalkenes cannot.	Explain the trend in the melting point of the oxides of the period 3 elements. Write equations for the reactions that occur between the oxides of the period 3 elements and given acids and bases. Write equations for ligand substitution reactions Explain the chelate effect, in terms of the balance between the entropy and enthalpy change Understand and draw the shape of complex ions. Describe how colorimetry is used to deduce the concentration of a solution containing a transition metal ion. Calculate the energy of an electron moving between d-orbitals from data given. Carry out redox titration calculations.	Explain why the acidity of $[Fe(H_2O)_6]^{3+}$ is greater than that of $[Fe(H_2O)_6]^{2+}$ Describe and explain the simple test-tube reactions of: $M^{2+}(aq)$ and $M^{3+}(aq)$ ions with the bases OH^-, NH_3 and CO_3^{2-}		

		Draw structures of peptides, polypeptides, or zwitterions from information given. Explain the idea of stereospecificity in enzymes. Explain how ionic bonds, hydrogen bonds, and disulphide bonds arise between amino acids in DNA. Identify or draw sections of DNA from information given. Explain why cisplatin prevents DNA replication.	Explain how certain species act as catalysts, for example: explain, with the aid of equations, how Fe^{2+} ions catalyse the reaction between I^- and $S_2O_8^{2-}$ Describe the stages in the action of heterogeneous catalysts. Explain why chemists aim to design processes that do not require a solvent, that use non-hazardous starting materials, and have a high % atom economy. Use reactions learned to devise a synthesis, with up to four steps, for an organic compound. Explain why TMS is a suitable standard, and $CDCl_3$ a suitable solvent, for use in NMR spectroscopy. Use ^1H NMR and ^{13}C NMR spectra along with chemical shift data to suggest possible structures or part structures for molecules. Explain how components of a mixture are separated in thin layer, column, and gas chromatography. Calculate Rf values from a chromatogram and compare with standards to identify substances.			

How is understanding assessed at the end of the unit?	Written assessment where students are asked many questions which require definitions, descriptions, explanations, deductions, and calculations, all done under timed conditions. Assessments are marked by teachers using set mark schemes, to award a % and grade. Practical work is assessed through reports on each experiment, written in a lab book. The reports are marked by teachers using a R/A/G system based on competencies shown by students.	Practical competencies report: pass / fail. Public A-level exams.