

KS4 Curriculum Map – Chemistry:

Topic	Substantive Knowledge This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	Disciplinary Knowledge (Skills) This is the action taken within a particular topic in order to gain substantive knowledge.	Assessment Opportunities What assessments will be used to measure student progress?
States of matter + separation	<ul style="list-style-type: none"> • Arrangement of particles in solids liquids and gases • Names for processes to convert between states of matter • Formulations • Separation techniques (filtration, crystallisation, distillation, chromatography) 	<ul style="list-style-type: none"> • Apply Particle theory to explain observations • Apply knowledge of physical properties to determine the most appropriate separation method • Calculate retention factor • Work safely in the laboratory 	<ul style="list-style-type: none"> • Required practical • Diagram drawing
Atomic structure	<ul style="list-style-type: none"> • History of atomic models • Plum pudding model, nuclear model (gold foil experiment), Chadwick, Bohr model, • Mass, charge + location of subatomic particles • Definitions of mass number and atomic number • Electron structure • Isotopes • Calculation of RFM / RMM 	<ul style="list-style-type: none"> • Apply knowledge of experimental work to explain the idea that models change over time. • Apply charges on Atoms and ions to determine numbers of subatomic particles • Use the periodic table to determine the number of different subatomic particles and the position of electrons. • Calculate RAM to an appropriate level of precision 	<ul style="list-style-type: none"> • Posters • Calculations of RAM • Short test
Bonding and analysis	<ul style="list-style-type: none"> • Ionic bonding • Formulae of ions • Tests for common ions • Tests for gases • Spectroscopic techniques • Covalent bonding 	<ul style="list-style-type: none"> • Apply knowledge of stability of a full outer Full outer shell to draw bonding diagrams • Write formulae for compounds • Balance reaction equations • Draw dot cross diagrams • Compounds behave differently to their constituent elements 	<ul style="list-style-type: none"> • Required practical • In class assessment of dot cross diagrams • Ionic formula literacy

		<ul style="list-style-type: none"> Use ideas of subjective and objective data to explain the rationale for spectroscopic methods 	
Periodic table	<ul style="list-style-type: none"> History of the Periodic Table Groups and Periods Group 1 Group 7 Noble Gases Transition Metals 	<ul style="list-style-type: none"> Research different scientists to enforce the idea that theories change over time and based on experimental observations Use Medeleev's table to make predictions Explain that reactivity is linked to distance, shielding and nuclear charge 	<ul style="list-style-type: none"> Poster / presentation
Rates	<ul style="list-style-type: none"> 4 factors can affect rate – concentration, surface area, temperature and catalyst Units of rate Practical methods for studying rate Activation energy 	<ul style="list-style-type: none"> State the meaning of rate of reaction Apply collision theory to explain the effect of concentration, temperature, surface area and catalysts on rate of reaction. Draw graphs and use them to draw conclusions Calculate mean rate and rate at a point in time Interpret data to draw accurate conclusions Apply knowledge of Control variables to design experimental work Identify anomalies and explain how they are caused. Use correct terminology when assessing validity of data Carry out practical work to generate data to support theory work. 	<ul style="list-style-type: none"> Required practical Data manipulation Method writing
Organic Chemistry (1)	<ul style="list-style-type: none"> Crude oil separation Alkanes – combustion and cracking Alkene reactions Addition polymers Pollution and environmental impact 	<ul style="list-style-type: none"> Apply knowledge of separation techniques Make links between molecular size, boiling point and viscosity Use knowledge of addition reactions to predict products for reactions of alkene compounds Draw displayed formulae and structural formulae 	<ul style="list-style-type: none"> Test Molymods

Atmosphere	<ul style="list-style-type: none"> History of the atmosphere Composition of the modern atmosphere Carbon footprints 	<ul style="list-style-type: none"> Apply a knowledge of timescales to discuss the limitations of scientific evidence Apply knowledge of photosynthesis to explain changes in the atmosphere over time. Analyse data to draw relevant conclusions (evaluating quality of evidence) Explore the importance of peer review and communicating results 	<ul style="list-style-type: none"> Leaflets / presentations Discussion groups / debates Analysis of current affairs
Bonding and structure	<ul style="list-style-type: none"> Properties of ionic compounds Properties of covalent compounds Metallic Bonding Nanoparticles Alloys 	<ul style="list-style-type: none"> Explore the benefits and limitations of different representations of substances Apply knowledge of bonding types to explain the relationship between structure type and properties Compare properties of materials with different particle Calculate SA:V ratios 	<ul style="list-style-type: none"> Whiteboards Topic test Extended writing
Calculations for solids	<ul style="list-style-type: none"> Moles Avogadro's constant Empirical formula Reacting mass calculation Limiting reagent % yield Atom economy 	<ul style="list-style-type: none"> Correctly use standard Form and significant figures in chemical calculations Use the law of conservation of mass to balance equations Manipulate data in order to draw valid conclusions. Compare the Environmental / economic implications of reactions using atom economy calculations 	<ul style="list-style-type: none"> In class questions Data analysis Test
Energetics	<ul style="list-style-type: none"> Exothermic and endothermic reactions and their uses Energy level diagrams Use of calorimeter to measure enthalpy change Bond enthalpy 	<ul style="list-style-type: none"> Carry out practical work to demonstrate that energy is conserved Draw energy level diagrams including activation energy and showing the role of a catalyst Calculate enthalpy change using the knowledge that Bond breaking and making is endothermic / exothermic 	<ul style="list-style-type: none"> Required practical In class calculation questions

Acid, metals and reactivity	<ul style="list-style-type: none"> pH and neutralisation Reactions to form salts Practical methods Reactivity series Rusting / corrosion 	<ul style="list-style-type: none"> Compare ease of purification with and without the use of a limiting reagent Determine appropriate use of separation techniques to form a pure product Write chemical and ionic equations for acid reactions and displacement reactions Design a method to effectively control variables for an experiment 	<ul style="list-style-type: none"> Required practical Equation writing Method writing
Electrolysis	<ul style="list-style-type: none"> Oxidation and reduction in terms of electrons Electrolytes Electrolysis molten (including Al) Electrolysis (aq) Extraction of metals Chemical cells 	<ul style="list-style-type: none"> Write half equations for reactions at electrodes Discuss the link between reactivity and product formed Use knowledge of reactivity to determine the most appropriate method of metal extraction Evaluate of data to draw conclusions 	<ul style="list-style-type: none"> Required practical Half equation writing Test
Water	<ul style="list-style-type: none"> Potable water / pure water Water treatment 	<ul style="list-style-type: none"> Compare the ease of obtaining potable water (by type of water available) in different geographical regions 	<ul style="list-style-type: none"> Required practical Debates / discussion
Group 7	<ul style="list-style-type: none"> Reactivity trends Properties 	<ul style="list-style-type: none"> Explain why distance, shielding and nuclear charge are related to reactivity Predict reactions of group 7 using displacement reactions Write ionic equations Carry out risk assessments for practical work 	<ul style="list-style-type: none"> Practical work
Acids and calculations	<ul style="list-style-type: none"> Strong and weak acids pH Concentration calculations Titration Gas volume calculations 	<ul style="list-style-type: none"> Explain that strong and concentrated have different meanings Write equations to show dissociation of strong and weak acids Calculate gas volumes in reactions. Calculate product quantities for reactions involving a limiting reagent 	<ul style="list-style-type: none"> Required practical Method writing In class calculations

Organic (II)	<ul style="list-style-type: none"> • Methods of alcohol production • Reactions of alcohols • Compounds formed from alcohols • Uses and properties of different compounds • Condensation polymers • Biochemistry 	<ul style="list-style-type: none"> • Draw displayed formulae • Asses the differences between condensation and addition reactions • Predict likely reactions of compounds based on their functional groups • Name organic compounds for the homologous series on the syllabus. 	<ul style="list-style-type: none"> • Molymods • Extended writing (fermentation vs hydration) • Drawing different molecules
Equilibrium	<ul style="list-style-type: none"> • Dynamic equilibrium • Haber process • Fertilizers 	<ul style="list-style-type: none"> • Make predictions about the position of equilibrium when changes are made to conditions • Analyse data to assess the most favourable reaction conditions. • Explain the compromise conditions used in the Haber process to get best yield / rate balance 	<ul style="list-style-type: none"> • Whiteboards • In class questions
Using resources	<ul style="list-style-type: none"> • Uses of materials (glass, ceramics, composites) • Recycling • Life cycle assessments 	<ul style="list-style-type: none"> • Explain how properties are linked to use of a material. • Compare products based on lifecycle assessment using data given 	<ul style="list-style-type: none"> • Extended response questions
Revision programme			