Rutlish School

CURRICULUM MAP	
Subject	**Chemistry**
Head of Department	**Mrs C Beck**

SCHOOL INTENT

Rutlish School: Curriculum Intent

Rutlish School provides a meaningful, broad and balanced curriculum which is accessible to all, as well as supports and challenges all students. Through all we do, we prepare students for opportunities, responsibilities and experiences later in life for them to be aware of their responsibilities and feel confident to participate and contribute to society. We aim to inspire, enable and facilitate lifelong learners that build on their individual strengths and capabilities and achieve their ambitions. We seek to support our students in becoming healthy, happy, successful modern people young adults, who are knowledgeable, kind, aware, confident, capable and skilful members of society.

The school aims to:

- ensure that the curriculum is designed for every student of every ability and every background to be supported in making the best possible progress and attainment from their starting point; all students can access the curriculum offer, with planning and teaching that support, stretch and challenge all learners across a full range of abilities, and making any reasonable adjustments required where particular needs are identified;
- provide a curriculum that is sequenced to build skills and knowledge throughout students' time at Rutlish School, to promote a deeper understanding of the world outside the classroom and equip them for their next steps in education, careers and in life;
- ensure that our curriculum offer support different educational and career pathways, including EBACC and vocational;
- ensure our curriculum consistently promotes high moral standards, social and self-awareness and allows students to formulate informed opinions on social issues such as, equality, diversity and inclusivity as well as the practical aspects of society;
- enrich the curriculum and provide opportunities for students to build cultural capital, enhance a wide range of skills and knowledge beyond requirements of the national curriculum, and personalise and apply learning in other contexts;
- provide students with the skills and knowledge necessary to becoming independent, analytical, critical, and innovative thinkers and encourage students' curiosity, creativity, self-expression, resilience, and confidence; provide consistent opportunities for students to develop and enhance their reading skills, and support is provided to ensure all students are able to access he curriculum.

DEPARTMENT INTENT

-The science curriculum at Rutlish school is designed to give students the substantive and disciplinary knowledge they need to understand the science they come across in the world around them and differentiate it from pseudoscience. We aim to address any misconceptions that students may hold prior to lessons.

We aim to prepare the students for their future lives by giving them the skills to apply their knowledge in unfamiliar situations and to undertake a STEM career if they so choose. We aim to give them an understanding of the range of STEM careers available to them.

-We want to develop students who are analytical and open minded in their approach to new information, who understand the importance of taking an ethical approach to scientific decision making. We aim to strengthen our students as independent thinkers who understand the value of asking questions.

-Through our curriculum we aim to challenge students' preconceptions about science and the world around them. We aim to develop the understanding that science is for everyone.

Our curriculum is designed to encourage students' curiosity about the world around them and to help them make informed decisions throughout their lives.

KEY STAGE 3 RATIONALE/ INTENT

Ensure that all students are equipped with the foundation (building blocks) for Science. To instil an appreciation for Science. Develop practical skills and ensure that all students are on the same level when completing the KS3 Science course.

KEY STAGE 4 RATIONALE/ INTENT

Aim to give students an understanding of the range of careers available to them. Ensure that they are literate in science and have the ability to apply knowledge and skills to the outside world. Climate change/vaccines etc. Ensure they have the technical language. Ensure they have the motor skills and background knowledge especially needed in KS5.

KEY STAGE 5 RATIONALE/ INTENT

Providing the substantive knowledge to access the undergraduate course at university. Disciplinary knowledge – research skill.

Rutlish School

YEAR 7

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KNOWLEDGE	**UNIT OF WORK: 1. Particle Model**	**UNIT OF WORK: 2.Separating mixtures**	**UNIT OF WORK: 3. Periodic Table**	**UNIT OF WORK: 4. Elements**	**UNIT OF WORK: 5. Acids and Alkalis**	**UNIT OF WORK: 6.Chemical energy**
	- Introduction to Chemistry - Solids, liquids and gases - Diffusion - Changing shape and compression - Expansion and contraction - Dissolving - How temperature affects solubility - Air pressure	- pure and impure substances - Mixtures - filtration – separating mixtures - distillation – separating mixtures - chromatography – separating mixtures	- periodic table - alkali metals - noble gases - halogens	- elements - more about elements - compounds - writing chemical formulae - polymers and ceramics	- identify acids and alkalis - how strong are acids and alkalis - neutralisation - uses of neutralisation	- Exothermic and endothermic reactions - Energy change in state - Catalysts
	Skills: - make predictions using scientific knowledge and understanding Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review Make predictions using scientific knowledge and understanding Present observations and data using appropriate methods, including tables and graphs.	**Skills:** - use techniques to separate mixture Literacy & Communication skills The use of facts and opinions to inform and persuade. Maths skills Qualitative and quantitative data The use of: tables; line graphs; scatter graphs; pie charts; and bar charts. Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety. Literacy & Communication skills Use flow charts to present sequences.	**Skills:** Literacy & Communication skills The use of facts and opinions to inform and persuade. Maths skills Qualitative and quantitative data The use of: tables; line graphs; scatter graphs; pie charts; and bar charts. Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety. Literacy & Communication skills Use flow charts to present sequences.	**Skills:** Evaluate data, showing awareness of potential sources of random and systematic error. Literacy & Communication skills Maths skills Identify anomalous results (outliers) Identify ranges Use a variety of charts and graphs to present and analyse data	**Skills:** Evaluate risks. Literacy & Communication skills Identify nouns and noun phrases Identify key points in text, Maths skills Reading and plotting line graphs Drawing bar charts. Present reasoned explanations, including explaining data in relation to predictions and hypotheses Evaluate data, showing awareness of potential sources of random and systematic error. Literacy & Communication skills The use of sentences to explain ideas clearly.	**Skills:** Evaluate data, showing awareness of potential sources of random and systematic error. Literacy & Communication skills The use of sentences to explain ideas clearly. Maths skills Identify anomalous results (outliers) Identify ranges Use a variety of charts and graphs to present and analyse data
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	This topic acts as an introduction to KS3 Chemistry. Particle model is the core theme underpinning other ideas in Chemistry. The topic is used as an opportunity to work out the prior knowledge and understanding of students	Builds on ideas from the separating mixtures topic, investigating separating mixtures in more detail. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Builds on ideas from the separating mixtures topic, investigating electrical energy in more detail. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Builds on ideas from the periodic table topic, investigating electrical energy in more detail. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Builds on ideas from the periodic table topicl. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Builds on ideas from the elements topic, investigating electrical energy in more detail. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.

LINKS TO THE WORLD i.e. links to careers; equality: gender, class, ethnicity, etc.; different subjects	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • Post 16 : A Level Biology • A level Chemistry • A level physics,
ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Transition test	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – particle model	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – separating mixtures	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – periodic table	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test - Elements	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Acids and alkalis and Chemical energy End of Year Exam
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	**Particle Model** • Particle • Particle Model • Diffusion • Gas Pressure • Density • Evaporate • Condense • Boil • Melt • Freeze • Sublimation	**Separating mixtures** • Solvent • Solute • Insoluble • Soluble • Solution • Solubility • Filtration • Distillation • Evaporation • Chromatography • Dissolve	Periodic table • Periodic table • Physical properties • Chemical properties • Group • Period • Rows	Elements • Elements • Atoms • Molecule • Compound • Chemical formula • polymer	Acids and alkalis • pH • indicator • base • concentration	Chemical Energy • catalyst • endothermic • exothermic • chemical bond
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions					

Rutlish School

YEAR 8

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KNOWLEDGE	**UNIT OF WORK: 7. Types of reactions**	**UNIT OF WORK: 8. Metals and non-metals**	**UNIT OF WORK: 9. Earth's structure**	**UNIT OF WORK: 10. Climate**	**UNIT OF WORK: 11. Universe**	**UNIT OF WORK: 12. Earth's resources**
	- physical and chemical change - conservation of mass in a chemical reaction - combustion - thermal decomposition	- metals - metals and water - metals and acid - more on the reactivity series - displacement reactions	- weathering - sedimentary rock - metamorphic rock - igneous rock - the rock cycle	- carbon cycle - greenhouse gases - humans and greenhouse gases - global climate change	- day and night - the four seasons - the solar system - the wider universe	- Earth's natural resources - Mining and extraction - Ways of reducing resources
KEY SKILLS	Practical work is carried out to support and consolidate scientific concepts, to develop investigative skills and to build and master practical skills. Key competencies are developed at KS3, provide a solid foundation of practical skills that students can draw on at KS4 Working scientifically is divided into the areas of: • Development of scientific thinking • Experimental skills and strategies • Analysis and evaluation • Scientific vocabulary, quantities, units symbols and nomenclature					
	Skills: Write word equations from information about chemical reactions. Literacy & Communication skills Recognise the use of biased language in texts. Maths skills Calculating mean values and percentages ¬ Drawing and interpreting bar charts, scatter graphs and line graphs.	**Skills:** Literacy & Communication skills Analysing the use of emotive language and evaluating media reports. Maths skills Interpreting more complex graphs Substituting into formulae.	**Skills:** Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, Literacy & Communication skills Maths skills Interpreting line graphs.	**Skills** Apply mathematical concepts and calculate results. Literacy & Communication skills Presenting arguments. Maths skills Using ratios to compare quantities Maths skills Drawing line graphs and scatter graphs	**Skills:** Apply mathematical concepts and calculate results. Literacy & Communication skills Presenting arguments. Maths skills Using ratios to compare quantities Writing one number as a fraction of another and converting fractions to decimals	**Skills:** Select, plan and carry out the most appropriate types of scientific enquiries Literacy & Communication skills Use information and explanation texts to answer different types of question. Maths skills Interpreting line graphs
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on ideas from the particle model topic, investigating the difference between physical and chemical change in more detail.	Builds on ideas from the periodic table. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this	Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this	Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this	Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this
LINKS TO THE WORLD	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician

Rutlish School

ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Types of reactions	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Metals and non-metals	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Earth's structure	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test - Climate	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of KS3 Mock Exam End of unit test: Universe	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Earth's resources End of KS3 Exam
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	**Types of reactions** • Fuel • Chemical reaction • Physical change • Reactants • Products • Conserved	**Metals and non-metals** • Metals • Non-metals • Displacement • Oxidation • Reactivity	Earth's structure • Rock cycle • Weathering • Erosion • Minerals • Sedimentary rock • Igneous rocks • Metamorphic rock • strata	**Climate** • Global warming • Fossil fuel • Carbon sink • Greenhouse effect	**Universe** • Galaxy • Light years • Stars • Orbit • exoplanet	**Earth's resources** • natural resources • mineral • ore • extraction • recycling • electrolysis
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions					

Rutlish School

Year 9	Autumn 1	Spring 1	Summer 1
KNOWLEDGE	**UNIT OF WORK:** **1. Periodic Table**	**UNIT OF WORK:** **2. Bonding & Structure**	**UNIT OF WORK:** **3. Chemical calculations**
	- Atoms, elements and compounds - Chemical equations - Separating mixtures - Models of the atom - Features of the atom - Isotopes and RAM - Electrons in atoms - Developing of the periodic table - The periodic table - Alkali metals - Halogens - Transition metals	- Ionic bonding - Ionic structure and properties - Covalent bonding - Small molecules and polymers - Giant covalent - Graphene and fullerenes - Metals and alloys - Nano-chemistry	- Conservation of mass and balanced chemical equations - Relative formula mass - Mass changes when the reactant or product is a gas - Chemical measurements - Moles - Amount of substance - Using moles to balance equations - Concentration of solutions - Percentage yield and atom economy - Amount of substance in gases
	Skills : Safe use of a range of equipment to separate chemical mixtures Use SI units and the prefix nano Recognise expressions in standard form. Visualise and represent 2D and 3D forms including twodimensional representations of 3D objects Explain how testing a prediction can support or refute a new scientific idea.	**Skills:** Visualise and represent 2D and 3D forms including twodimensional representations of 3D objects Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding	**Skills:** Opportunities within investigation of mass changes using various apparatus Recognise and use expressions in decimal form. Recognise and use expressions in standard form Use an appropriate number of significant figures Understand and use the symbols: =, <>, >, ∝, ~ Change the subject of an equation Use ratios, fractions and percentages. Substitute numerical values into algebraic equations using appropriate units for physical quantities.
HOW DO WE BUILD ON SKILLS AND	They will see how to interpret chemical formulae and extend their KS3 knowledge of the law of the conservation of mass, leading them to balance chemical equations. It is important that they understand that when balancing an equation, the formula of the substance must not change.	In this section, students have developed their understanding of the states of matter from KS3. They have built upon their understanding of the particle model, using this to explain the energy transfers involved when substances change state.	In this section, students will build upon their understanding of the structure of atoms and sub-atomic particles to understand relative atomic mass and relative formula mass. Students should be able to use relative atomic masses to calculate relative formula masses of compounds.
LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.;	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Links to Maths : substitution and rearrangement of equation. Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences

Rutlish School

ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative: End of unit test and PEQs**	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative: End of unit test and PEQs**	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Year 9 Exams End of unit test – Bonding and structure
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	• Atom • Compound • Element • Formula • Symbol • Periodic table • Balanced equation • Conservation of mass • State symbol • Distillation • Evaporation • Filtration • Mixture • Multi-step • Properties • Purification • Separation • Technique • Boiling point • Chromatography • Fractional distillation • Miscible	• Ionic • Covalent • Metallic • Sharing • Transfer • Alloy • Delocalised electron • Fullerenes • Gases • Nanoparticles • Giant lattice • Giant covalent structure • Intermolecular forces • Dot and cross diagrams • polymers	• Avogadro's constant • Burette • Concentration • Concordant • End point • Limiting reactant • Mole • Percentage yield • Pipette • Relative atomic mass • Relative formula mass • Titration • yield
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions		

Rutlish School

YEAR 10

	Autumn	Autumn	Spring	Spring	Summer	Summer
KNOWLEDGE AND KEY SKILLS	**UNIT OF WORK:** **4. Chemical calculations**	**UNIT OF WORK:** **5. Metal reactions**	**UNIT OF WORK:** **6. Electrolysis**	**UNIT OF WORK:** **7. Energy changes**	**UNIT OF WORK:** **8. Rate of reaction**	**UNIT OF WORK:** **9. Reversible reactions and equilibrium** **10. Chemical analysis**
	- Conservation of mass and balanced chemical equations - Relative formula mass - Mass changes when the reactant or product is a gas - Chemical measurements - Moles - Amount of substance - Using moles to balance equations - Concentration of solutions - Percentage yield and atom economy - Amount of substance in gases	- Metal oxides - The reactivity series - Extraction of metals by reduction - Redox in terms of electrons - Reactions of metals with acids - Neutralisation - pH scale and neutralisation - strong and weak acids	- the process of electrolysis - electrolysis in molten ionic compounds - using electrolysis to extract metals - electrolysis of aqueous solutions - representation of electrolysis as half equations	- Endothermic and exothermic reactions - Reaction profiles - Energy changes of reactions - Cells and batteries - Fuel cells	- Measuring rates - Calculating rates - Collison theory and surface area - The effect of temperature - The effect of concentration -	- Energy changes and reversible reactions - Equilibrium - Effect of changing temperature - Effect of changing pressure - Effect of changing concentration - Pure substances and formulations - Test for hydrogen - Test for oxygen - Test for carbon dioxide - Test for chlorine
	Skills: Recognise and use expressions in decimal form. Recognise and use expressions in standard form Use an appropriate number of significant figures Understand and use the symbols: =, <>, >, ∝, ~ Change the subject of an equation Use ratios, fractions and percentages. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	**Skills:** Mixing of reagents to explore chemical changes and/or products Make order of magnitude calculations.	**Skills:** An opportunity to measure temperature changes when substances react or dissolve in water	**Skills:** Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form Drawing and interpreting appropriate graphs from data to determine rate of reaction Plot two variables from experimental or other data Determine the slope and intercept of a linear graph.	**Skills:** Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form Drawing and interpreting appropriate graphs from data to determine rate of reaction Plot two variables from experimental or other data Determine the slope and intercept of a linear graph.	**Skills:** Opportunities within investigation of mass changes using various apparatus
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	In this chapter, students will build upon their understanding of the structure of atoms and sub-atomic particles to understand relative atomic mass and relative formula mass. Students should be able to use relative atomic masses to calculate relative formula masses of compounds	In this chapter, students will revise and develop their understanding of the reactivity series from KS3	In this chapter, students are introduced to electrolysis. They will build upon their knowledge from Chapter C3 to explain why ionic compounds can undergo electrolysis when molten or in solution	Students will also apply their understanding of the reactivity series and electrolysis to chemical cells and fuel cells	Students should apply their knowledge on endothermic and exothermic reactions to equilibrium reactions to be able to predict the effect of temperature changes on the reversible reactions and the position of the equilibrium	Students build on their knowledge of separating mixtures in the Atomic structure and periodic table unit.

LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.;	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences
Feedback Supports Learning	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** **End of unit test**	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test: Mock Exam	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test
SPECIALIST VOCABULARY	• Avogadro's constant • Burette • Concentration • Concordant • End point • Limiting reactant • Mole • Percentage yield • Pipette • Relative atomic mass • Relative formula mass • Titration • yield	• metal • acid • displacement reactions • reactivity series • salt • soluble salt • precipitate • neutralisation • alkali • pH • strong acid • weak acid • dissociates • metal oxide	• anode • cathode • electrode • electrolyte • electrolysis • half equation • cation • anion • balanced equation • ionic half equation • reduction • oxidation • redox reactions	• exothermic • endothermic • reaction profile • reactants • products • enthalpy change • activation energy • cells • batteries • fuel cells • electrode re-chargeable	• collision theory • rate of reaction • temperature • pressure • surface area • catalyst • successful collision • particle • industrial process	• backward • exothermic • endothermic • forward • favoured • yield • equilibrium • Le Chatelier's principle • Concentration
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions					

Rutlish School

	Y11 Chemical calculations	Further Organic Chemistry	Chemical analysis	Sustainable development	All content
KNOWLEDGE	**UNIT OF WORK: Chemical calculations**	**UNIT OF WORK: Further Organic Chemistry (Triple only)** **Mock exams**	**UNIT OF WORK: Chemical analysis** **Mock exams**	**UNIT OF WORK: Sustainable development**	**UNIT OF WORK: Skills and Revision** **GCSE Exams**
	- Conservation of mass and balanced chemical equations - Relative formula mass - Mass changes when the reactant or product is a gas - Chemical measurements - Moles - Amount of substance - Using moles to balance equations - Concentration of solutions - Percentage yield and atom economy - Amount of substance in gases	- Structure and formulae of alkenes - Reactions of alkenes - Alcohols - Carboxylic acid - Addition polymerisation - Condensation polymerisation - Amino acids - Key concepts intermolecular forces	- Pure substances - Formulations - Chromatography - Testing for gases - Testing for negative ions(T) - Testing for negative ions(T) - Instrumental analysis (T)	- Using resources and sustainable development - Potable water - Waste water treatment - Alternative methods of metal extraction - Lifecycle assessment and recycling - Ways of reducing the uses of resources - Corrosions and its prevention - Alloys and useful materials - Ceramics and polymers - The Haber process - Production and use of NPK fertilizer	All the content covered
	Skills: Recognise and use expressions in standard form Use an appropriate number of significant figures Understand and use the symbols: =, <>, >, ∝, ~ Change the subject of an equation Use ratios, fractions and percentages. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	**Skills:** Make models of alkane molecules using the molecular modelling kits Visualise and represent 2D and 3D forms including twodimensional representations of 3D objects Opportunities when investigating reactions of alcohols Use models to represent addition polymerisation.	**Skills:** Use ratios, fractions and percentages Make estimates of the results of simple calculations. An opportunity to observe flame spectra using a hand-held spectroscope. Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations	**Skills:** Translate information between graphical and numeric form. Interpret LCAs of materials or products given appropriate information Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations Translate information between graphical and numeric form Use an appropriate number of significant figures. Recognise and use expressions in decimal form.	**Skills:** • Manipulating equations • Solving multi-step calculations • Graph skills • Identification of variables • Writing methods • Interpreting exam questions • Comparing • Evaluating • Application of knowledge to unfamiliar contexts
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	In this chapter, students will build upon their understanding of the structure of atoms and sub-atomic particles to understand relative atomic mass and relative formula mass. Students should be able to use relative atomic masses to calculate relative formula masses of compounds	Students apply their knowledge and understanding from the Organic chemistry introductory lessons done in Y10. They build on not only identifying organic structures and naming them, but understand how the structures affect their reactivity.	In this chapter, students have developed their understanding of rusting from KS3 to understand how both water and air are required for iron to corrode. They should be able to explain how the two methods for preventing rusting – barrier methods and sacrificial methods – disrupt the oxidation of iron and prevent corrosion.	In this chapter, students have developed their understanding of rusting from KS3 to understand how both water and air are required for iron to corrode. They should be able to explain how the two methods for preventing rusting – barrier methods and sacrificial methods – disrupt the oxidation of iron and prevent corrosion.	

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LINKS TO THE WORLD i.e. links to careers; equality: gender, class, ethnicity, etc.;	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician A level Chemistry	Careers: STEM based e.g; research chemist, pharmacist, environmental chemist, investment analyst, lab technician, textile colour technician • A level Chemistry Biological sciences, Medicine and allied subjects, Veterinary sciences, Engineering and Technology, Physical sciences	
ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:**	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – calculations End of unit test – sustainable development (double) Year 11 Mock Exams (1)	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Chemical analysis (double)	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Year 11 Mock Exams (2)	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – Sustainable development (Triple only) **Public exams: GCSE**
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
Specialist Vocabulary	• Avogadro's constant • Burette • Concentration • Concordant • End point • Limiting reactant • Mole • Percentage yield • Pipette • Relative atomic mass • Relative formula mass • Titration • yield	• alkene • double bond • unsaturation • saturation • addition reaction • alcohols • carboxylic acids • esters • polymer • polymerisation • condensation polymerisation • addition polymerisation • fermentation • oxidation • enzyme • ionises	• anion • cation • sodium hydroxide • silver nitrate • nitric acid • precipitate • ammonia • red litmus • barium chloride • hydrochloric acid • calcium carbonate • carbon dioxide • lime water • instrumental analysis • chromatography	• potable water • sustainable • finite • infinite • renewable • distillation • chromatography • life- cycle assessment • Haber process • Recycling • Reclamation • Reusing • Reduce • Bioleaching Phytomining	
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions				

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YEAR 12 – AS content

	Atomic structure	Amount of substance	Bonding	Energetics	Kinetics	Chemical equilibria
KNOWLEDGE	**UNIT OF WORK:** • Fundamental particles • Mass number and isotopes • The arrangement of electrons • The mass spectrometer • More about electron arrangement • Electron arrangement and ionisation energy •	**UNIT OF WORK:** • Relative atomic and molecular masses • The mole and the avogadros constant • Moles in solution • The ideal gas equation • Empirical and molecular formulae • Balanced equations and associated calculations Atom economy and percentage yield	**UNIT OF WORK:** • Ionic bonding • Nature of covalent and dative covalent bonds • Metallic bonding • Bonding and physical properties • Shapes of simple molecules and ions • Bond polarity • Forces between molecules	**UNIT OF WORK:** • Exothermic and endothermic reacions • Enthalpy • Measuring enthalpy changes • Hess' Law • Enthalpy changes of combustion • Representing thermochemical cycles	**UNIT OF WORK: Kinetics** • Collision theory • The Maxwel-Boltzman distribution • Effect of temperature on reaction rate • Effect of concentration and pressure • catalysts	**UNIT OF WORK:** • the idea of equilibria • changing the conditions of an equilibrium reaction • equilibrium reactions in industry • the equilibrium constant Kc • calculations using equilibrium constant expressions • The effect of changing conditions on equilibria
KEY SKILLS	**skills** • Substitute numerical values into algebraic equations • Recognise and make use of appropriate units in calculations • Use an appropriate number of significant figures • Apply scientific knowledge to practical contexts • Process and analyse data	**skills** • Students carry out calculations using numbers in standard and ordinary form eg using the Avogadro constant. MS 0.4 • calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures • calculated results can only be reported to the limits of the least accurate measurement • determine uncertainty when two burette readings are used to calculate a titre value.	**skills** • find the type of structure of unknowns by experiment (eg to test solubility, conductivity and ease of melting). • Students could try to deflect jets of various liquids from burettes to investigate the presence of different types and relative size of intermolecular forces.	**skills** • correct units need to be used in $q = mc\Delta T$ Students report calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures. • understand that calculated results can only be reported to the limits of the least accurate measurement	**skills** • Students could investigate the effect of temperature on the rate of reaction of sodium thiosulfate and hydrochloric acid by an initial rate method. Research opportunity Students could investigate how knowledge and understanding of the factors that affect the rate of chemical reaction have changed methods of storage and cooking of food.	**skills** • estimate the effect of changing experimental parameters on a measurable value eg how the value of Kc would change with temperature, given different specified conditions. • report calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures. • understand that calculated results can only be reported to the limits of the least accurate measure
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on KS4 Atomic structure topics. •the structure of atoms •the effect of a force on a moving objects •the effect of a magnetic field on a moving, electrically charged particle. Builds on GCSE maths skills	Builds on KS4 chemical calculations • relative atomic mass, relative molecular mass, relative formula mass • writing formulae (elements, common compounds and ionic compounds) • balancing equations • moles • calculations involving Masses • concentration of solutions empirical and molecular formulae Builds on GCSE maths skills	Builds on KS4 structure bonding Builds on GCSE maths skills	• Builds on KS4 energetics topic exothermic and endothermic reactions. • Builds on GCSE maths skills	Builds on KS4 chemical equilibria Chemistry topics	• Builds on KS4 Chemical equilibria topic reaction rates • exothermic and endothermic reactions • equilibria • energetics • kinetics.

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LINKS TO THE WORLD	Link to A-level maths Links to A-level Physics Atomic Physics and general chemistry Nuclear physics Quantum chromo dynamics	Link to A-level maths Analytical chemist Chemical technician Toxicologist	Link to A-level maths Chemical Engineering	Link to A-level maths Links to A-level Physics	Link to A-level maths Links to A-level Physics Atomic Physics and general chemistry Nuclear physics Quantum chromo dynamics	Electrical engineer A-level Physics Links to A- level Maths
ASSESSMENT	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	• atomic number • mass number • isotopes • TOF – time of flight • Speed • Kinetic energy • Groups • Periods • Avogadro's constant • spectrometry	• Relative formula mass • Relative atomic mass • Mole • Concentration • Atom economy • Empirical formulae	• Bonding • Van der Waals forces • Intermolecular forces • Covalent bond • Ionic bond • Hydrogen bond • Weak forces • Electronegativity • Electron affinity • Shapes of molecules • Tetrahedral • Lone pair • Bond pair • Linear • Trigonal • Bipyramidal	• exothermic • endothermic • reaction profile • reactants • products • enthalpy change • activation energy • cells • batteries • fuel cells • electrode • re-chargeable • Hess' Law	• Temperature • Concentration • Catalyst • Pressure • Equilibrium constant • Maxwell–Boltzmann distribution	• Kc • Concentration • Catalyst • Reverse reaction • Dynamic equilibrium • Yield • Product • Reactants

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YEAR 12 – AS level content	Reduction, oxidation and redox reactions	Periodicity	Group 2 and Group 7	Introduction to Organic chemistry
	UNIT OF WORK:	**UNIT OF WORK:**	**UNIT OF WORK:**	**UNIT OF WORK:**
KNOWLEDGE	• oxidation and reduction • oxidation states • redox equations	• periodic table • trends in the properties of elements in period 3 • a closer look at ionisation energy • reactions of period 3 • the acid/basic nature of period 3 oxides	• group 2 – properties of the alkaline erth metals • group 2 compounds • the halogens – physical and chemical properties of group7 • the chemical reactions of halogens • reactions of halides • uses of chlorine	• Carbon compounds • Nomenclature – naming organic compounds • Isomerism • Alkanes • Fractional distillation of crude oil • Industrial cracking • Combustion of alkanes • The formation of halogenoalkanes •
KEY SKILLS	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on AS mathematical skills	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • electron structure • ionisation energy • bonding. Builds on AS mathematical skills	Builds on AS mathematic Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • writing formulas of ionic compounds • ionisation energy • bonding.	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • some simple organic chemistry, for example, alkanes and alkenes • empirical and molecular formulae Builds on AS mathematical skills
LINKS TO THE WORLD	Links to A-level maths Links to GCSE metal and reactions	Links to A-level maths Links to atomic structure	Links to A-level maths Links to GCSE Atomic structure and periodic table	Links to A-level Physics Links to A-level maths Performing research experiments to understand and analyse carbon-based molecules Testing products to ensure public safety Training and managing laboratory technicians Analysing new compounds and research from other scientists and chemists Developing new products, medicines, materials and more

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ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	• reduction • oxidation • redox • ionic half equation • ionic equation • balanced equation • oxidising agent • reducing agent • oxidation number	• periodic table • period • period 3 oxides • periodicity • rows	• electronegativity • soluble • insoluble • dissolved • precipitate • cations • anions • trends	• nomenclature • alkanes • fractional distillation • homolytic fission • heterolytic fission • IUPAC • Carbon compounds • Isomers • Functional groups
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions			

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YEAR 12 – AS level content					
	Organic Analysis	**Halogenoalkanes**	**Alkenes**	**Alcohols**	**Revision**
KNOWLEDGE	**UNIT OF WORK:**	**UNIT OF WORK:**	**UNIT OF WORK:**	**UNIT OF WORK:**	
	• Test-tube reactions • Mass spectrometry • Infrared spectroscopy	• Halogenoalkanes – introduction • Nucleophilic substitution in halogenoalkane • Nucleophilic substitution in halogenoalkanes – 2 • Elimination reactions in halogenoalkanes • Ozone depletion	• Alkenes • Reactions of alkenes • addition polymers	• Alcohols – introduction • Ethanol production • The reactions of alcohols • the reaction of alcohols – oxidation • the reaction of alcohols – elimination • reaction of alcohols	• All content covered in year 12.
KEY SKILLS	• follow instructions when carrying out test-tube hydrolysis of halogenoalkanes to show their relative rates of reaction.	• prepare a chloroalkane, purifying the product using a separating funnel and distillation. • prepare a chloroalkane, purifying the product using a separating funnel and distillation. • test organic compounds for unsaturation using bromine water and record their observations	• test organic compounds for unsaturation using bromine water and record their observations.	• produce ethanol by fermentation, followed by purification by fractional distillation • carry out the preparation of an aldehyde by the oxidation of a primary alcohol. Students could carry out the preparation of a carboxylic acid by the oxidation of a primary alcohol • carry out the preparation of cyclohexene from cyclohexanol, including purification using a separating funnel and by distillation	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on AS mathematical skills Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • mass spectrometry • halogenoalkanes • alkenes • alcohols.	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • Nomenclature of organic compounds (3.3.1)	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • E-Z isomerism • principles of curly arrow mechanisms • shapes of molecules	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • what are biofuels? • production of ethanol • addition polymers • alkenes.	
LINKS TO THE WORLD i.e. links to careers; equality: gender, class, ethnicity, etc.; different subjects	Links to A-level maths Links to A-level maths Performing research experiments to understand and analyse carbon-based molecules Testing products to ensure public safety Training and managing laboratory technicians Analysing new compounds and research from other scientists and chemists Developing new products, medicines, materials and more	Links to A-level maths Links to A-level maths Performing research experiments to understand and analyse carbon-based molecules Testing products to ensure public safety Training and managing laboratory technicians Analysing new compounds and research from other scientists and chemists	Links to A-level maths Links to A-level maths Performing research experiments to understand and analyse carbon-based molecules Testing products to ensure public safety Training and managing laboratory technicians Analysing new compounds and research from other scientists and chemists Developing new products, medicines, materials and more	Links to A-level maths Performing research experiments to understand and analyse carbon-based molecules Testing products to ensure public safety Training and managing laboratory technicians Analysing new compounds and research from other scientists and chemists Developing new products, medicines, materials and more	

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		Developing new products, medicines, materials and more			
ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	
FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	• test tube • chemical reactions • mass spectroscopy • infrared spectroscopy • sample • gas chromatography	• halogenoalkane • homologous series • halogen • addition • substitution • heterolytic • homolytic • alkane	• alkenes • unsaturated • bromine water • addition reaction	• alcohol • substitution • polymers • addition polymerisation • condensation polymerisation	
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions				

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YEAR 13				
	Thermodynamics	**Rate equations**	**Equilibrium constant Kp for homogenous systems**	**Electrode potential and electrochemistry**
KNOWLEDGE	**UNIT OF WORK:** • Enthalpy change • Born-Haber cycles – 1 • More enthalpy changes • Why do chemical reactions take place?	**UNIT OF WORK:** • the rate of chemical reactions • The rate expression and order of reaction • Determining the rate equation & the rate determining step	**UNIT OF WORK:** • Equilibrium constant Kp for homogenous systems	**UNIT OF WORK:** • Electrode potentials and the electrochemical series • Predicting the direction of a redox reaction • Electrochemical cells •
KEY SKILLS	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables	• Substituting into equations • Rearranging equation • Describing the relationships between variables	• Use of appropriate apparatus • Drawing conventional representation of cells • Use of SI units & prefixes • Writing methods • Substituting into equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs Describing the relationships between variables
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Build on Year 12 content on Energetics AS Maths skills	Build on Year 12 content on Kinetic 1. AS Maths skills	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • Dynamic equilibrium • Reversible reactions	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • exothermic and endothermic reactions.
LINKS TO THE WORLD	Link to A-level maths Links to A-level Physics	Link to A-level maths Links to A-level Physics	Links to year 1 equilibria Links to Maths	Links to GCSE electrolysis Links to Maths Links GCSE reactivity series
ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment

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FEEDBACK SUPPORTS LEARNING	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓	**Opportunity for students to reflect on learning, respond to feedback, improve work, etc.** ✓
SPECIALIST VOCABULARY	• enthalpy change • Born-Have cycles • Theoretical calculation • Feasibility	• rate constant • rate –determining step • rate expression • enthalpy of formation • enthalpy of combustion	• Kp • Equilibrium constant • Partial pressure	• Electrode • Reference cell • Anions • Cations • Electrode potential • Feasible • Hydrogen fuel cells
QUALITY FIRST TEACHING	✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions			

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YEAR 13	Acids and Bases	Optical isomerism and carbonyl groups	Transition Metals	Aromatic chemistry
KNOWLEDGE	**UNIT OF WORK:**	**UNIT OF WORK: optical isomerism, aldehydes and ketones and carboxylic acids and derivatives**	**UNIT OF WORK: Transition metals and reaction of ions in aqueous solutions**	**UNIT OF WORK:**
	• Defining an acid • The pH scale • Weak acids and bases • Acid-base titrations • Choice of indicators for titrations • Buffer solutions	• Naming organic compounds • optical isomerism • synthesis of optically active compound • Introduction to Aldehydes and Ketones • Reactions of the carbonyl groups in aldehydes and ketones • Hydroxynitriles • Carboxylic acids and esters • Reactions of carboxylic acids • Acylation	• The general properties of transition metals • Substitution reactions • Shapes of complex ions • Formation of coloured ions • Variable oxidation states of transition metals • Catalysts • A summary of acid-base and substitution reactions of some metal ions. • The acid-base chemistry of aqueous transition metal ions. • Ligand substitution reactions	• Introduction to arenes • Arenes - physical properties, naming, and reactivity • Reactions of arenes
Key skills	• Use of appropriate apparatus • Drawing ray diagrams • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Interpreting oscilloscope traces • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Drawing ray diagrams • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Interpreting oscilloscope traces • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Drawing ray diagrams • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Interpreting oscilloscope traces • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Drawing ray diagrams • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Interpreting oscilloscope traces • Tabulating data • Drawing graphs • Describing the relationships between variables
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Students will need to build on their knowledge and skills, from Key Stage 4 Science and Mathematics, of: • reaction rates.	Students will build on their knowledge and skills of AS.	Students will build on their knowledge and skills of AS amount of substance, bonding, shapes of molecules	Students will build on their knowledge and skills of Transition metals, amount of substance, bonding and shapes of molecules.
LINKS TO THE WORLD	Maths link – logarithms Links to GCSE acids and bases	Links to maths Links to year 1 Organic Chemistry	Links to maths Links to year 1 bonding and structure	Links to maths

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ASSESSMENTS **Summative and Formative as applicable**	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	Mock examinations, PEQs, Final A-level assessment
SPECIALIST VOCABULARY	• acid • bases • weak acid • dissociates • neutralisation • concentration • buffer solution • mole	• isomerism • optical isomers • stereoisomerism • racemate mixture	• Chelation • Co-ordinate bond • Complex ion • Homogeneous • Heterogeneous • ligand	• bonding • aromatic • electrophilic substitution •

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YEAR 13				
	Amines	**Organic analysis**	**Organic synthesis**	**Revision**
KNOWLEDGE	**UNIT OF WORK: polymers, amino acids, proteins, DNA and amines**	**UNIT OF WORK: nmr and spectroscopy and chromatography**	**UNIT OF WORK: organic synthesis**	**UNIT OF WORK:,**
	• Condensation polymers • Condensation of polymers practical investigation • Monomers and repeating units and disposing of polymers • Introduction to amino acids • Peptides, polypeptides, and proteins • Enzymes • DNA • The action of anti-cancer drugs • Introduction to amines • The properties of amines as bases • Amines as nucleophiles and their synthesis	• C-13 NMR spectroscopy • H-NMR spectroscopy • Chromatography	• Organic synthesis and analysis • Synthetic routes • Organic analysis	All content covered over the two years
Key skills	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables	• Selecting relevant information to answer questions • Use of appropriate apparatus • • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs • Describing the relationships between variables	• Use of appropriate apparatus • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Tabulating data • Drawing graphs Describing the relationships between variables
HOW DO WE BUILD ON SKILLS AND	Builds on Y12 Organic Chemistry mathematical and practical skills from previous units	Builds on Y12 Organic Chemistry Gives opportunity to rehearse mathematical and practical skills from previous units	Builds on Y12 Organic Chemistry Gives opportunity to rehearse mathematical skills from previous units	
LINKS TO THE WORLD	Polymer synthesis Synthetic chemist Material engineer - polymers	Maths link – logarithms	Dietetics and nutrition Biomedical Scientist Biological characterisation scientist	
ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	

SPECIALIST VOCABULARY	• Amines • Bronsted-Lowry bases • Synthesized • aromatic	• synthesis • target molecule • synthetic route	• synthesis • target molecule • synthetic route	