Curriculum Map **Subject: KS4 Chemistry** **Year Group: GCSE**

Year 9	Chemistry of the Atmosphere	Atomic Structure and Periodic Table	Using resources	Bonding and Structure
Content- WHAT will be learned? What previous learning can be linked? Why this order/**sequence**?	Simple topic as an introduction, links to current news topic, cross curricular links, also sets basics of quantitative chemistry in a cognitively simple unit. Builds on Year 8 'Earth Resources and Products' of Earth as a resource to be extracted but the need for future sustainable development, and Plant Power carbon cycle. Builds on Year 7 'Exploring Reactions' using Periodic Table. Composition of the atmosphere Global warming and its evidence Relative formula masses Polluting gases Climate change Carbon footprint **Quantitative Chemistry**: Relative formula mass Percentage composition ***The Quantitative Chemistry unit has been split up and taught throughout the whole course. This encourages retrieval and introduces the unit at the start of the course.***	Extend Year 7 'Exploring Reaction' understanding of Atomic Structure and Periodic Table. Structure of an atom Atomic models Periodic table organisation Group 1 Group 7 Group 0 Transition metals Separation techniques including filtration, distillation (check distillation – think it's in Resources) and chromatography. **Quantitative Chemistry**: Relative formula mass	Builds on Year 7 'All that Matters' separation techniques & Year 8 'Earth, Resources and Products' - the 3 Rs – reduce, reuse, recycle. Adds to Year 9 Chemistry of the Atmosphere ideas of environmental impact – introducing LCA. Extends understanding of separation techniques to include distillation and desalination and reverse osmosis. Purifying water (RP) Earth's resources Life cycle assessments	Builds on Year 7 'All that Matters' change of state' boiling points & Year 8 'Earth Resources and Products' covalent bonding in hydrocarbons, intermolecular forces of attraction and boiling points as a physical property. Extends understanding of using the Periodic Table. Extends understanding of ions from Year 9 Atomic Structure. Metallic bonding Ionic bonding Covalent bonding Properties of metals Properties of ionic compounds Properties of covalent compounds (simple molecules, large molecules, giant covalent) **Quantitative Chemistry**: Relative formula mass
Skills- What will be developed?	Interpreting data from graphs and charts. Numeracy (see below) Understanding of global issues	Practical: linking observations to reactivity. Consideration of risks and hazards Use of filter funnel and includes folding the filter paper. Chromatography involving use of fine glassware such as capillary tubes. Subject: Be able to represent the electronic structures of the first twenty elements of the periodic table in both forms. Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Practical skills – measuring volumes using a measuring cylinder, use of a Bunsen burner; recording masses to 2dp; safe use of equipment, developing an awareness of risks and hazards. GCSE Required Practical on water testing.	Constructing 'models' to describe bonding and structure. Being able to draw ions and show how this leads to ionic bonding. Drawing covalent molecules and explaining how they bond. Linking the properties of the molecules to the type of bonding Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.
Key 'How'/'Why' Questions- What **powerful knowledge** will be gained? What areas/themes/concepts will be explored?	The key themes are: - What are atoms, molecules, element, mixtures and compounds. This leads on from KS3 science. - what was the early atmosphere like and how did it evolve over 4.5 billion years	The key themes for this unit are: - matter is composed of tiny particles called atoms and there are about 100 different naturally occurring types of atoms called elements - elements show periodic relationships in their chemical and physical properties	The key themes for this unit are: - matter is composed of tiny particles called atoms and there are about 100 different naturally occurring types of atoms called elements **Quantitative is further developed by use of percentages of dissolved solids in water samples.**	The key focus for this unit is: -atoms bond by either transferring electrons from one atom to another or by sharing electrons -the shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave

	The quantitative unit is first introduced here. Students consider what elements are in a mixture and a compound They are introduced to formula mass.	- these periodic properties can be explained in terms of the atomic structure of the elements **The quantitative unit has been split up across the curriculum**		**Quantitative developed further by use of empirical formulae from diagrams**
SEND- how will support be seen? Seating plans? Simplified questions?	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.
Assessment- What? Why?	End of Unit Assessment 12 marks – includes long answers and use of data. One tier as this is the first assessment of the GCSE course Low stakes quizzes at the start of each lesson	Assessment 1 12 marks-focuses on the structure of the atom and isotopes Assessment 2 12 marks– focuses on the periodic table End of Unit Assessment 25 marks– designed to identify key mistakes in application of knowledge in novel contexts All assessments two tiers	End of Unit Assessment – focuses on the whole unit, but with emphasis on required practical 25marks Two tiers	Assessment 1 – focusses on ionic bonding and particle theory 12 marks End of Unit Assessment – covers all types of bonding 25 marks Two tiers
What **memory for learning** skills will be required- modelling? Concrete answers? Retrieval?	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 Elements, compounds and mixtures (ER), Y8 composition of Earth's atmosphere (ERP) Year 8 (PP) – carbon cycle	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 Elements, compounds and mixtures, properties of metals, word equations, atomic model and periodic table (ER), separation techniques (ATM), Y8 composition of Earth's atmosphere (ERP)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 separation techniques and water purification (ATM), Y8 Earth resources, sustainability and 3 Rs (ERP). Year 9 'Chemistry of the atmosphere' environmental impact retrieval for LCA.	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Modelling of the bonding in ionic compounds and covalent compounds. Students can see how we draw these using the visualiser and different models. Retrieval of Y7 states of matter and cooling curves (ATM), Y9 formation of ions (atomic structure and periodic table)
Literacy- reading, extended accurate writing and oracy opportunities	Reading the relevant information cards to develop an argument for the most important evidence for climate change and for disregarding the ones that are not valid.	Reading task on the development of atomic structure models	Reading life cycle assessments Fast Fashion homework exercises	Sentence shrinking to summarise key scientific processes. Use of 'APE'
Numeracy/computing skills	Quantitative chemistry is use of number: Formula mass calculations, and percentages for composition of gases. These are often shown in pie charts and graphs Use SI units and the prefix nano. Recognise expressions in standard form.	Quantitative chemistry is use of number: Formula mass calculations Calculation of sub-atomic particles. Calculation of relative atomic masses given isotopes and percentages.	Processing experimental data for the RP – determine percentage salt in sea water.	Use ratios, fractions and percentages. Substitute numerical values into algebraic equations to find formula mass.
Character development	Students explain why data is needed to answer scientific questions, and why it may be uncertain, incomplete or not available. They are encourgaed to outline a simple ethical RESPECTFUL argument about the rights and wrongs of a new technology.	Students work together and develop teamwork during practical work. Mendeleev is an example of RESILIENCE in the face of adversity and AMBITION in his mother for him	Students consider the process of peer review helps to detect false claims such as those regarding climate change. They are made more aware of media bias by considering that reports of scientific developments in the popular media are not subject to peer review and may be oversimplified, inaccurate or biased.	Problem solving throughout the unit. Students can be invited to consider the new materials that have been designed due to our knowledge of bonding and alloys and the benefits and problems that these new materials have/can cause.

	They consider how testing a prediction can support or refute a new scientific idea.		Students also consider the need for fresh water and some of the difficulties that may be occurring to prevent that in various societies.	
Equality/Diversity opportunities	International climate change scientists (gender and ethnicity)	*Link to James Harris (nuclear chemist)* *https://en.wikipedia.org/wiki/James_Andrew_Harris*	Father of reverse osmosis who made a huge impact on our world: Srinivasa Sourirajan (October 16, 1923–February 20, 2022) https://www.nature.com/articles/s41545-022-00167-0	Sean Collins, working at the University of Leeds, uses a technique known as electron microscopy that allows him to look so closely at materials that it's possible to observe individual atoms and how they form the structure of materials. Sean came out during high school, and has been involved in supporting the LGBT community ever since, committing to making the research and teaching environments he belongs to inclusive ones
Homework/Independent learning	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers
CIAG coverage/links	Peer reviewing of scientific evidence Environment chemist https://edu.rsc.org/job-profiles/environmental-chemist/4010879.article	Radioactive waste consultant https://edu.rsc.org/job-profiles/radioactive-waste-consultant/4013774.article	Bioleaching technician https://edu.rsc.org/job-profiles/bioleaching-lab-technician/4014506.article	Science communicator https://edu.rsc.org/job-profiles/science-communicator/4010947.article

Curriculum Map **Subject: KS4 Science Year 10** **Year Group: GCSE**

Year 10	Rates and Extent of Chemical Change	Organic Chemistry A	Chemical Changes	Modern Molecules (part of Bonding and Structure)
Content- WHAT will be learned? What previous learning can be linked? Why this order/**sequence**?	Builds on yr7&8 work from Rates & Reactions – factor affecting rate and introduction to collision theory. Now – focussed look at each component. Then moves onto equilibrium (new concept) Interleaving of quantitative chemistry – cover in previous Chem topics from yr9 **Rates & Extent** Collision theory Rates equation Tangent method Effect of catalysts Concentration Temperature Surface area Equilibrium	Builds on from Yr8 Earth resources & products. Fractional distillation and formation of oil covered in yr8. Now explores hydrocarbons in more depth. Introduces cracking as a second stage of processing. Interleaving of quantitative chemistry with %yield and atom economy.(new topics) **Organic** Formation of crude oil Fractional distillation Properties of hydrocarbons Cracking alkanes **Quantitative Chemistry:**	This builds on several previous topics: Yr7 exploring reactions (for acids / bases & neutralisation work, words and symbol equations (across most yr7 & 8 topics) Electrolysis was introduced in ERP Reactivity – in Exploring reactions (yr7) and also in ERP and rates and reactions (yr8) This time the interleaved quantitative work builds from previous yr10 topic (Rates & Extent) **Chemical Changes** Reactions of acids Preparing a dry sample of a salt (RP) Metals reacting with O_2 Reactivity series Extracting metals Electrolysis	Direct continuation from Yr9 topic – bonding and structure. **Final Unit: Modern Molecules** Properties of covalent compounds (simple molecules, large molecules, giant covalent)

	H: effect on equilibrium of changing concentration, temperature, pressure **Quantitative Chemistry:** Concentration of solution g/dm^3 H: Moles of solid *T: moles of gases*	Higher groups Atom Economy and % yield	Electrolysis of solutions (RP) *T: Fuel cells* *Electrolytic cells* **Quantitative Chemistry:** Concentration of solution g/dm^3 *H: Moles of solid* *T: Concentration in mol/dm^3 and titration (RP)*	
Skills- What will be developed?	Practical :Make a range of measurements accurately Record a range of measurements accurately Show safe use of the equipment Change concentration by dilution Measure volume of gas produced Safe use of equipment and chemicals	Producing 3D models of hydrocarbons Investigate the properties of different hydrocarbons.	Required Practical x 2 Rates – simplified version of this covered in Rates & Reactions (yr8) Electrolysis – simplified version of this RP covered in ERP (yr8) Also first time they see a titration – (this becomes a RP for TRIPLE in year11) Mixing of reagents to explore chemical changes and/or products. Investigate pH changes when a strong acid neutralises a strong alkali	Make order of magnitude calculations.
Key 'How'/'Why' Questions- What **powerful knowledge** will be gained? What areas/themes/concepts will be explored?	Building on a Year 8 unit. The key focuses are: -the shapes of molecules and the way giant structures are arranged is of great importance in terms of the way they behave -there are barriers to reaction so reactions occur at different rates	Fossil fuels were first introduced in KS3. The key themes are: -matter is composed of tiny particles called atoms which can be combined to makes compounds. Organic chemistry is a focus on hydrocarbons.	- chemical reactions take place in only three different ways: -proton transfer - electron transfer -electron sharing -energy is conserved in chemical reactions so can therefore be neither created or destroyed.	This is a recap of key ideas first introduced in Year 9. The key focus is: The key focus for this unit is: -atoms bond by either transferring electrons from one atom to another or by sharing electrons -the shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave
SEND- how will support be seen? Seating plans? Simplified questions?	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.
Assessment- What? Why? Progress checks are formative and assessments are summative	Assessment 1 (12) - focus on required practicals and skills such as graph work and numeracy Assessment 2 (12) - focus on the latter half of the unit but including graphical skills 1 x end of unit test (25) - covers whole unit. Designed to assess whether students have improved from first assessment	1 x end of unit test (25) - based on knowledge retrieval as this is the skill that these questions concentrate on in the final examination. Also includes longer answers that cover the process of fractional distillation/cracking (dependent on tier)	Assessment 1 (12) - covers the first part of the unit – acids/bases knowledge and making a dry sample of a salt. Also includes some links to general investigation skills in foundation tier. Assessment 2 (12) - concentrates on the required practical and electrolysis 1 x end of unit test (25) - designed to give further practice on key topics and long answer questions.	No assessment as it is a retrieval topic
What **memory for learning** skills will be required- modelling? Concrete answers? Retrieval?	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 chemical reaction (ER), Y8 collision theory and reaction rates (R&R)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y8 Earth resources, Crude oil formation, fractional distillation and hydrocarbon definition (ERP)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 pH scale, neutralisation metals with acid (ER), Y8 extraction of metals, displacement reactions, electrolysis (ERP, R&R), Y9 formation of ions (atomic structure and periodic table) and ionic bonding (bonding and	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Y9 formation of ions (atomic structure and periodic table), ionic, covalent and metallic bonding (bonding and structure)

			structure), Y7/Y8 electrical circuits (EE/MTW, overlap with physics KS4)	
Literacy- reading, extended accurate writing and oracy opportunities	Reading and following methods and instructions for the required practicals. They both include detail instructions and the use of unfamiliar chemical names. Developing extended answers for 3,4 and 6 mark questions.	Comprehension task on Earth structure	Developing extended answers for 3,4 and 6 mark questions Reading practical instructions and stating the error in the method. Reading and following instructions for the required practicals. They both include detailed steps and the use of unfamiliar chemical names. They are both very different and the text is different in both cases.	Developing extended answers for 3,4 and 6 mark questions
Numeracy/computing skills	Calculate mean Identifying anomalies Plotting graphs Interpretation of data Manipulating equations Calculate gradient using tangent Calculate surface area Construct and interpret frequency tables and diagrams, bar charts and histograms. Plot two variables from experimental or other data.	Translate information between graphical and numeric form such as considering properties and size of molecule. Quantitative Substitute numerical values into algebraic equations using appropriate units for physical quantities. Recognise and use expressions in decimal form. Recognise and use expressions in standard form. Use an appropriate number of significant figures.	Manipulating equations Use an appropriate number of significant figures Find the arithmetic mean and range of a set of data Quantitative: Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	Use ratios, fractions and percentages. Make order of magnitude calculations.
Character development	Recognising the need for sustainability by using catalysts to reduce energy costs and therefor saving resources – RESOURCEFUL in providing alternative pathways that use less energy. Discussion regarding Haber – also link to Alfred Nobel who was COMPASSIONATE and wanted to produce a better process that didn't kill the workers	Empathy and COMPASSIONATE/RESPECTFUL by considering the environmental impact of the oil industry around the world. BP now pivoting to becoming an 'Integrated Energy Provider' to meet carbon net zero by 2050 instead of being an 'Intensive Oil Provider' as it has historically been. Other oil companies involved in a similar transition e.g. Shell.	There is a lot of practical work so teamwork and co-operation is developed. Inculcates a RESPECTFUL attitude between students in use of resources provided and moving around the rooms.	Dorothy Hodgkin – RESILIENCE provided first evidence of structures using X-ray crystallography at a time when that science was ground-breaking and also it was rare for women to be involved at that level of Science in academia
Equality/Diversity opportunities	Discussion regarding Haber Polly Arnold (born 1972) was awarded the Rosalind Franklin Award (2012) and an OBE (2017) for her work in chemistry and for women in STEM. Her work in synthetic chemistry underpins understanding of how catalysts work, especially the use of the lanthanides and actinides	DNA including the contributions of Francis Crick, James Watson, Maurice Wilkins and Rosalind Franklyn.	Stephanie Kwolek discovered Kevlar https://en.wikipedia.org/wiki/Stephanie_Kwolek	Sean Collins, working at the University of Leeds, uses a technique known as electron microscopy that allows him to look so closely at materials that it's possible to observe individual atoms and how they form the structure of materials. Sean came out during high school, and has been involved in supporting the LGBT community ever since, committing to making the research and teaching environments he belongs to inclusive ones
Homework/Independent learning	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers

CIAG coverage/links	Chemical engineering Senior principal scientist https://edu.rsc.org/job-profiles/senior-principal-scientist/4015672.article	Work in the chemical industry Pharmaceuticals https://edu.rsc.org/job-profiles/process-chemist-higher-apprentice-pharmaceuticals/4013847.article Drug discovery https://edu.rsc.org/job-profiles/medicinal-chemist/4013025.article	Product and process development manager https://edu.rsc.org/product-and-process-development-manager/4015740.article Patent lawyer https://edu.rsc.org/job-profiles/patent-attorney/4010853.article	Science communicator https://edu.rsc.org/job-profiles/science-communicator/4010947.article

Curriculum Map **Subject: KS4 Science Year 11 trilogy (higher and combined)** **Year Group: GCSE**

	Energy Changes	Analysis	Required practicals	Bonding revision
Content- WHAT will be learned? What previous learning can be linked? Why this order/**sequence**?	This topic was first introduced in Year 8 and focusses on: Exothermic changes Endothermic changes Reaction profiles H: Bond energies **Quantitative Chemistry:** Balancing equations **6 lessons**	Analysis is a topic that builds on work first introduce in Year 7, then 9 and now is covered in more detail. It focuses on: Separating mixtures Formulations Chromatography (RP) Testing gases **Quantitative Chemistry:** Balancing equations Calculating formula mass Reacting masses **5 lessons**	This is a retrieval unit focussing on the required practical content of the course and associated exam questions. Focussing on: Making a sample of a dry salt Electrolysis Temperature Changes Rates of Reaction – two methods Chromatography Water purification – dry mass of solids, distillation **6 lessons** **Quantitative Chemistry:** Balancing equations	Metallic bonding Ionic bonding Covalent bonding Properties of metals Properties of ionic compounds Properties of covalent compounds (simple molecules, large molecules, giant covalent) **6 lessons**
Skills- What will be developed?	Practical skills Using a thermometer to measure temperature changes when substances react or dissolve in water. Measuring out acids Weighing Being aware of risk Understanding of chemical formulae	Practical skills Using delicate glassware such as capillary tubes Measuring accurately using rulers	Practical skills Measuring volumes of liquids Using a thermometer Understanding of 'fair testing', independent, dependent and control variables Understanding of Repeatable/reproducible experiments Accurate timing Reading scales on equipment	Visualisation of molecules/3D structures Understanding of chemical formulae
Key 'How'/'Why' Questions- What **powerful knowledge** will be gained? What areas/themes/concepts will be explored?	**Powerful knowledge:** The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen. How can chemical reactions transfer energy? Why do chemical reactions transfer energy (H only)? How are these transfers used in society?	**Powerful knowledge:** All material in the Universe is made of very small particles. How can we use knowledge of particles to explain separation of inks? How can chemical reactions be used to identify substances?	**Powerful knowledge:** effective science is achieved by conducting experiments that are valid (repeatable, reproducible, fair tests, accurate) and test hypotheses.	**Powerful knowledge:** All material in the Universe is made of very small particles. How can we use knowledge of particles to explain the observable properties of substances?
SEND- how will support be seen? Seating plans? Simplified questions?	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.
Assessment- What? Why? Progress checks are formative and assessments are summative	End of unit test (25 marks) Self-assessed exam practice within lessons	End of unit test (25 marks) Self-assessed exam practice within lessons	End of unit test (25 marks) Self-assessed exam practice within lessons	No final assessment

What **memory for learning** skills will be required- modelling? Concrete answers? Retrieval?	Retrieval quizzes throughout starters, model answers within PPTs, self/peer assessed exam question examples. Retrieval of Y7 chemical reactions (ER), Y8 exothermic and endothermic reactions (ERP),	Retrieval quizzes throughout starters, model answers within PPTs, self/peer assessed exam question examples. Retrieval of Y7/ Y9 elements, compounds and mixtures and separation techniques (ATM / chemistry of atmosphere / atomic structure and periodic table)	Retrieval quizzes throughout starters, model answers within PPTs, self/peer assessed exam question examples.	Retrieval quizzes throughout starters, model answers within PPTs, self/peer assessed exam question examples.
Literacy- reading, extended accurate writing and oracy opportunities	Keywords and definitions	Keywords and definitions	Keywords and definitions, Reading exam questions Reading and following methods and instructions for the required practical Developing extended answers for 3,4 and 6 mark questions.	Reading exam questions
Numeracy/computing skills	Calculating mean Use ratios, fractions and percentages. Change the subject of an equation.	Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	Plotting graphs Using tangents and gradients Calculating mean	Substitute numerical values into algebraic equations to find formula mass.
Character development	RESILIENCE on calculating bond energies as this is common knowledge to A level Chemistry	ASPRIRATION & AMBITION: working in science labs to develop analytical tests for diseases (chromatography was the fundamental principle behind CoVID tests)	RESILIENCE: being able to identify errors in scientific enquiry without feeling that this is failure	RESILIENCE and ASPIRATION: story of the development of post-it notes – aiming for superglue, but when tested noticed that the compound was not very sticky. Two of the scientists were choristers and at that evening's practice, one of them dropped all their bookmarks at which point the two choristers realised that they could use their failure to make a commercial product, so convinced the company's directors that there was a use for this, which was produced as the world famous Post-It notes.
Equality/Diversity opportunities	None in this topic	Link to Percy Julian who discovered plant based medicines, in the context of quality assurance of medicines	None in this topic	Link to Kehang Cui who co-invented the blackest material known, a form of carbon nanoparticles.
Homework/Independent learning	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers
CIAG coverage/links	Using knowledge of chemical energy transfers to control energy changes in industry Recycling car batteries https://edu.rsc.org/job-profiles/research-fellow-battery-recycling/4013825.article	Analytical scientists and uses of techniques for forensic science. https://edu.rsc.org/job-profiles/analytical-chemists-thames-water/4011778.article	Scientific process and enquiry	Materials science

Curriculum Map **Subject: KS4 Science Year 11 triple** **Year Group: GCSE**

	Energy Changes	Analysis	Organic B	Using Resources B
Content- WHAT will be learned? What previous learning can be linked? Why this order/**sequence**?	This topic was first introduced in Year 8 and focusses on: Exothermic changes Endothermic changes Reaction profiles H: Bond energies	**Analysis** Separating mixtures Formulations Chromatography (RP) Testing gases Identifying ions (RP) Emission spectra Testing for metals by precipitation and flame tests Testing for non-metals by precipitation **Quantitative Chemistry:** *Titration calculations*	**Organic B** Properties of alkenes Alcohols Carboxylic acids Polymerisation inc DNA **Quantitative Chemistry:** Atom Economy Percentage Yield	Haber process Rusting Ceramics/polymer properties Composites
Skills- What will be developed?	Practical skills Using a thermometer Measuring out acids Weighing Being aware of risk	Practical Skills Using glassware such as capillary tubes Reading from scales on a burette Using analytical skills to determine unknown chemicals	Practical skills Use of chemicals with a strong odour.	
Key 'How'/'Why' Questions- What **powerful knowledge** will be gained? What areas/themes/concepts will be explored?	**Powerful knowledge:** The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen. How can chemical reactions transfer energy? Why do chemical reactions transfer energy (H only)? How does this link to energy stores in physics? How are these transfers used in society?	**Powerful knowledge:** All material in the Universe is made of very small particles. How can we use knowledge of particles to explain separation of inks? How can chemical reactions be used to identify substances?	**Powerful knowledge:** Chemistry can be used to control the properties of materials – alloys for a particular purpose, polymers for a purpose.	
SEND- how will support be seen? Seating plans? Simplified questions?	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons. Reading and following methods and instructions for the required practical. The Analysis practical requires a lot of reading and comprehension. The titration practical uses a greater density of technical key words resulting in more complex reading Developing extended answers for 3, 4 and 6 mark questions.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.	Keyword box for each lesson, glossary pages for each unit, knowledge organisers in booklet, scaffolded tasks and sentence starters in appropriate lessons.
Assessment- What? Why? Progress checks are formative and assessments are summative	End of Unit Assessment (35 marks)	End of Unit Assessment (35 marks)	End of Unit Assessment (35 marks)	End of Unit Assessment (35marks)
What **memory for learning** skills will be required- modelling? Concrete answers? Retrieval?	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 chemical reactions (ER), Y8 exothermic and endothermic reactions (ERP), Y7/Y8 electrical circuits (EE/MTW, overlap with physics KS4)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7/ Y9 elements, compounds and mixtures and separation techniques (ATM / chemistry of atmosphere / atomic structure and periodic table)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y8 / Y10 Earth resources, Crude oil formation, fractional distillation and hydrocarbon definition, polymerisation (ERP/ organic A)	Retrieval quizzes throughout starters, model answers within PPTs, progress checks. Retrieval of Y7 properties and corrosion of metals (ATM), Y8 Earth resources, sustainability and 3 Rs (ERP).

		Titration calculations will be modelled and a scaffolding given.		
Literacy- reading, extended accurate writing and oracy opportunities	Keywords and definitions	Keywords and definitions	DNA reading exercise.	Haber reading task
Numeracy/computing skills	Calculating mean Use ratios, fractions and percentages. Change the subject of an equation.	Calculations for titration calculations Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities. Use an appropriate number of significant figures Find the arithmetic mean and range of a set of data	Looking for patterns in chemical formula eg CnH2n+2 Quantitative Percentage calculations for atom economy and percentage yield Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	Interpreting graphs and describing trends.
Character development	RESILIENT on calculating bond energies as this is common knowledge to A level Chemistry	ASPIRATION & AMBITION: working in science labs to develop analytical tests for diseases (chromatography was the fundamental principle behind CoVID tests)	COMPASSION and RESPECT for the environment in the development of new materials and design of products to allow biodegradability	RESILIENCE
Equality/Diversity opportunities	No focus in this topic	Link to Percy Julian who discovered plant based medicines, in the context of quality assurance of medicines	Link to St Elmo Brady who discovered the trend in acidity of carboxylic acids. Link to Marie Maynard Daly who investigated enzymes and helped the understanding of protein structure	Link to Fritz Haber and the Nobel prize (see earlier comment on Year 10 rates of reaction topic).
Homework/Independent learning	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers Exam paper questions	Quizzes on retrieval practice topics (see schedule), links to www.my-gcsescience.com, knowledge organisers Exam Paper questions
CIAG coverage/links	Using knowledge of chemical energy transfers to control energy changes in industry Recycling car batteries https://edu.rsc.org/job-profiles/research-fellow-battery-recycling/4013825.article	Analytical scientists Museum scientist https://edu.rsc.org/job-profiles/museum-scientist/4013027.article Analytical scientists https://edu.rsc.org/job-profiles/analytical-chemists-thames-water/4011778.article	Work in the chemical industry Pharmaceuticals https://edu.rsc.org/job-profiles/process-chemist-higher-apprentice-pharmaceuticals/4013847.article Drug discovery https://edu.rsc.org/job-profiles/medicinal-chemist/4013025.article	Research scientist https://edu.rsc.org/job-profiles/senior-principal-scientist/4015672.article