

Year 10 Topic Seven - Analysis (GCSE Trilogy Chemistry)

Topic 8 Analysis	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.8 Chemical Analysis Chemists have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals. Forensic scientists and drug control scientists rely on such instrumental	 Year 8 Reaction types  Year 11 Chemical Analysis Post 16 Analysis using a range of chromatography techniques. Gas tests.	<u>Lesson 1 - Pure Substances and Formulations</u> <i>...that</i> a formulation is a specific mixture that has been designed as a useful product. Pure substances have a specific boiling point. Mixtures boil over a range of temperatures. <i>....how to</i> distinguish between a pure substance and a mixture. <i>....how to</i> apply knowledge to past exam questions	Pure, substance, melting point, boiling point, impure, mixture, product, purpose, fertilisers,	a) <u>Numeracy</u> Analysis and evaluation of data based questions using graphs and/or tables for analysis. b) <u>Literacy</u> Scientific literacy on gas formulae c) <u>Reading</u> Reading for learning on case studies. d) <u>Cultural Capital/Careers</u> Forensic science Food quality scientist e) <u>Cross curricular knowledge links</u> Food technology – food additives and food safety f) <u>Misconceptions</u> A pure substance in chemistry means that it is only one type of particle, pure in general language means it hasn't had anything extra added to it such as pure orange juice. Orange juice isn't pure in chemistry as it contains
		<u>Lesson 2 - Testing for Common Gases</u> <i>...that</i> carbon dioxide, oxygen, hydrogen and chlorine have specific tests which can be used to identify them <i>....how to</i> carry out the tests for carbon dioxide, hydrogen, chlorine and oxygen <i>....how to</i> apply knowledge to past exam questions	Hydrogen, chlorine, carbon dioxide	
		<u>Lesson 3 and 4 - Chromatography</u> <i>...that</i> chromatography can be used to separate mixtures and can give information to help identify substances. <i>....how to</i> calculate Rf values <i>....how to</i> set up an investigation to find the content/solubility of a dye and to calculate the Rf value. <i>....how to</i> apply knowledge to past exam questions	Solvent, solute, chromatography, stationary phase, mobile phase.	

methods in their work.				sugars, water, pulp, and lots of other things.
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Year 10 Topic Eight Chemistry of the Atmosphere (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>.... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.8 Chemistry of the Atmosphere The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of natural cycles. Scientists use software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and	 Year 7 Materials Year 8 Earth – climate  Year 10 Earth's resources Chemical changes Post 16 Organic chemistry, biofuels	Lesson 1 - Composition of the Atmosphere <i>... that</i> the atmosphere is a mixture of gases <i>...that</i> theories about what was in the Earth's early atmosphere and how the atmosphere was formed have changed over time. <i>...how to</i> interpret graphs and charts which compare atmospheres. <i>...how to</i> apply knowledge to past exam questions	Composition, atmosphere	a) Numeracy Construct and interpret tables, graphs and charts on the composition of atmosphere of planets in the solar system. b) Literacy Scientific literacy – CO and CO ₂ c) Reading Reading and summarising accounts on the development of the atmosphere and the effects of climate change. d) Cultural Capital/Careers Climate scientist. COP 25. International government agreements on mitigating climate change. George Monbiot – political activist on climate change and the environment. e) Cross curricular knowledge links Geography – climate change (f) Misconceptions
		Lesson 2 -Evolution of the Atmosphere <i>...that</i> the Earth's atmosphere evolved from early Earth to modern Earth <i>...how to</i> interpret evidence and evaluate different theories about the Earth's early atmosphere. <i>...how to</i> apply knowledge to past exam questions	Evolution, dissolving, sedimentary photosynthesis	
		Lesson 3 - Carbon Dioxide and the Greenhouse Effect <i>...that</i> climate change is impacted by the greenhouse effect, <i>....how to</i> describe and explain the greenhouse effect and its consequences. <i>...how to</i> apply knowledge to past exam questions	Carbon dioxide, methane, radiation, greenhouse gases, greenhouse effect.	
		Lesson 4 - Global Warming and Climate Change <i>...that</i> climate change is having a significant impact on the way we live, the weather and the habitats in our world. <i>.....how to</i> evaluate the impact climate change will have on agriculture, animals, ecosystems, coastal regions and water supplies. <i>...how to</i> apply knowledge to past exam questions	climate change, environment, impact, precipitation, ecosystem	

engineers to develop solutions that help mitigate human activity.		<u>Lesson 5 - Products of Combustion</u> ... <i>that</i> combustion of fuels releases harmful products ... <i>how to</i> prove the products of complete combustion ... <i>how to</i> link named emissions with the associated consequence. ... <i>how to</i> apply knowledge to past exam questions	Pollutants, emissions, combustion, global dimming, Sulphur dioxide Nitrogen oxides, Carbon monoxide	The gas we breath in for respiration isn't the largest part of our atmosphere The proportion of gases has stayed the same for around 200 million years, it has only started to change over the last 200 in a very small way Global warming and cooling are natural and have happened in cycles since Earth was a ball of molten rock, the argument is that humans have impacted on this cycle. Climate change and global warming are different, climate change is changes to the weather that can have drastic consequences, and global warming is the average warming of the Earth that causes climate change.
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Year 10 Topic Three Chemical Changes (GCSE Chemistry)

Topic 5	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.4 Chemical Changes Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organising their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes	 Year 7 Acids and alkalis Metals and non- metals Year 8 Types of reaction Year 9 Chemical changes, reactions of metals, reactivity series and acids and alkalis  Year 11 Chemical changes – paper 1 Post 16 Acid, alkali titrations. Types of acid. Neutralisation reactions.	<u>Lesson 1 – Reactivity Series and Displacement Reactions</u> <i>...that</i> the reactivity series places metals in increasing order of reactivity and can be used to predict reactions. <i>....how to</i> use the reactivity series to predict whether or not a displacement reaction will happen.	ionic compounds, reactivity series, displacement	a) <u>Numeracy</u> Balancing ionic equations for more able students. b) <u>Literacy</u> Etymology of words to describe metallic properties e.g. lustre. c) <u>Reading</u> Methods, hazard warnings, extraction of aluminium reading to extract knowledge. Application of hydrogen homes. d) <u>Cultural Capital/Careers</u> Hydrogen extraction for fuels (hydrogen homes) e) <u>Cross curricular knowledge links</u> Environmental impacts of large scale metal extraction – recycling metals and alternative metal extraction f) <u>Misconceptions</u>
		<u>Lesson 2 – The Process of Electrolysis</u> <i>...that</i> electrolysis is a process which separates ionic compounds <i>.... how to</i> describe and explain the process of basic electrolysis <i>.... how to</i> represent the process at the electrodes using half equations	Electrolysis, anode, cathode, anion, cation, electrolyte, electrodes, half equations	
		<u>Lesson 3 – The Extraction of Aluminium</u> <i>...that</i> aluminium is a reactive metal that requires electrolysis to be separated from its ores	Bauxite, aluminium, electrodes, electrolysis, half equations	

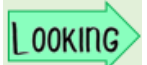
		 <i>how</i> the extraction of aluminium is adjusted and has special conditions		Not all metals are found as pure metal on Earth, most are found in rocks as metal oxides or metal carbonates which are called ores.
		<u>Lesson 4 – Aqueous Electrolysis</u> <i>...that</i> aqueous solutions of ionic compounds can be separated using electrolysis <i>how to</i> predict the products of aqueous electrolysis	Aqueous, prediction, products, reactivity series, halogens	During electrolysis the metal is not always produced, if the metal is higher in reactivity than hydrogen then hydrogen is produced. A solution of the metal hydroxide would also be produced which is then later purified to produce the pure metal.
		<u>Lesson 5 – Electrolysis Required Practical</u> <i>how to</i> predict the products of electrolysis then test the predictions using the practical equipment	Aqueous, hazards, risks, electrolyte, anode, cathode	

Year 10 Topic Four Energy Changes (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.5 Energy Changes Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications.	 Year 8 Endothermic and exothermic reactions  Year 11 Apply energy change knowledge and detailed use of cells and batteries. Post 16 Energetics and electrochemistry	<u>Lesson 1 – Exothermic and Endothermic</u> <i>...that</i> exothermic reactions release heat energy and endothermic absorb heat energy from their surroundings. <i>.... how to</i> draw reaction profiles for exothermic and endothermic reactions	Exothermic, endothermic, profiles, activation energy, surroundings	a) Numeracy Analysis and evaluation of data based questions using graphs and/or tables for energy transfer Carry out bond energy calculations b) Literacy and reading Reading methods in order to follow instructions. Student safety sheets in order to evaluate risks in a practical.
		<u>Lesson 2 – Bond Enthalpy Calculations HT Only</u> <i>...that</i> bonding breaking is endothermic and bond formation is exothermic <i>...how to</i> calculate bond enthalpy changes	Enthalpy, exothermic, endothermic, ΔH .	c) Cultural Capital/Careers Food hygienist and preparation – hot and cold cans. Medics hot and cold packs. DofE – hand warmers
		<u>Lesson 3 and 4 – Temperature Changes Practical</u> <i>...how to</i> safely conduct a practical to investigate temperature changes in a reaction <i>.... how to</i> draw a graph from which data can be extrapolated	Extrapolation, variables, hazard, risk, control	d) Cross curricular knowledge links DT – Materials design of hot/cold cans PE – hot/cold packs

				e) Misconceptions It requires energy to break bonds and releases energy when bonds are made. The enthalpy change is a balance between energy used from bond breaking and bond making. Endothermic reactions are cold as they take in thermal (heat) energy from the surroundings.
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Year 10 Topic Six Organic Chemistry (GCSE Trilogy Chemistry)

Topic 6	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.7 Organic Chemistry The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. The main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels, a major source of feedstock for the petrochemical industry. Chemists take organic	 Year 8 Elements, compounds, mixtures Year 9 Atomic structure, separating mixtures, organic and chemistry of the Atmosphere  Post 16 Organic chemistry	Lesson 1 - Crude Oil <i>...that</i> crude oil is a non-renewable resource made from the remains of microscopic organisms living in the sea. <i>...how to</i> interpret data linked to the availability and use of crude oil over time. <i>...how to</i> apply knowledge to past examination questions	Crude oil, heat, pressure, mixture, hydrocarbon	a) Numeracy Interpreting charts and graphs on data linking crude oil and its uses. Using general formulae to predict formulae of alkanes and alkenes. b) Literacy Systematic naming of molecules in homologous series: meth-, eth-, prop-, etc. Key words in terms of properties of hydrocarbons and the etymology of these words. c) Reading Reading for information retrieval. Literacy homework. d) Cultural Capital/Careers Organic chemistry can help you get into careers in forensics, pharmaceuticals, making perfumes and flavours (Christmas dinner flavoured crisps!) (e) Cross curricular knowledge links DT: polymers as design materials. Geography – crude oil as a finite resources (f) Misconceptions
		Lesson 2 - Fractional Distillation <i>...that</i> crude oil can be separated into hydrocarbons of similar properties, called fractions. <i>...how to</i> describe the process of fractional distillation and explain the principles behind it. <i>...how to</i> apply knowledge to past examination questions	crude oil, fractional distillation, fraction, alkane, mixture, separation	
		Lesson 3 - Alkanes and Properties <i>...that</i> the properties of alkanes vary according to the length of the carbon chain. <i>...how to</i> distinguish between alkanes according to viscosity, flammability, boiling point. <i>...how to</i> apply knowledge to past examination questions	Flammable, viscous, saturated	
		Lesson 4 -Cracking Hydrocarbons <i>...that</i> long chain hydrocarbons can be split into smaller ones by cracking; thermal or catalytic. <i>...how to</i> construct cracking equations <i>...how to</i> distinguish between saturated and unsaturated compounds using bromine water. <i>...how to</i> apply knowledge to past examination questions	Cracking, thermal, catalytic, saturated, unsaturated	

molecules and modify to make new, useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.		<u>Lesson 5 - Alkenes and Polymers</u> <i>...that</i> alkenes are carbon compounds containing a C=C bond <i>...that</i> polymers are formed from alkenes <i>...how to</i> apply knowledge to past examination questions	Unsaturated, cracking, thermal, catalytic, monomer, polymer.	Organic does not mean natural – it chemistry it refers to carbon chemistry. The “hydro” in hydrocarbons does not mean water – it means hydrogen. Saturated means no double bonds present – not a “saturated solution” Fractions themselves are a mixture of compounds with similar properties. Fractional distillation is separation, cracking is thermal decomposition.
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Year 10 Topic Two Quantitative Chemistry (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.3 Quantitative Chemistry Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Identifying different types of chemical reactions allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing	 Year 8 Periodic table Year 9 Atomic structure and periodic table  Year 11 Apply quantitative knowledge across a broad range of questions. Post 16 Quantitative chemistry	Lesson 1 – Relative Atomic and Relative Formula Mass <i>...that</i> relative atomic masses are found on the periodic table <i>...how to</i> calculate relative atomic and relative formula mass	Mass number, formula mass, formula, equation, reactants, products	a) Numeracy A wide range of calculation on moles, RFM, reacting masses, limiting factors, concentration of solutions. Analysis and evaluation of data based questions using graphs and/or tables for quantitative questions. b) Literacy and reading c) Cultural Capital/Careers Chemical engineers, pharmaceuticals, toxicology, river water analysis d) Cross curricular knowledge links Rearranging equations, converting units, percentages all linked with maths skills e) Misconceptions When balancing equations you can't change how the compounds are
		Lesson 2 Conservation of Mass <i>...that</i> mass is conserved in a reaction <i>...how to</i> use chemical equations to evaluate conservation of mass	Conservation, mass, balanced	
		Lesson 3 – Conservation of Mass Practical <i>...that</i> mass does not always appear to be conserved in a reaction <i>...how to</i> complete a practical to investigate conservation of mass safely	Safety, crucible, balance, weighing boat	

chemical reactions and are a key way for chemists to communicate chemical ideas.		<u>Lesson 4 - Introduction to Moles</u> <i>...that</i> a mole is a chemical quantity <i>...how to</i> calculate moles using the correct equation	Mole, quantity, mass, relative atomic/formula mass, Avogadro's constant	made up – this means you can't add or take away any of the 'small numbers'. Some reactions look like mass is lost however it is normally a product that is a gas escaping from wherever the reaction is happening. HT ONLY. A mole is just a number. As atoms are so small it is impossible to talk about 1 atom of a substance, we can only really talk about them in very large amounts. So, a mole was created as a standard, it stands for 6.02×10^{23} particles. Understanding the correct units and their conversions. Appreciation of standard form and manipulation of standard form within calculations. Scale of what a decimetre is. Use of non-integers in balancing equations.
		<u>Lesson 5 – Moles Lesson 2</u> <i>...how to</i> calculate moles using the correct equation <i>...how to</i> rearrange the moles equation <i>...how to</i> apply your knowledge to questions	Mole, quantity, mass, relative atomic/formula mass, Avogadro's constant	
		<u>Lesson 6 – Reacting Masses</u> <i>...that</i> moles can be used to calculate required masses of reagents and predicted masses of products <i>...how to</i> apply the moles equation to calculating reacting masses	Moles, reacting masses, balanced equation, conservation	
		<u>Lesson 7 – Percentage Element</u> <i>...that</i> elements exist in different percentages within compounds <i>...how to</i> calculate percentage of a given element in a compound	Percentage, element, proportion,	
		<u>Lesson 8 – Concentration of Solutions</u>	Solutions, concentration, volume, solute, decimetre, cubic centimetre, mass	

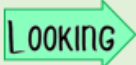
		<i>...that</i> cubic decimetres are a unit of concentration <i>...how to</i> convert between units <i>...how to</i> calculate the concentration of solutions.		
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Year 10 Topic Five - Rate and extent of chemical change (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.6 Rate and extent of chemical change Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. In industry, chemists and chemical engineers	 Year 8 Rates of reaction  Year 11 Apply rate and extent of chemical change knowledge to extended questions. Post 16 kinetics	Lesson 1 – Measuring Rate of Reaction <i>...that</i> mean rate of reaction can be determined by measuring quantity of mass used or product released <i>...how to</i> determine the rate of a chemical reaction by interpreting data	Product, reactant, rate, mean, gradient	a) Numeracy Analysis and evaluation of data based questions using graphs and/or tables for rates and chemical changes. Learners need to employ the use of suitable units when measuring and collecting data. There is a need for learners to develop their mathematical mastery to determine the gradient of a straight line. Learners will also need to be able to determine the intercept on a linear graph. b) Literacy and reading Analysis and evaluation of data based questions using extended text for use of changing conditions on the Haber process.
		Lesson 2 – Factors affecting rate of reaction <i>...that</i> the rate of reaction can be changed by altering conditions <i>...how to</i> use collision theory to explain the effect of changing conditions on the rate of reaction	Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state	
		Lesson 3 and 4 – Changing Surface Area <i>...how to</i> measure the rate of reaction during a practical for production of gaseous products <i>...how to</i> represent data using graphs	Dependent, independent, control, variable, surface area, delivery tube	
		Lesson 5, 6 and 7 – Changing Concentration <i>...how to</i> measure the rate of reaction during a practical which produces solid <i>...how to</i> represent data using graphs	Dependent, independent, control, variable, rate, concentration, hydrochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion	

determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.		...<i>how to</i> describe and explain the shape of a graph		c) <u>Cultural Capital/Careers</u> How the Haber Process has had an impact on the global economy. d) <u>Cross curricular knowledge links</u> Opportunities for learners to demonstrate their research skills e) <u>Misconceptions</u> Not all reactions happen quickly, some take millions of years to happen! Mass and energy are never lost or created; however, it might look like the mass goes down during a reaction. But this is because a gas will be given off and has escaped. Catalysts are not part of the reaction; they just interact with the atoms to help them react. Particles collide all the time however not all collisions cause a reaction, this is because they don't have enough energy for the reaction to occur.
		<u>Lesson 8 – Reversible Reactions</u> ... <i>that</i> some chemical reactions are reversible ...<i>how to</i> represent reversible reactions	Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated	
		<u>Lesson 9 – Equilibria HT ONLY</u> ... <i>that</i> chemical reactions reach a state of equilibria ...<i>how to</i> change the position of the equilibrium by applying Le Chateliers principle	Reactant, product, forward, backward, reversible, equilibrium, Le Chatelier.	

Year 10 Topic One - Bonding, Structures and Properties (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.2 Bonding, Structures and Properties Chemical bonds are the glue that hold substances together. The attraction of one atom to another determines a substances chemical reactivity and its physical properties. Understanding how these can be determined by considering the atoms involved within the substance can be used to advance our understanding of materials science and where research may go in the immediate future.	 Year 7 Properties of metals and non-metals Year 8 Periodic table Year 9 Atomic structure  Year 11 Apply bonding knowledge and detailed use of nanoparticle Post 16 AS Bonding unit	Lesson 1 – Forming Ions <i>...that</i> ions are formed from the loss and gain of electrons into electron shells <i>...how to</i> represent ions using dot and cross diagrams <i>...how to</i> describe and explain ionic bond formation using dot and cross diagrams.	Ion, positive, negative, cation, anion, transfer, noble gas, configuration, ionic	a) Numeracy Analysis and evaluation of data based questions using graphs and/or tables for bonding properties. b) Literacy and reading Analysis and evaluation of data based questions using extended text for use of polymers and nanoparticles. c) Cultural Capital/Careers The development of new and diverse nanoparticles for use in everyday life. d) Cross curricular knowledge links Opportunities for learners to demonstrate their research skills e) Misconceptions When a substance dissolves or changes state no bonds are broken, this is often confused as FORCES between molecules are overcome when a change of state happens.
		Lesson 2 – Ionic Compounds <i>...that</i> ionic compounds can be represented in different ways <i>...that</i> the specific bonding in ionic compounds leads to different properties <i>...how to</i> construct the formula of common ionic compounds	Giant, lattice, 3D, ions, conductivity, brittle, soluble, electrostatic	
		Lesson 3 and 4 – Covalent Bonding <i>...that</i> covalent bonds are formed from the sharing of electrons <i>...how to</i> draw dot and cross diagrams to represent simple covalent molecules <i>...how to</i> explain the properties of simple covalent compounds in terms of structure and bonding	Covalent, dot and cross, sharing, valence, intermolecular forces	
		Lesson 5 – Polymers	Polymer, manufactured, covalent, molecule, monomer, repeat unit	

		...<i>that</i> simple covalent molecules can form polymers ...<i>how to</i> draw the structure of polymers and repeat units	polymerisation, thermosetting, thermosoftening, intermolecular	Non metals do-not conduct electricity however graphite, graphene and fullerenes made purely from carbon (a non-metal) can conduct electricity. To be stable each atom wants a full outer shell of electrons, hydrogen and helium need 2 electrons, however every other atom wants 8. You only need to know the first 20 elements as this rule works for them. In ionic bonding electrons are not shared, they are given and taken. It is then those differently charged ions that are attracted to each other forming the bond. Ionic compounds are not just two or three ions (NaCl is not 1 sodium ion and 1 chlorine ion), there are millions of ions that make up the compounds, the formula shown is the simplest way to write the ratio of ions.
		<u>Lesson 6 – Giant Covalent Molecules</u> ...<i>that</i> carbon can exist in three different forms called allotropes ...<i>that</i> the different bonding in these allotropes leads to the different properties of the allotropes ...<i>how to</i> explain the properties of these allotropes in terms of structure and bonding	Brilliant, strong, hard, lubricant,	
		<u>Lesson 7 – Nanoparticles</u> ...<i>that</i> nanoscience is the study of nano-sized particles ...<i>how to</i> explain the properties of nanoparticles in terms of structure and bonding ...<i>how to</i> calculate surface area to volume ratio HT	Nanoparticle, surface area to volume ratio	
		<u>Lesson 8 – Metallic Bonding</u> ...<i>that</i> metallic bonding occurs in metals ...<i>how to</i> explain the properties of metals in terms of structure and bonding	Delocalised, electrostatic, electron, conduction	

Year 10 Topic Nine - Earths resources and using resources (GCSE Trilogy Chemistry)

Topic	Rationale (Layering, why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
4.10 Earths resources and using resources. Industries use the Earth's natural resources to manufacture useful products. To operate sustainability, chemists seek to minimise the use of limited resources, use of energy, waste, and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists' study how human activity	 Year 7 Fossil fuels Year 9 Organic chemistry  Year 11 Apply Earths resources and using resources knowledge. Post 16 polymers	<u>Lesson 1 – The Earth's Resources</u> <i>...that</i> the Earth provides all the resources needed for human survival. <i>... how to</i> distinguish between finite and renewable sources.	Resources, warmth, shelter, food, transport, natural, agriculture, fuels, finite, renewable.	a) <u>Numeracy</u> Extract and interpret information about resources from charts, graphs, and tables. Use orders of magnitude to evaluate significance of data. b) <u>Literacy and reading</u> Analysis and evaluation of data-based questions using extended text for LCAs and metal extraction methods. Methods to produce potable water, comparison, and evaluation. Reading for information retrieval. c) <u>Cultural Capital/Careers</u> Access to potable water and purification of water sources in different locations around the global – the challenges and implications of water safe for everyone to drink.
		<u>Lesson 2 – Potable Water</u> <i>...that</i> potable water is different to pure water. <i>... how to</i> test the purity of water. <i>... how to</i> describe the differences between the treatment of ground water and freshwater	Potable, pure, sterilising, desalination, reverse osmosis, filter.	
		<u>Lesson 3 – Wastewater Treatment</u> <i>...that</i> sewage can be treated to make it safe to drink. <i>... how to</i> purify wastewater.	Sewage, grit, sedimentation, anaerobic digestion, aerobic, effluent, sludge, agricultural.	
		<u>Lesson 4 – Water RP</u> <i>... how to</i> purify salt water by simple distillation. <i>... how to</i> test the purity of the water produced.	Distillation, Liebig condenser, evaporation, condensing, boiling point	
		<u>Lesson 5– Alternative Extraction of Metals</u>	Metal ores, phytomining, bioleaching, bacteria, leachate, electrolysis, metal extraction.	

has affected the Earth's natural cycles and how damaging effects can be minimised.		...<i>that</i> the Earth's resources of metal ores is limited. ... <i>how to</i> use alternative extraction methods to access low grade ores.		d) <u>Cross curricular knowledge links</u> Sustainable development – geography
		<u>Lesson 6 – Life Cycle Assessments</u> ...<i>that</i> life cycle assessments are carried out to assess environmental impact of products ... <i>how to</i> carry out a life cycle assessment for shopping bags made of paper and plastic.	Life cycle assessment, manufacturing, packaging, lifetime, quantified, processing.	e) <u>Misconceptions</u> Water has been cycled through the water cycle millions of times; it can be purified easily. The reduction of energy use in cleaning water and recycling materials will reduce the amount of carbon dioxide produced.
		<u>Lesson 7 – Reducing the Use of Resources</u> ...<i>that</i> reducing, reusing, and recycling help to conserve resources. ... <i>how to</i> evaluate ways of reducing the use of materials.	Metals, glass, building materials, ceramics, quarrying, mining, recycled, melting, recasting, scrap, ore, extraction.	Fossil fuels will run out as it is a non-renewable resource, it can be made still however it takes longer to make it than the time we use it in.