Year 10 Topics

In year 10 we teach the following modules over the course of the year. Each module draws on prior learning from previous years and builds on understanding from the KS2 programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at KS3 and KS4.

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment	
Atomic structure	The periodic table provides chemists	Atoms, elements, compounds, mixtures	Atoms, elements, compounds, mixtures	Separation techniques, Filtration, distillation,	
and the periodic table	with a structured organisation of the known chemical	Separating mixtures – distillation – Liebig Condenser, boiling points	Separation techniques, Filtration, distillation, Crystallisation.	Crystallisation. Safe use of a range of equipment to separate	
	elements from which they can	Separating mixtures – salt and sand – sea water practical – filtration (portion for evaporation)	Evaporation	chemical mixtures. Numeracy.	
	make sense of their physical and	Sea water practical continued, distillation	Distillation, Liebig Condenser		
	chemical properties	History of the atom, structure of the atom, masses and charges of PEN	protons, neutrons and electrons		
		Calculate number of protons, neutrons and electrons in atoms and ions definition and recognition of isotopes	protons, neutrons and electrons isotopes		
Atomic structure	The historical development of the	History of the atom, structure of the atom, masses and charges of PEN		This historical context provides an opportunity	
and the periodic	periodic table and models of atomic	Calculate number of protons, neutrons and electrons in atoms and ions definition and recognition of isotopes		for students to show an understanding of why and	
table	structure provide good examples of	Electronic structure, drawing electron configurations	Electron configurations, shielding.	describe how scientific methods and theories	
	how scientific ideas and explanations develop over time	History of the periodic table timeline of development up to modern periodic table Newlands and Mendeleev		develop over time.	
	as new evidence emerges.	The modern periodic table, groups, periods, metals, non-metals, transition metals, group 0			
		Group 7 – the Halogens – electronic structure and reactions			
		Explaining trends in Group 7 – link to electronic structure			
		History of the atom, structure of the atom, masses and charges of PEN			

Topic	Rationale	Knowle	dge acquisition	Key vocabulary	Skills and enrichment e.g
Bonding, Structures	Chemical bonds are the glue that hold	1.	Structure of the atom (revision)	Proton, Neutron, Electron, Negligible	Opportunities for learners to
and Properties	substances together. The	2.	Formation of ions and ionic bonding	Ion, positive, negative, cation, anion, transfer, noble gas, configuration, ionic	demonstrate their research skills – for an
	attraction of one atom to another	3.	Ionic compounds and properties of giant ionic lattices	Giant, lattice, 3D, ions, conductivity, brittle, soluble, electrostatic	individual transition element. This could
	determines a substances	4.	Covalent bonding dot and cross diagrams	Venn diagram, covalent, share	be presented as an extended piece of
	chemical reactivity and its physical properties. Understanding how	5.	Simple covalent molecules and polymers	Polymer, manufactured, covalent, molecule, monomer, polymerisation, thermosetting, thermosoftening, intermolecular	prose (literacy) or 2 minute oral presentation (oracy) Some opportunities
	these can be determined by	6.	Giant covalent structures, to include diamond and graphite	Brilliant, strong, hard, lubricant,	for learners to develop their
	considering the atoms involved within the	7.	Nanoparticles, to include graphene, fullerenes and nanotubes	Pure, element, lubricant, delocalised, covalent	practical skills, especially those of qualitative observation.
	substance can be used to advance our understanding of materials science and where research may go in the immediate future.	Metallic bonding and the properties of metals	Delocalised, electrostatic, electron, conduction	Learners could analyse the use and appropriateness of a range of materials for specific purposes. Further research opportunities exist for learners to demonstrate the new and diverse use of nanoparticles.	

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment e.g independence, problem solving, evaluation, analysis, creativity, literacy, numeracy and oracy
4.3.1 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	What is relative atomic and relative formula mass?	Mass number, formula mass, formula, equation, reactants, products	Independence: Identify a chemical reaction that has a high atom economy and research the positives to industry of
		Why do we need to know percentage yield and atom economy?	Completion, reversible, yield, reactant, product, theoretical, atom economy	producing a high yield of useful product. Independence: Identify a chemical reaction
		What are moles and how do we calculate them?	Moles, mol, substance, Avogadro	that has a low atom economy and research the negatives to industry of producing a low yield of useful product and ways the
		How can we apply moles to work out reacting masses?	Balanced, equation, moles, masses, grams	reactions has been improved to increase the yield of useful product.
		How can we apply moles to balance equations?	Balancing, equation, converting, reactants, products	Problem solving: Finding x in hydrated
		How can we apply moles to work out limiting factors?	Limiting reagents, reactants, quantity	magnesium sulphate
		How can we use moles to work out the number of moles of gas?	Volume, temperature, pressure, volumes, gaseous	Practical skills: Titrate HCl with NaOH using an indicator of methyl orange. Use the titre results and know volumes of
	representing chemical reactions and are a key way for chemists to communicate chemical ideas.	How do we calculate the concentration of solutions?	Solutions, concentration, volume, solute	NaOH and concentration, to calculate the concentration of the HCl. REQUIRED PRACTICAL – TITRATION

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment e.g independence, problem solving, evaluation, analysis, creativity, literacy, numeracy and oracy
Chemical Changes	Understanding of chemical changes began when people began experimenting with	How does the pH scale work?	pH, hydrogen ions, concentration, neutralisation reaction,	Practical: (chemistry only) determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration. REQUIRED PRACTICAL SEPARATES ONLY TITRATION
	chemical reactions in a systematic way and organising their results logically. Knowing about	How can we accurately calculate the amount of acid needed to neutralise and alkali? (SEPARATES ONLY)	Burette, pipette, indicator, endpoint, titrations, concentration	Numeracy: practice order of magnitude calculations Research: research the extraction of aluminium and explain why the process is energy intensive
	these different chemical changes meant that scientists could begin to predict exactly what new	What is the difference between a strong and weak acid?	ionisation, strong and weak acids, neutrality, relative acidity, dilute and concentrated	Practical: investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis. REQUIRED
	substances would be formed and use this knowledge to develop a wide range of different materials and processes	What is electrolysis?	lonic compound, electrolysis, electrolytes, ions, discharge, electrodes, half equations, molten, aqueous.	PRATICAL ELECTROLYSIS
		How do we represent the process at each electrode?	Electrode, half equations, oxidation, reduction	

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment e.g
4.5 Energy	Energy changes are an important part of	Energy transfer during		Practical skills development - An
changes	chemical reactions. The interaction of	exothermic and	Exothermic	opportunity to measure
	particles often involves transfers of energy	endothermic reactions	Endothermic.	temperature changes when
	due to the breaking and formation of			substances react or dissolve in
	bonds.	Using energy transfer	activation energy	water.
		reactions	energy level	
	Reactions in which energy is released to	Reaction profiles for	reaction profiles	analysis – Draw simple reaction
	the surroundings are exothermic	exothermic and		profiles (energy level diagrams) for
	reactions, while those that take in thermal	endothermic reactions		exothermic and endothermic
	energy are endothermic. These	Bond energy calculations	Energy change	
	interactions between particles can	(HT only)		Analysis - Use reaction profiles to
	produce heating or cooling effects that			identify reactions as exothermic or
	are used in a range of everyday			endothermic.
	applications.	Cells and batteries	Energy transferred	Numeracy skills - Calculate the
	Separate		Chemical reaction.	energy transferred in chemical
			Cells and batteries	reactions.
	Some interactions between ions in an		Voltage.	
	electrolyte result in the production of		Electrode and electrolyte.	Extended writing: write instructions
	electricity. Cells and batteries use these		Alkaline batteries	to another student how to calculate
	chemical reactions to provide electricity. Electricity can also be used to decompose		Fuel cells	the energy transferred in a chemical
	ionic substances and is a useful means of	For all and la		reaction.
	producing elements that are too	Fuel cells	Oxidation	
	expensive to extract any other way.		oxidised electrochemically	Analysis - Be able to interpret data
	expensive to extract any other way.		half equations Electrode	in terms of the relative reactivity of
			Electrode	different metals and to evaluate the
				use of cells.
				Evaluate Personal and evaluate
				Evaluate - Research and evaluate uses of cells and batteries.
				uses of cells and batteries.
				Practical skills development
				Construct simple cells using
				combinations of metal strips
				combinations of metal strips
				•

chemical change change 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 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. The Thiosulfate with water 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study The Theorem Process; a case study The Challeler (HT), equilibrium, position, position, position, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state To Collision theory and factors affecting the rate of reaction of rate of reaction of any drochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion The Thiosulfate Cross 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Collision theory and factors affecting the catalyst, temperature, surface area, state 16. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state 17. Required Practical Rates of Reaction processure, sufficient, catalyst, temperature, surface area, state 18. Required Practical Rates of Reaction processure, sufficient, catalyst, temperature, surface area, state 19. Expersible Reaction processure, sufficient, catalyst, temperature, controlly variable, rate, concentration, processure, sufficient, catalyst, temperature,	Topic	Rationale	Knowled	dge acquisition	Key vocabulary	Skills a	nd enrichment e.g
chemical change 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 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. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state 10. Collision theory and factors affecting the rate of reaction 11. Required Practical – Rates of Reaction – The Thiosulfate Cross 12. Reversible Practical – Rates of Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state 16. Collision theory and factors affecting the rate of reaction in rate and yield of product. 17. Required Practical – Rates of Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated Practical – Rates of Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 18. Equilibria and factors affecting the equilibrium position 19. Equilibria and factors affecting the reaction of anhydrous copper sulfate with water 19. Equilibria and factors affecting the reaction of anhydrous copper sulfate with water 19. Equilibrium position 19. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, controlly variable, rate, concentration, pressure, sufficient, catalyst, temperature,	Rate and	-	9.	How to	Product, reactant, rate, mean, tangent,	•	Wide range of
change 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 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. 12. Required Practical – Rates of Reaction – The Thiosulfate Cross 12. Reversible reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, catalyst, temperature, surface area, state derwa a suitable tar a graph with a curv of best fit. 16. Essential opportun learneed to practice and derwa suitable tar a graph with a curv of best fit. 17. Required Practical – Rates of Reaction – Short, product, toinsulphate. Erlenmeyer, obscure, hypothesis, conclusion observation when measuring data as with rate of reaction determination. 18. Required Practical – Rates of Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 19. Equilibrium, dynamic, pressure, equilibrium, position, a straight line. 19. Learners will also or to develop their mathematical mas determine the grad a straight line. 20. Learners will also or to develop their mathematical mas determine the grad a straight line. 21. The Haber Process; a case study	extent of	different rates. Whilst the reactivity of		determine the	gradient, slope		opportunities for learners
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 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. The Thiosulfate cross of Reaction of an energy-efficient way. The Thiosulfate reactions of the reaction of an energy-efficient way. The Thiosulfate reactions of the reaction of an energy-efficient way. The Thiosulfate reactions of the reaction of an energy-efficient way	chemical	chemicals is a significant factor in how fast		rate of a			to demonstrate their
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 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. 10. Collision theory and factors affecting the rate of reaction for eaction, pressure, affect area, sufficient, catalyst, temperature, surface area, state 11. Required Practical – Rates of Reaction – The Thiosulfate Cross 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Collision, particle, energy, activation, rate, concentration, pressure, sufficient, a daralyst, temperature, surface area, state 16. Collision theory and factors affecting the rate of reaction preactions, pressure, catalyst, temperature, concentration, pressure, sufficient, affecting the rate of reaction of best fit. 16. Essential opportunt learners to develop practical skills, esp tobscure, hydrous, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 17. Reversible reaction of anhydrous copper sulfate with water 18. Equilibria and factors affecting the rate of reaction of best fit. 19. Essential opportunt learners to develop practical skills, esp to develop practical skills to develop practical skills, esp to develop practical skills to develop practical skills, esp to develop practical skills t	change	• •		chemical			graphing skills. All learners
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 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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the rate of reaction of anhydrous copper sulfate with water 14. The Haber Process; a case study 15. Consentration, pressure, sufficient, catalyst, temperature, surface area, state of peaction, catalyst, temperature, surface area, state of peaction, catalyst, temperature, surface area, state of peaction. 16. Dependent, independent, control, variable, rate, concentration, hydrochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion 16. Essential opportunt learners to develop practical skills, esp those of quantitati observation when measuring data ass with rate of reaction determination. 17. Equilibria and factors affecting the rate of reaction of anhydrous copper sulfate with water 18. Equilibria and factors affecting the rate of reaction of anhydrous copper sulfate with water 19. Equilibrium, prosure, temperature, catalyst, shift, forward, backward 19. Equilibrium, position, backward 19. Equilibrium, pressure, catalyst, shift, forward, backward 19. Equilibrium, position, backward 19. Equilibrium, prosure, catalyst, shift, forward, backward 20. Ecarres will also reaction of a trace of reaction of anhydrous collecting data. 20. There is a need for to develop their mathematical mas determine the grad a straight line.		· · · · · · · · · · · · · · · · · · ·		reaction			need to practice and
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 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. 12. Reversible reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the rate of reaction 14. The Haber Process; a case study 15. Required Practical – Rates of Reaction – The Thiosulfate Cross 16. Reaction – The Thiosulfate Cross 17. Required Practical – Rates of Reaction – The Thiosulfate Cross 18. Reversible reactions, to include the reaction of anhydrous 19. Essential opportunt learners to develop practical skills, esp those of quantitati observation when measuring at with rate of reaction of anhydrous copper sulfate with water 19. Essential opportunt learners to develop practical skills, esp those of quantitati observation when measuring and assimate of reaction of anhydrous copper sulfate with water 19. Earners will also reaction, to include the reaction of anhydrous copper sulfate with water 19. Essential opportunt learners to develop practical skills, esp those of quantitati observation when measuring and a collecting data. 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Essential opportunct of Reaction – Process; a case study		order to speed them up or slow them	10.	Collision theory	Collision, particle, energy, activation, rate,		demonstrate the ability to
different variables needs to be established in order to identify how to maximise the yield of desired product. In industry, chemists and chemical engineers 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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Required Practical – Rates of Reaction — Dependent, independent, control, variables, conclusion of best fit. 16. Essential opportunt learners to develop practical skills, espentous on beautilities. Elemeyer obscure, hypothesis, conclusion 16. Required Practical – Rates of Reaction — Dependent, independent, control, variables, conclusion of best fit. 18. Required Practical – Rates of Reaction — Obscure, hypothesis, conclusion 19. Reversible reactions, to include the reactions, to include the reaction of anhydrous copper sulfate with water 19. Reversible reaction, to include the reaction, bydrated 19. Reversible reaction, to include the reaction of anhydrous copper sulfate with water 19. Reversible reaction, to possure, hypothesis, conclusion 19. Reversible reaction, to product, forward, backward, reversible, equilibrium, rate, anhydrous, they are determination. 19. Learners need to entermine the gradient determination. 19. Learners need to entermine the gradient determination. 19. Learners unit and particular time, and in determination. 20. Learners need to entermine the gradient determination. 21. There is a need for to develop their mathematical mass determine the gradient determination. 22. Le Chatelier (HT), equilibrium, position, shift, rate, pressure, catalys		down. Chemical reactions may also be		and factors	concentration, pressure, sufficient,		draw a suitable tangent on
in order to identify how to maximise the yield of desired product. In industry, chemists and chemical engineers 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. 11. Required Practical – Rates of Reaction – The Thiosulfate Cross 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Required Practical – Rates of Reaction, hydrochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion 16. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 17. Required Practical – Rates of Reaction – The Thiosulfate Cross 18. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 19. Essential opportung learners to develop practical skills, esp obscrvation when measuring data ass with rate of reaction of anhydrous copper sulfate with water 19. Equilibrium, rate, anhydrous, hydrated 19. Learners need to e the use of suitable when measuring a collecting data. 19. There is a need for to develop their mathematical mas determine the grad a straight line. 19. Cross		reversible and therefore the effect of		affecting the	catalyst, temperature, surface area, state		a graph with a curved line
yield of desired product. In industry, chemists and chemical engineers 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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 16. Reaction – The Thiosulfate cross 17. Reaction – The Thiosulfate voluct, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 18. Equilibria and factors affecting the equilibrium position 19. Reactant, product, forward, backward 19. Reactant, product, forward, backward 19. Reactant, product, forward, backward 19. Learners to develop practical skills, esp those of quantitation observation when measuring data ass with rate of reaction of the use of suitable when measuring at collecting data. 19. Equilibrium, position 10. Learners need to entermination. 11. The Haber Process; a case study 12. Reversible reactions, to include the reaction of anhydrous, hydrated 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Reversible reversible, equilibrium, rate, anhydrous, hydrated 16. Reactant, product, forward, backward 18. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Learners will also reversible, equilibrium, position, shift, rate, pressure, catalyst, temperature, compromise, condition, be able to determine the grad a straight line.		different variables needs to be established		rate of reaction			of best fit.
chemists and chemical engineers 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. 12. Reversible reactions, to include the anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study hydrochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward processers to ensure that enough product is produced within a sufficient time, and in an energy-efficient way. 13. Equilibria and factors affecting the equilibrium, position 14. The Haber Process; a case study hydrochloric, thiosulphate. Erlenmeyer, obscure, hypothesis, conclusion Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward • There is a need for to develop their mathematical mas determine the grad a straight line. • Learners will also r be able to determi		•	11.	Required	Dependent, independent, control,	•	Essential opportunities for
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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Reversible reaction, to include the reaction of anhydrous, hydrated 16. Equilibrium, rate, anhydrous, reversible, equilibrium, rate, anhydrous, hydrated 17. Reversible reaction, to include the reaction of anhydrous copper sulfate with water 18. Equilibria and factors affecting the equilibrium position 19. The Thiosulfate Cross 19. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 19. Equilibrium, rate, anhydrous, hydrated 19. Learners need to each the use of suitable with rate of reaction determination. 19. Learners will also reaction of those of quantitation observation when measuring data associated the reaction of anhydrous, hydrated 19. Equilibrium, rate, anhydrous, hydrated 19. Learners need to each the use of suitable with rate of reaction determination. 19. Learners and yield of product in the equilibrium, rate, anhydrous, hydrated 19. Equilibrium, rate, anhydrous, hydrated 19. Equilibrium, dynamic, pressure, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, catalyst, shift, forward, backward 20. Clearners will also reaction of those observation when measuring data associated the reaction of the use of suitable observation when measuring data associated the reaction of the use of suitable observation when measuring data associated the reaction of the use of suitable observation observation when measuring data associated the reaction of the use of suitable observation observation observation observa		· · · · · · · · · · · · · · · · · · ·		Practical – Rates	variable, rate, concentration,		learners to develop their
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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 16. Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 18. Equilibria and factors affecting the equilibrium position 19. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 19. Reversible reaction, to include the reaction of anhydrous 19. Equilibrium, rate, anhydrous, hydrated 10. Equilibrium, and the measuring data ass with rate of reaction determination. 10. Equilibrium, and a collecting data. 11. Equilibrium and factors affecting the grad ass with rate of reaction determination. 10. Equilibrium, and a collecting data. 11. Equilibrium, and a collecting data. 12. Reversible anhydrous, hydrated 13. Equilibrium, and a collecting data. 14. The Haber anhydrous, hydrated 15. Equilibrium, anhydrous, hydrated 16. Learners need to enthe the use of suitable when measuring data ass with rate of reaction determination. 18. Equilibrium, anhydrous, hydrated 19. Equilibrium, anhy		_		of Reaction –	hydrochloric, thiosulphate. Erlenmeyer ,		practical skills, especially
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. 12. Reversible reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Reversible Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 16. Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 18. Equilibria and factors affecting the equilibrium position 19. Reactant, product, forward, backward, reversible, equilibrium, rate, anhydrous, hydrated 19. Learners need to endetermination. 10. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19.				The Thiosulfate	obscure, hypothesis, conclusion		those of quantitative
made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way. The Haber Process; a case study made, they carry out optimisation reactions, to include the reactions, to include the reaction of anhydrous, hydrated reactions, to include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 16. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 17. The Haber Process; a case study 18. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, shift, rate, pressure, catalyst, temperature, compromise, condition, be able to determine the grad a straight line.							observation when
processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way. include the reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study processes to ensure that enough product include the reaction of anhydrous copper sulfate with wated 14. The Haber Process; a case study include the reaction of anhydrous copper sulfate with wated 15. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 16. Learners need to enthe the use of suitable when measuring and collecting data. 18. Equilibrium, backward 19. Chatelier (HT), equilibrium, position, shift, rate, pressure, catalyst, shift, rate, pressure, catalyst, shift, rate, pressure, condition, be able to determine the grade as traight line.		•	12.	Reversible			measuring data associated
is produced within a sufficient time, and in an energy-efficient way. reaction of anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study reaction of anhydrous copper sulfate with water Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward Le Chatelier (HT), equilibrium, position, shift, rate, pressure, catalyst, temperature, compromise, condition, Learners need to entire the use of suitable when measuring and collecting data. There is a need for to develop their mathematical mass determine the grade a straight line. Learners will also reaction of anhydrous copper sulfate with use of suitable when measuring and collecting data. There is a need for to develop their mathematical mass determine the grade a straight line. Learners will also reaction of anhydrous copper sulfate with use of suitable when measuring and collecting data. There is a need for to develop their mathematical mass determine the grade a straight line.		· · · · · · · · · · · · · · · · · · ·		reactions, to	reversible, equilibrium, rate, anhydrous,		with rate of reaction
an energy-efficient way. anhydrous copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study anhydrous copper sulfate with water Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward backward 14. The Haber Process; a case study backward 15. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward a straight line. • Le Chatelier (HT), equilibrium, position, shift, rate, pressure, catalyst, shift, rate, pressure, condition, be able to determine the grade at the use of suitable when measuring and collecting data. • There is a need for to develop their mathematical mass determine the grade at the use of suitable when measuring and collecting data. • There is a need for to develop their mathematical mass determine the grade at the use of suitable when measuring and collecting data.				include the	hydrated		determination.
copper sulfate with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Equilibria and factors affecting the equilibrium position 16. The Haber Study 17. The Haber Study 18. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 18. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 19. There is a need for to develop their mathematical mass determine the grad a straight line. 19. Equilibrium, position, shift, rate, pressure, catalyst, shift, rate, pressure, catalyst, shift, forward, be able to determine the grad a straight line.		-				•	Learners need to employ
with water 13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Equilibria and factors affecting temperature, catalyst, shift, forward, backward 16. Equilibrium backward 17. The Haber Le Chatelier (HT), equilibrium, position, shift, rate, pressure, catalyst, shift, forward, to develop their mathematical mass determine the grade a straight line. 14. The Haber Shift, rate, pressure, catalyst, shift, forward, to develop their mathematical mass determine the grade a straight line.		an energy-efficient way.		•			the use of suitable units
13. Equilibria and factors affecting the equilibrium position 14. The Haber Process; a case study 15. Equilibria and factors affecting temperature, catalyst, shift, forward, backward 16. Equilibrium, dynamic, pressure, temperature, catalyst, shift, forward, backward 17. The Haber Le Chatelier (HT), equilibrium, position, shift, rate, pressure, catalyst, shift, rate, pressure, catalyst, shift, rate, pressure, catalyst, shift, forward, temperature, compromise, condition, be able to determine the gradual straight line.				• •			when measuring and
factors affecting the equilibrium position 14. The Haber Process; a case study 15. The Haber Study 16. The Haber Study 17. The Haber Study 18. The Haber Study 19. The Habe							_
the equilibrium position 14. The Haber Process; a case study the equilibrium backward Dackward Determine the grade a straight line. Shift, rate, pressure, catalyst, be able to determine the grade a straight line. Dackward Dackwar			13.	•		•	There is a need for learners
position 14. The Haber Process; a case study 15. The Haber Process; a case study 16. Chatelier (HT), equilibrium, position, a straight line. 17. Le Chatelier (HT), equilibrium, position, a straight line. 18. Le Chatelier (HT), equilibrium, position, a straight line. 18. Learners will also recomposition, be able to determine the grade a straight line.				•			•
14. The Haber Le Chatelier (HT), equilibrium, position, a straight line. Process; a case study temperature, compromise, condition, be able to determine the component of the co					backward		mathematical mastery to
Process; a case shift, rate, pressure, catalyst, temperature, compromise, condition, be able to determine				•			determine the gradient of
study temperature, compromise, condition, be able to determi			14.			1	_
		_		,	• • •	•	Learners will also need to
qualitative(HT) intercept on a linear		_		study	· · · · · · · · · · · · · · · · · · ·		be able to determine the
					qualitative(HT)	1	intercept on a linear graph.
						1	
						1	

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment e.g independence, problem solving, evaluation, analysis, creativity, literacy, numeracy and oracy
4.7 Organic Chemistry - Separates Only Content	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	Polymerisation of alkenes and properties of polymers	Homologous series, alkene, unsaturated, polymerisation, thermosetting, thermo-softening, monomer, polymer, repeat unit, polymer structure	Analysis: Recognise substances that are alkenes from their names or from given formulae in these forms Problem solving: Model polymerisation using molecular model kits.
	bonds. This branch of chemistry gets its name from the fact that the main sources of organic	Reactions of alkenes	Functional group, combustion, complete, incomplete, addition reactions	Independence: Research uses of simple polymers.
	compounds are living, or once- living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.	Alcohols, acids and esters functional groups and properties	Functional group, carboxylic acid, ester, ethyl ethanoate, strong and weak acids	Evaluation: Look at the suitability of different types of polymers for their function
		Alcohols, acids and esters reactions Condensation polymers	Combustion, oxidising agent, fermentation, glucose, yeast Condensation polymerisation,	Independence: Research uses of common alcohols.
n u p		Amino acids	monomers, repeat units Amino acids, polypeptides, proteins	Practical skill: investigating the reactions of alcohols.
		Natural Polymers and DNA	Deoxyribonucleic acid, polymer chains, nucleotides, double helix	Evaluation: comparison and evaluation of the environmental impacts of production of ethanol from steam hydration of ethane and fermentation of glucose with yeast.
				Practical skill: investigating the reactions of carboxylic acids.

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment e.g independence, problem solving, evaluation, analysis, creativity, literacy, numeracy and oracy
4.8.1 Purity, Formulations and Chromatography 4.8.2 Identification	Analysts have developed a range of qualitative tests to detect specific chemicals in order to determine the purity of substances and the presence	What is the difference between pure and impure substances and how can you distinguish between the two?	Pure, substance, melting point, boiling point, distinguish, impure	Independence: research the melting points and boiling points of common pure substances and compounds. Suggest reasons for different data being available on the internet.
of common gases	of gases. Purity of samples can be checked using	What is a formulation and why are they useful?	Mixture, product, purpose, fertilisers,	Independence: research the composition
	chromatography.	How do we separate mixtures using simple paper chromatography?	Separation, identification, stationary, mobile, phase, retention factor, soluble, solvent, solute, solution dissolve, chromatograms	 of the following formulations: Fuel Cleaning agents Paints Medicines
		How do identify common atmospheric gases?	Hydrogen, oxygen, carbon dioxide, chlorine, splint, burning, glowing, lime water, calcium hydroxide, cloudy, precipitate, litmus paper, bleach	Practical skills: Investigate how paper chromatography can be used to separate and tell the difference between coloured substances, including the calculation of Rf values REQUIRED PRACTICAL - CHROMATOGRAPHY
				Analysis: analyse the composition of various tubes of gas by carrying out simple gas tests
4.8.3 Identification of ions by chemical and spectroscopic means	Chemical tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a	How can we use flame tests to identify positive ions?	Flame tests, metals, species, ions	Practical skills: use flame tests to identify positive metal ions and to investigate the masking effect of mixtures in the Bunsen flame REQUIRED PRACTICAL – IDENTIFYING IONS

precipitate. Instrumethods provide and accurate me analysing chemic particularly useful amount of chemic	fast, sensitive hydroxide to identify positive ions? als, and are all when the call being	Solutions, coloured, white precipitates	Practical skills: make precipitates of metal hydroxides to identify positive ions, investigate the difficult in distinguishing magnesium, calcium and aluminium as they produce a white precipitate REQUIRED PRACTICAL – IDENTIFYING IONS
analysed is small scientists and dru scientists rely on instrumental med work.	negative ions?	Carbonates, halides, sulfates	Practical skills: produce carbon dioxide gas a test for carbonates, use barium chloride to identify sulphates, use acidified silver nitrate to identify precipitates of halides, highlighting the difficulty of identify halides individually without direct comparison REQUIRED PRACTICAL – IDENTIFYING IONS
	Are there advantages to using instrumental methods over chemical methods?	Identification, instrumental, accurate, sensitive, rapid	Independence: Students could research the use of different spectroscopic techniques
	What is flame emissio spectroscopy?	Flame emission spectroscopy, spectroscope, spectrum, concentrations, metal ions	Practical skills: observe flame spectra using a hand-held spectroscope Analysis: analyse emission spectra using data in chart or tabular form.