

## Key Stage 4 Long Term Planning

Year 9 2020-2022 **For current year 10 and year 11 students**

Faculty Area: Chemistry Trilogy Science

Year 9	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Syllabus</b>			AQA Chemistry Collins - Chapter 1 Atomic Structure and the Periodic Table		AQA Chemistry Collins - Chapter 2 Structure, Bonding and the Properties of Matter	
<b>Connections to prior learning</b>						
<b>Knowledge</b>			Structure of the Atoms, mixtures and compounds Construct word equations Filtration Crystallization Simple distillation Fractional distillation Chromatography Models of the atom Electron structure The periodic table		Chemical bonds- ionic, covalent and metallic Simple and giant structures States of matter Polymers Properties of molecules Fullerenes	
<b>Skills</b>			Plan investigations, make observations and analyse data Model atoms (using physical models or computer simulations). Multiple Separation techniques Create a timeline for the history of the atomic model. Demonstration of reactivity of Na, Li and K in water with universal indicator. Carry out displacement reactions Write word equations for reactions Identify anomalies.		Plan investigations, make observations and analyse data Draw the dot and cross diagram for reactions. Model the sodium chloride lattice using molecular model kits. Practically test the conductivity of ionic compounds. Practically test the conductivity of simple covalent substances Investigate the properties of plastic bags Research some uses of metallic substances.	
<b>Assessment</b>			End of unit test for Chapter 1 Atomic Structure and the Periodic Table		End of unit test for Chapter 2 Structure, Bonding and the Properties of Matter	
<b>Homework</b>			GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions		GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	
<b>Cultural enrichment including Trips, Visits, Experiences, Extra-curricular</b>	<b>School and University Network</b> Trip 1-Health and Medicine Trip 2-Law and Business Trip 3-Media and Higher Education					

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<p><b>Literacy</b></p>			<p>Use scientific conventions to identify chemical symbols. Describe each practical technique of separating mixtures. Describe the differences between the plum-pudding model, nuclear model and atomic model. Create a timeline for the history of the periodic table. Describe the trends in properties</p> <p>Keywords: Alkali metals, Atom, Atomic number, Chromatography, Compound, Crystallisation, Displacement, Electron, Electron shell, Element, Filtration, Fractional distillation, Group (periodic table), Halogens, Ion, Isotope, Mass number, Metals, Mixture, Neutron, Non-metals, Nuclear model, Periodic table, Plum pudding model, Proton, Relative atomic mass, Simple distillation, Transition metals,</p>	<p>Extended writing tasks e.g.: describe the properties of matter in a solid, liquid and gas. Write up investigations Develop skills to communicate through use of symbolic equations</p> <p>Keywords: particles, Conductor, Covalent bond, Diamond, Electrostatic forces, Empirical formula, Fullerenes, Gas, Graphene, Graphite, Ion, Ionic compound, Intermolecular forces, Lattice, Liquid, Metallic bond, Metals, Molecular formula, Non-metals, Particle theory, Polymers, Repeat unit, Solid, State symbols,</p>
<p><b>Numeracy</b></p>			<p>Describe the relationship between number of positive and negative charges. Apply this relationship to explain why there is no overall charge. Calculate how many electrons there can be in the first, second and third energy shells. Identify link between electron configuration and the structure of the periodic table for elements 1 to 20</p>	<p>Translate data between diagrammatic and numeric forms Students should be able to visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.).</p>
<p><b>CIAG</b></p>	<p>Future Morph resources aim to show students that there is a wide choice of options open to those who study sciences</p>	<p>NCW STEM lessons – where can science take you?</p>	<p>Future Morph Careers Quest-students quiz exhibitors at The Big Bang Fair about their chosen career, why they chose it and what it involves</p>	

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### Year 10 2020-2022 SYLLABUS:

Curriculum Area: Chemistry Trilogy Science

Year 10	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Syllabus</b>	AQA Chemistry Collins - Chapter 4 Chemical Changes		AQA Chemistry Collins - Chapter 5 Energy Changes	AQA Chemistry Collins - Chapter 6 The rate and extent of Chemical Reactions	AQA Chemistry Collins - Chapter 7 Hydrocarbons	AQA Chemistry Collins - Chapter 8 Chemical Analysis
<b>Connections to prior learning</b>						
<b>Knowledge</b>	Reactivity of metals Extraction of metals Oxidation and reduction reactions Reactivity of acids Neutralization reactions Electrolysis Predicting the products, using common reactants		Exothermic and endothermic reactions Reaction profiles Fuel cells Cells and batteries	Rate of reaction Factors which affect the rates of chemical reactions Reversible reaction systems at equilibrium	Carbon compounds as fuels and feedstock	Chemical analysis Purity, formulations and chromatography Identification of common gases
<b>Skills</b>	Required Practical: Making Salts AT 2 safe use of appropriate heating devices and techniques including the use of a Bunsen burner and water bath or electric heater AT 4 safe use of a range of equipment to purify and/or separate a chemical mixture including evaporation, filtration and crystallisation AT 6 safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products Required Practical: Electrolysis AT 3 use of appropriate apparatus and techniques for conducting and monitoring chemical reactions including appropriate reagents and/or techniques for the measurement of pH in different situations AT 7 use of appropriate apparatus and techniques to		Required Practical: Temperature Change AT1 use of appropriate apparatus to make and record a range of measurements accurately, including mass, temperature and volume of liquids AT 5 making and recording appropriate observations during chemical reactions including changes in temperature AT 6 safe and careful handling of gases, liquids and solids, including careful mixing	Required Practical: Rates of Reaction AT1 use of appropriate apparatus to make and record a range of measurements accurately, including mass, time, temperature and volumes of liquids and gases AT 3 use of appropriate apparatus and techniques for conducting and monitoring chemical reactions AT 5 making and recording appropriate observations during	Plan investigations, make observations and analyse data Plot boiling points of alkanes against number of carbons. Make predictions of the boiling points of other alkanes. Research uses of the fractions of crude oil. Test for saturation and unsaturation in compounds.	Required Practical Chromatography AT 4 safe use of a range of equipment to purify and/or separate chemical mixtures including chromatography Plan investigations, make observations and analyse data Research the composition formulations: Use chemical tests to identify the ions in unknown single ionic compound

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	<p>draw, set up and use electrochemical cells for separation and production of elements and compounds</p> <p>investigate the reactivity of some of the metals with water and acid.</p> <p>Mix reagents to explore chemical changes and/or products</p> <p>Research different methods for extraction metals from their oxides.</p> <p>Carry out simple displacement reactions.</p> <p>Investigate the reactions of metals with sulfuric acid</p>	<p>of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products</p> <p>Plan investigations, make observations and analyse data</p> <p>Investigate the variables that affect temperature changes in reacting solutions</p> <p>displacement of metals. Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions</p>	<p>chemical reactions including the measurement of rates of reaction by a variety of methods such as production of gas and colour change</p> <p>AT 6 safe and careful handling of liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes</p> <p>Plan investigations, make observations and analyse data</p> <p>React <math>\text{CaCO}_3</math> with dilute HCl and measure the volume of <math>\text{CO}_2</math> evolved against time.</p> <p>Record the results and plot a graph of results of volume of gas against time.</p> <p>Develop a hypothesis. Predict and explain using collision theory the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction.</p> <p>Predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio.</p>		
<b>Assessment</b>	End of unit test for Chapter 4 - Chemical Changes	End of unit test for Chapter 5 - Energy Changes	End of unit test for Chapter 6 - The rate and extent of Chemical Reactions	End of unit test for Chapter 7 - Hydrocarbons	End of unit test for Chapter 8 - Chemical Analysis

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<b>Homework</b>	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions
<b>Cultural enrichment including Trips, Visits, Experiences, Extra-curricular</b>	<u><b>School and University Network</b></u> Trip 1- Magnets and Motors Trip 2- Life on Mars				
<b>Literacy</b>	<p>Write word and balanced symbol equations for the reactions of metals with oxygen to produce metal oxides.</p> <p>Compare the year of discovery of a metallic element with its position in the reactivity series.</p> <p>Compare and contrast the methods, evaluating the methods in terms of environmental, economic and social impacts.</p> <p>Keywords: Acid, Alkali, Crystallisation, Displacement, Electrolysis, Electrolyte, Extraction, Filtration, Negative electrode (cathode), Neutralisation, Oxidation, pH scale, Positive electrode (anode), Reduction, Universal indicator,</p>	<p>Write-up the practical investigations ensuring the following are included:</p> <ul style="list-style-type: none"> <li>• hypothesis</li> <li>• plan including identification of the independent, dependent and control variables</li> <li>• data collection</li> <li>• analysis of results</li> </ul> <p>evaluation of the results and plan.</p> <p>Extended writing: write instructions to another student how to calculate the energy transferred in a chemical reaction.</p> <p>Keywords:</p> <p>Activation energy, Battery, Endothermic reaction, Exothermic reaction, Reaction profile,</p>	<p>Use graphical data to explain each part of the graph.</p> <p>Research the work of Le Chatelier or the life of Fritz Haber.</p> <p>Highlight the moral ambiguity of Haber's work</p> <p>write instructions to another student how to calculate the mean rate of reaction.</p> <p>Extended writing: explain the effect on the rate of reaction of different factors</p> <p>investigate the catalytic effect of adding different metal salts to a reaction such as the decomposition of hydrogen peroxide.</p> <p>Keywords: Activation energy, Catalyst, Collision theory, Equilibrium, Pressure, temperature, concentration, collisions, kinetic energy, activation energy, Equilibrium, Le Chatelier's Principle, Rate of reaction, Reversible reaction</p>	<p>Draw bonding diagrams</p> <p>Describe processes e.g. fractional distillation &amp; formation of crude oil</p> <p>Look at the cultural and environmental impact of the oil industry around the world.</p> <p>Research and present the discovery of the structure of DNA</p> <p>Keywords: Alcohols, Alkanes, Alkenes, unsaturated, Carboxylic acids, Catalytic cracking, Combustion, Complete combustion, Crude oil, Cracking, DNA, Esters, Fermentation, Fractional distillation, Hydrocarbons, Polymers, Polypeptide, Steam cracking</p>	<p>Discuss the advantages and disadvantages of instrumental analysis versus test tube analysis.</p> <p>Research how firework manufacturers produce the different colours in fireworks</p> <p>Keywords: Chromatogram, Chromatography, Impure substance, *Instrumental methods, Litmus paper, Mobile phase, Precipitation, Pure substance, Rf value, Stationary phase</p>

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<b>Numeracy</b>	<p>Using common reactants, predict the products Deduce an order of reactivity of metals based on experimental results. Interpret or evaluate specific metal extraction processes when given appropriate information. Write ionic equations for displacement reactions. Explain in terms of gain or loss of electrons, that these are redox reactions. Explain thoroughly what happens at the following electrodes using suitable examples and half equations: cathode anode.</p>	<p>Measurements of temperature change Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions Be able to calculate the energy transferred in chemical reactions using bond energies supplied</p>	<p>Use the results and graph to determine the mean rate of reaction. Calculate the mean rate of a reaction from given information about the quantity of a reactant used or the quantity of a product formed and the time taken. Draw and interpret graphs showing the quantity of product formed or quantity of reactant used up against time. Draw tangents to the curves on these graphs and use the slope of the tangent as a measure of the rate of reaction. Calculate the gradient of a tangent to the curve on these graphs as a measure of rate of reaction at a specific time. Be able to interpret appropriate given data to predict the effect of a change in temperature on given reactions at equilibrium. Use simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction.</p>	<p>Write balanced symbol equations for the combustion of hydrocarbon fuels.</p>	<p>calculate the Rf value.</p>
<b>CIAG</b>		<p>NCW STEM lessons – where can science take you?</p>		<p>Careers in Physics Lesson (Step Up resources)</p>	

## Key Stage 4 Long Term Planning

Year 11 2020-2022

Curriculum Area: Chemistry Trilogy Science

Year 11	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
<b>Syllabus</b>	AQA Chemistry Collins - Chapter 9 The Atmosphere	AQA Chemistry Collins - Chapter 10 Sustainable Development	AQA Chemistry Collins - Chapter 3 Chemical Quantities and calculations		
<b>Connections to prior learning</b>					
<b>Knowledge</b>	The composition and evolution of the Earth's atmosphere Carbon dioxide and methane as greenhouse gases Common atmospheric pollutants and their sources	Using the Earth's resources and obtaining potable water Life cycle assessment and recycling Using materials	The law of conservation of mass relative atomic mass relative formula mass Change in mass Use of amount of substance in relation to masses of pure substances Chemical equations can be interpreted in terms of moles Limiting reactants		
<b>Skills</b>	Plan investigations, make observations and analyse data Use the internet to obtain data for concentrations of greenhouse gases. Evaluate the reliability of the data available on the internet. Research the process of peer review in reporting results/data.	Plan investigations, make observations and analyse data Required Practical: Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation. AT1 use of appropriate apparatus to make and record a range of measurements accurately including mass AT 2 safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater AT 3 use of appropriate apparatus and techniques for the	Plan investigations, make observations and analyse data Carry out the precipitation reaction: Explain what has happened to the mass during the experiment and why it has happened.		

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		measurement of pH in different situations AT 4 safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, distillation Research how water is treated.			
<b>Assessment</b>	End of unit test for Chapter 9 The Atmosphere	End of unit test for Chapter 10 Sustainable Development	End of unit test for Chapter 3 - Chemical Quantities and calculations		
<b>Homework</b>	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions	GCSE past paper exam questions Analysis / Evaluation of investigations Extended answer questions		
<b>Cultural enrichment including Trips, Visits, Experiences, Extra-curricular</b>	<b>School and University Network</b> Trip 1-Young Scientist Centre (details to be confirmed) Trip 2-Young Scientist centre				
<b>Literacy</b>	Extended writing: describe the theory of the evolution of the Earth's early atmosphere. Identify the effects of global warming. Explain the effects of climate change. Write word equations for complete and incomplete combustion.  Keywords: Acid rain, Carbon footprint, Environmental implication, Fossil fuels, Global climate change, Global dimming, Greenhouse effect, Greenhouse gases, Particulates, Photosynthesis, Pollutants	Research how water is treated. Extended writing: detail the methods involved in water treatment Extended writing: describe the processes of: phytomining bioleaching. Use information to interpret the LCA of a given material or product  Keywords: Alloy, Bioleaching, Corrosion, Desalination, Displacement, Electrolysis, Finite resources, Ground water, Life cycle assessment (LCA), , Ore, Phytomining, Potable water, Raw materials, Renewable resources, Sterilisation, Sustainable development, *The Haber process, Thermosetting polymers, Thermosoftening polymers	Write simple word equations. Write simple symbol equations. Extended writing tasks: write instructions to another student how to calculate the relative formula mass  Keywords: Actual yield, Avogadro constant, *Avogadro's law, Concentration, Conservation of mass, Limiting reactant, Relative formula mass, Thermal decomposition, Uncertainty		



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<b>Numeracy</b>	<p>Use data to calculate your own carbon footprint over a period/holiday.</p> <p>Suggest the effects on Earth and atmosphere of the calculated carbon footprint</p> <p>Draw accurate pie charts for the composition of the atmosphere</p> <p>Use the equation for photosynthesis</p>	<p>Extract and interpret information about resources from charts, graphs and tables.</p> <p>Use orders of magnitude to evaluate the significance of data.</p>	<p>Balancing chemical equations</p> <p>Define one mole in terms of Mr and Ar</p> <p>Calculate the number of moles in a substance using the relative formula mass.</p> <p>Be able to convert <math>\text{cm}_3</math> into <math>\text{dm}_3</math>.</p>		
<b>CIAG</b>	<p>Year 11: Studying science at KS5 lesson</p>			<p>NCW STEM lessons – where can science take you?</p>	