

## Key Stage 4 Long Term Planning

### Year 9

#### Faculty Area: Chemistry Single 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		AQA Chemistry Collins - Chapter 4 Chemical Changes	
<b>Connections to previous learning</b>	3.5.3 Periodic table Sort elements using chemical data and relate this to their position in the periodic table The elements in a group all react in a similar way and sometimes show a pattern in reactivity. As you go down a group and across a period the elements show patterns in physical properties. Metals are generally found on the left side of the table, non-metals on the right. Group 1 contains reactive metals called alkali metals. Group 7 contains non-metals called halogens. Group 0 contains unreactive gases called noble gases.		3.5.4 Elements Compare the properties of elements with the properties of a compound formed from them Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain. Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Name simple compounds using rules: change non-metal to –ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate.		3.6.1 Metals and non-metals Use experimental results to suggest an order of reactivity of various metals Metals and non-metals react with oxygen to form oxides which are either bases or acids. Metals can be arranged as a reactivity series in order of how readily they react with other substances. Some metals react with acids to produce salts and hydrogen. 3.6.2 Acids and alkalis Devise an enquiry to compare how well indigestion remedies work The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water. Acids have a pH below 7, neutral solutions have a pH of 7, alkalis have a pH above 7.	
<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 and nanotubes		Reactivity of metals Extraction of metals Oxidation and reduction reactions Reactivity of acids Neutralization reactions Electrolysis Predicting the products, using common reactants	
<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.		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		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	

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	Demonstration of reactivity of Na, Li and K in water with universal indicator. Carry out displacement reactions Write word equations for reactions Identify anomalies.	Research some uses of metallic substances.	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 draw, set up and use electrochemical cells for separation and production of elements and compounds investigate the reactivity of some of the metals with water and acid. Mix reagents to explore chemical changes and/or products Research different methods for extraction metals from their oxides. Carry out simple displacement reactions. Investigate the reactions of metals with sulfuric acid
<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	End of unit test for Chapter 4 - Chemical Changes
<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><u>School and University Network</u></b> Trip 1-Health and Medicine Trip 2-Law and Business Trip 3-Media and Higher Education		
<b>Literacy</b>	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  Keywords:	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 Keywords: *Coarse particles, Conductor, Covalent bond, Diamond, Electrostatic forces, Empirical formula, *Fine particles, Fullerenes, Gas, Graphene, Graphite, Ion, Ionic compound, Intermolecular forces, Lattice, Liquid, Metallic bond, Metals, Molecular	Write word and balanced symbol equations for the reactions of metals with oxygen to produce metal oxides. Compare the year of discovery of a metallic element with its position in the reactivity series. Link discoveries to new technology such as the invention of the battery. Compare and contrast the methods, evaluating the methods in terms of environmental, economic and social impacts.  Keywords: Acid, Alkali, Crystallisation, Displacement, Electrolysis, Electrolyte, Extraction, Filtration, Negative electrode (cathode), Neutralisation, Oxidation, pH scale, Positive

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	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,	formula, *Nanoparticles, *Nanoscience, Non-metals, Particle theory, Polymers, Repeat unit, Solid, State symbols,	electrode (anode), *Redox reaction, Reduction, *Titration, Universal indicator,
<b>Numeracy</b>	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	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.).	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.
<b>CIAG</b>	What workplace skills does chemistry develop?  Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.  Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.  Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate	What workplace skills does chemistry develop?  Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.  Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.  Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.	What workplace skills does chemistry develop?  Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.  Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.  Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.

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	<p>criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</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

#### Curriculum Area: Chemistry Single Science

Year 10	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Syllabus</b>	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	AQA Chemistry Collins - Chapter 9 The Atmosphere	
<b>Connections to previous learning</b>	3.6.3 Chemical energy Investigate a phenomenon that relies on an exothermic or endothermic reaction During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic.	3.1.4 Pressure Investigate how pressure from your foot onto the ground varies with different footwear Pressure acts in a fluid in all directions. 3.5.4 Elements Compare the properties of elements with the properties of a compound formed from them Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain. Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Name simple compounds using rules: change		3.5.2 Separating mixtures Devise ways to separate mixtures, based on their properties A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties. The method chosen to separate a mixture depends on which physical properties of the individual substances are different. Use techniques to separate mixtures.	3.7.1 Earth structure Model the processes that are responsible for rock formation and link these to the rock features Sedimentary, igneous and metamorphic rocks can be inter converted over millions of years through weathering and erosion, heat and pressure, and melting and cooling. The three rock layers inside Earth are the crust, the mantle and the core. 3.7.3 Climate Investigate the contribution that natural and human chemical processes make to our carbon dioxide emissions Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust (such as photosynthesis and respiration) as well as human activities (burning fuels). Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen. Scientists have evidence that global warming caused by human activity is causing changes in climate. Methane and carbon dioxide are greenhouse gases.	

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		non-metal to -ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate.			
<b>Knowledge</b>	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 Reactions of alkenes and alcohols Synthetic and naturally occurring polymers	Chemical analysis Purity, formulations and chromatography Identification of common gases Identification of ions by chemical and spectroscopic means	The composition and evolution of the Earth's atmosphere Carbon dioxide and methane as greenhouse gases Common atmospheric pollutants and their sources
<b>Skills</b>	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 of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products Plan investigations, make observations and analyse data Investigate the variables that affect temperature changes in reacting solutions displacement of metals.	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 chemical reactions including the measurement of rates of reaction by a variety of methods such as production of gas and colour change AT 6 safe and careful handling of liquids and solids, including careful mixing of reagents under controlled conditions, using	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 Identifying ions: AT 2 safe use of appropriate heating devices and techniques including use of a Bunsen burner AT 8 use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including gas tests, flame test and precipitation reactions 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	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.

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	Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions	appropriate apparatus to explore chemical changes Plan investigations, make observations and analyse data React $\text{CaCO}_3$ with dilute HCl and measure the volume of $\text{CO}_2$ evolved against time. Record the results and plot a graph of results of volume of gas against time. 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. Predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio.		unknown single ionic compound	
<b>Assessment</b>	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	End of unit test for Chapter 9 The Atmosphere
<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>	<b>School and University Network</b> Trip 1- Magnets and Motors Trip 2- Life on Mars				

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<p><b>Literacy</b></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. Extended writing: write instructions to another student how to calculate the energy transferred in a chemical reaction.</p> <p>Keywords: Activation energy, *Alkaline batteries, *Battery, *Chemical cells, Endothermic reaction, Exothermic reaction, *Fuel cells, Reaction profile, *Rechargeable cells</p>	<p>Use graphical data to explain each part of the graph. Research the work of Le Chatelier or the life of Fritz Haber. Highlight the moral ambiguity of Haber's work write instructions to another student how to calculate the mean rate of reaction. Extended writing: explain the effect on the rate of reaction of different factors 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 Describe processes e.g. fractional distillation &amp; formation of crude oil Look at the cultural and environmental impact of the oil industry around the world. Research and present the discovery of the structure of DNA including the contributions of Francis Crick, James Watson, Maurice Wilkins and Rosalind Franklyn.</p> <p>Keywords: *Addition polymerisation, Alcohols, Alkanes, Alkenes, unsaturated, *Amino acids, Carboxylic acids, Catalytic cracking, Combustion, Complete combustion, Crude oil, *Condensation polymerisation, Cracking, *DNA, Esters, Fermentation, Fractional distillation, Hydrocarbons, *Nucleotides, *Polyesters, Polymers, Polypeptide, Steam cracking</p>	<p>Discuss the advantages and disadvantages of instrumental analysis versus test tube analysis. Research how firework manufacturers produce the different colours in fireworks Plan an analysis programme to identify an unknown substance using just test-tube reactions.</p> <p>Keywords: Chromatogram, Chromatography, *Flame emission spectroscopy, *Flame test, Impure substance, *Instrumental methods, Litmus paper, Mobile phase, Precipitation, Pure substance, Rf value, Stationary phase</p>	<p>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.</p> <p>Keywords: Acid rain, Carbon footprint, Environmental implication, Fossil fuels, Global climate change, Global dimming, Greenhouse effect, Greenhouse gases, Particulates, Photosynthesis, Pollutants</p>
<p><b>Numeracy</b></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</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</p>	<p>Write balanced symbol equations for the combustion of hydrocarbon fuels. Describe the balanced symbol equation including moles present, long alkane reactant, specific</p>	<p>Interpret instrumental results for flame emission spectroscopy calculate the Rf value.</p>	<p>Use data to calculate your own carbon footprint over a period/holiday. Suggest the effects on Earth and atmosphere of the calculated carbon footprint Draw accurate pie charts for the composition of the atmosphere Use the equation for photosynthesis</p>

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	<p>chemical reactions using bond energies supplied</p>	<p>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>reaction conditions, and alkene and short alkane products</p>		
<p><b>CIAG</b></p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find</p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find</p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a</p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the</p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p>

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	<p>issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p>	<p>issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p>	<p>programme to find issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p>	<p>performance of a programme to find issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p> <p>NCW STEM lessons – where can science take you?</p>	<p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p> <p>Careers in Physics Lesson (Step Up resources)</p>
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## Key Stage 4 Long Term Planning

### Year 11

#### Curriculum Area: Chemistry Single Science

Year 11	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
<b>Syllabus</b>	AQA Chemistry Collins - Chapter 10 Sustainable Development	AQA Chemistry Collins - Chapter 3 Chemical Quantities and calculations	Revision in preparation for GCSE exams	Revision in preparation for GCSE exams	
<b>Connections to previous learning</b>	3.7.4 Earth resources Predict the method used for extracting metal based on its position in the reactivity series There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.	3.6.4 Types of reaction Investigate changes in mass for chemical and physical processes Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.			
<b>Knowledge</b>	Using the Earth's resources and obtaining potable water Life cycle assessment and recycling Using materials The Haber process and the use of NPK fertilisers	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	Plan investigations, make observations and analyse data			

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	<p>Required Practical: Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.</p> <p>AT1 use of appropriate apparatus to make and record a range of measurements accurately including mass</p> <p>AT 2 safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater</p> <p>AT 3 use of appropriate apparatus and techniques for the measurement of pH in different situations</p> <p>AT 4 safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, distillation</p> <p>Research how water is treated.</p>	<p>Carry out the precipitation reaction:</p> <p>Explain what has happened to the mass during the experiment and why it has happened.</p> <p>Required Practical: Neutralisation</p> <p>AT 1 use of appropriate apparatus to make and record a range of measurements accurately including volume of liquids</p> <p>AT 8 use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including the determination of concentrations of strong acids and strong alkalis</p>			
<b>Assessment</b>	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			
<b>Cultural enrichment including Trips, Visits, Experiences, Extra-curricular</b>	<p><b>School and University Network</b></p> <p>Trip 1-Young Scientist Centre (details to be confirmed)</p> <p>Trip 2-Young Scientist centre</p>				
<b>Literacy</b>	<p>Research how water is treated.</p> <p>Extended writing: detail the methods involved in water treatment.</p> <p>Extended writing: describe the processes of: phytomining bioleaching.</p> <p>Use information to interpret the LCA of a given material or product</p>	<p>Write simple word equations.</p> <p>Write simple symbol equations.</p> <p>Extended writing tasks: write instructions to another student how to calculate the relative formula mass</p> <p>Keywords: *Actual yield, *Atom economy, Avogadro constant, *Avogadro's</p>			

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	<p>Keywords: *Alloy, Bioleaching, *Borosilicate glass, *Composite, *Corrosion, Desalination, Displacement, Electrolysis, *Electroplating, Finite resources, *Galvanise, Ground water, Life cycle assessment (LCA), *NPK fertilisers, Ore, Phytomining, Potable water, Raw materials, Renewable resources, *Sacrificial protection, *Soda-lime glass, Sterilisation, Sustainable development, *The Haber process, Thermosetting polymers, Thermosoftening polymers</p>	<p>law, Concentration, Conservation of mass, Limiting reactant, *Mole, *Percentage by mass, *Percentage yield, Relative formula mass, *Theoretical yield, Thermal decomposition, Uncertainty</p>			
<b>Numeracy</b>	<p>Extract and interpret information about resources from charts, graphs and tables. Use orders of magnitude to evaluate the significance of data. Evaluate alternative biological methods of metal extraction, given appropriate information. Write a balanced symbol equation for the manufacture of ammonia.</p>	<p>Balancing chemical equations The number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant. The value of the Avogadro constant is <math>6.02 \times 10^{23}</math> per mole. Define one mole in terms of Mr and Ar</p> <p>Calculate the number of moles in a substance using the relative formula mass. Be able to convert <math>\text{cm}^3</math> into <math>\text{dm}^3</math>. Use the equation: <math>C = m / v</math> to calculate the concentration of a solution. Rearrange the equation: <math>C = m / v</math> to make mass the subject.</p>			
<b>CIAG</b>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative</p>	<p>What workplace skills does chemistry develop?</p> <p>Collating: Bringing together information from different sources is a useful skill in many jobs. An investigative</p>		<p>NCW STEM lessons – where can science take you?</p>	

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	<p>journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p> <p>Year 11: Studying science at KS5 lesson</p>	<p>journalist will need to find evidence from a range of sources to build a story. Software testers need to collate information about the performance of a programme to find issues and suggest appropriate improvements.</p> <p>Investigation: There are many jobs where you have to use these investigative skills. A forensic computer analyst investigates cyber crime to find out how breaches happen. A vet must investigate the causes of illness in an animal by looking at the symptoms and then deciding on a treatment.</p> <p>Critical evaluation: Critical evaluation is a skill that transfers to many jobs. If you work as a crown prosecutor, you'll have to evaluate criminal cases and decide whether the evidence is likely to lead to a conviction. In business, managers need to carry out regular performance evaluations with the members of their team and identify areas for improvement.</p>			
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