

Curriculum Map Year 11 Combined Science – Chemistry

Topic Name		Scientific Skills	Essential Knowledge (misconceptions or really tricky bits are highlighted in red)	Prior Learning (KS3 or Y10)	Assessment
REACTION RATES	Autumn HT1 (approx.8 lessons)	<p>Demonstrating that I can:</p> <ul style="list-style-type: none"> Measure the rate of a reaction using a range of methods and collect reliable data. Evaluate practical work and comment on ways to reduce error Explain how to increase reliability of data Plot a graph and interpret the results eliminating any anomalous results. Calculate the mean rate of reaction with correct units Measure the gradient of a line <p>HT</p> <ul style="list-style-type: none"> plot the tangent to a curve and calculate rate using the gradient of the tangent. 	<p>In this topic I will know:</p> <ul style="list-style-type: none"> How Collision Theory explains why the rate of a reaction changes Methods of altering the rate of a reaction. Why increasing temperature has a greater impact on reaction rate than changing concentration or surface area. Methods of measuring a rate of reaction by measuring loss of reactant or gain of product over time. Justify the choice of method The meaning of the term activation energy. How catalysts speed up rates of reaction by lowering activation energy. Be able to draw a reaction profile with and without a catalyst. About a range of catalysts (link to biology with enzymes being biological catalysts) 	<p>Before I start this topic, I need to know:</p> <ul style="list-style-type: none"> The difference between a chemical reaction and physical change. How to write word equations A range of types of chemical reaction e.g. neutralisation, combustion That all matter is made of particles called atoms. The difference between elements and compounds, atoms and elements. The terms reactant and product. Basic apparatus and practical techniques 	<p>Knowledge and skills will be assessed by:</p> <p>Assessment booklet 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 Identify catalysts in reactions from their effect on the rate of reaction Predict and explain using collision theory the effects of changing temperature on the rate of a reaction Predict and explain using collision theory the effects of changing concentration on the rate of a reaction explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio Interpret graphs showing the quantity of product formed or quantity of reactant used up against time Required practical: Investigate how changes in concentration affect the rates of reactions by a method involving the production of a gas and a method involving a colour change End of topic assessment</p>
QUANTITATIVE CHEMISTRY	Autumn HT2 (approx.8 lessons)	<p>Demonstrating that I can:</p> <ul style="list-style-type: none"> Rearrange equations and use them correctly. Round up or down to 2dp or 3sf correctly. How to convert units by scaling up or down e.g. g to kg or cm³ to dm³ <p>HT</p> <ul style="list-style-type: none"> Work with standard form (Avogadro's number) 	<p>In this topic I will know how to:</p> <ul style="list-style-type: none"> Find the relative atomic mass of an element from the Periodic Table. Calculate the relative formula mass of a compound. Calculate the % of an element in a compound. Describe what the concentration of a solution is Calculate the concentration of a solution in g/dm³ or the mass of solute with a given concentration. <p>HT</p> <ul style="list-style-type: none"> Balance a symbol equation Calculate the number of moles of a substance from a given mass or volume of gas Understand how to find mole ratios from a balanced symbol equation Calculate the mass of reactant or product in a reaction using the mole ratios Identify the limiting reagent in a chemical reaction Calculate the number of particles in a solution with a given concentration and volume 	<p>Before I start this topic, I need to know:</p> <ul style="list-style-type: none"> How to locate an atomic or mass number on the Periodic Table The difference between elements and compounds, atoms and elements. How to write basic chemical formulae like H₂O and know how many atoms and elements are in the molecule. Particle theory The term solution (aq) and be able to describe a solution in terms of particles, dissolving, soluble and insoluble. Be able to understand the terms volume and mass and understand how to measure them in the lab. 	<p>Knowledge and skills will be assessed by:</p> <p>Assessment booklet State that mass is conserved and explain why, including describing balanced equations in terms of conservation of mass. Describe what the relative formula mass (Mr) of a compound is and calculate the relative formula mass of a compound, given its formula. Calculate the mass of solute in a given volume of solution of known concentration in terms of mass per given volume of solution. HT Explain the effect of limiting the quantity of a reactant on the amount of products in terms of moles or masses in grams Explain how the mass of a solute and the volume of a solution is related to the concentration of the solution. End of topic assessment</p>

Chemical Changes 1	<i>Spring HT3 (approx. 10 lessons)</i>	<p>Demonstrating that I can:</p> <ul style="list-style-type: none"> • mix reagents to explore chemical changes and/or products. • safely use appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater. • use appropriate apparatus and techniques for conducting chemical reactions, including appropriate reagents. • safely use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation. • safely use and careful handle liquids and solids, including careful mixing of reagents under controlled conditions. <p>HT</p> <ul style="list-style-type: none"> • Make order of magnitude calculations. 	<p>In this topic I must know how to:</p> <ul style="list-style-type: none"> • explain reduction and oxidation in terms of loss or gain of oxygen. • Work out an order of reactivity of metals based on experimental results. • interpret or evaluate specific metal extraction processes identifying the substances which are oxidised or reduced. • predict products from given reactants. • use the formulae of common ions to deduce the formulae of salts. • describe the use of universal indicator or a wide range indicator to measure the approximate pH of a solution. • use the pH scale to identify acidic or alkaline solutions. <p>HT</p> <ul style="list-style-type: none"> • write ionic equations for displacement reactions. • identify in a reaction, symbol equation or half equation which species are oxidised, and which are reduced. • explain what redox reactions are. • use and explain the terms dilute and concentrated (in terms of amount of substance), and weak and strong (in terms of the degree of ionisation) in relation to acids 	<p>Before I start this topic, I must know:</p> <ul style="list-style-type: none"> • 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 • Metals react with oxygen to form oxides. • 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. • 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. • Acids and alkalis can be corrosive or irritant and require safe handling. 	<p>Knowledge and skills will be assessed by:</p> <p>Assessment booklet Plan an investigation to find the order of reactivity of three metals using the temperature change when each metal reacts with hydrochloric acid. Name common salts Use the formulae of common ions to deduce the formulae of salts. Use the pH scale to identify acidic or alkaline solutions.</p> <p><i>Required practical activity: preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.</i></p> <p>HT identify in a reaction which species are oxidised, and which are reduced. Write ionic equations for displacement reactions. use and explain the terms dilute and concentrated (in terms of amount of substance), and weak and strong (in terms of the degree of ionisation) in relation to acids. End of topic assessment</p>
Chemical Changes 2	<i>Spring HT4 (approx. 6 lessons)</i>	<p>Demonstrating that I can:</p> <ul style="list-style-type: none"> • use of appropriate apparatus and techniques for conducting and monitoring chemical reactions. • use of appropriate apparatus and techniques to draw, set up and use electrochemical cells for separation and production of elements and compounds. • use scientific theories and explanations to develop hypotheses. • plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. • apply a knowledge of a range of techniques, instruments, apparatus and materials to select those appropriate to the experiment. • carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. • make and record observations and measurements using a range of apparatus and methods. 	<p>In this topic I must know how to:</p> <ul style="list-style-type: none"> • predict the products of the electrolysis of ionic compounds in the molten state. • explain why a mixture is used in the extraction of Aluminium from its ore and why the positive electrode must be continually replaced. • predict the products of the electrolysis of aqueous solutions containing an ionic compound. <p>HT</p> <ul style="list-style-type: none"> • Represent reactions at electrodes as half equations 	<p>Before I start this topic, I must know:</p> <ul style="list-style-type: none"> • An ore is a naturally occurring rock containing sufficient minerals for extraction. • Extraction is the separation of a metal from a metal compound. • Recycling is the processing of a material so that it can be used again. • Electrolysis is using electricity to split up a compound into its elements. 	<p>Knowledge and skills will be assessed by:</p> <p>Assessment booklet predict the products of the electrolysis of ionic compounds in the molten state. explain why a mixture is used in the extraction of Aluminium from its ore and why the positive electrode must be continually replaced. predict the products of the electrolysis of aqueous solutions containing an ionic compound. <i>Required practical activity: investigate what happens when aqueous solutions are electrolysed using inert electrodes.</i></p> <p>HT Represent reactions at electrodes as half equations End of topic assessment</p>

Reflection and preparation for examinations	<i>Summer HT5</i>				
Examination period	<i>Summer HT6</i>				