Subject: Year 10 Chemistry
Year Overview

ST. MARY MAGDALENE C OF E SCHOOL PENINSULA CAMPUS

Key content – knowledge and skills	National Curriculum focus
No Chemistry units were missed in year 9 due school closures in light of the Covid-19 pandemic. Therefore, the Chemistry curriculum will run as normal. **Chemistry: 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. **Chemistry- Chemical changes** Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. **Chemistry: energy changes** Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic **Chemistry: Rate of reaction:** Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down **Chemistry: Organic:** The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because	

carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. **Chemistry: Chemical analysis:** Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. **Chemistry: Atmosphere:** The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity. **Chemistry: Using resources** Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised.	
Key assessment points	
End of unit assessment	
Christian ethos	
British values	
• Taking responsibility for their own and other people's safety • Considering the environment • Understanding that science has a major effect on the quality of our lives. • Consider the benefits of scientific developments and the social responsibility involved	

Subject: Chemistry (year 10)
Long-term plan

Week	Month	Learning Intentions and/or Key Questions
Aut1-1	September	Chemistry: Quantitative Chemistry: • I can explain why some elements have the same relative atomic mass as each other and why relative atomic masses may not be a whole number. • I can calculate the number of moles or mass of a substance from data supplied. • I can convert between units in calculations. • I can interpret balanced symbol equations in terms of mole ratios. • I can use balanced symbol equations to calculate reacting masses. • I can explain the effect of a limiting reactant on the amount of product made. • I can use balanced symbol equations to calculate reacting masses when there is a limiting reactant. • I can calculate the percentage yield using a variety of units and conversions. • I can justify why percentage yield can never be above 100%. • I can evaluate different reactions to decide the best production method of a chemical. • I can explain why the sum of the formula masses of the reactants **is** the same as the sum of the formula masses of the products. • I can calculate the concentration of a solution when the number of moles and volume in cm3 is given. • I can calculate the mass of a chemical when any volume and concentration is given and independently express their answers to an appropriate number of significant figures. • I can calculate the amount of solute in a solution using the concentration of the solution. • I can justify the use of a pipette and burette for a titration, evaluating the errors involved in reading these instruments. • I can explain how precise results are obtained in a titration. • I can justify the use of an indicator in an acid-base titration. • I can calculate the unknown concentration of a reactant in a neutralisation reaction when the volumes are known and the concentration of one reactant is also known. • I can extract data from given information to perform multi-step calculations independently. • I can suggest how the volume of gas would change when temperature or pressure was changed. • I can calculate the moles or volume of a gaseous substance involved in a chemical reaction.
Aut1-2		
Aut1-3		
Aut1-4		
Aut1-5	October	
Aut1-6		
Aut1-7		
		Half term holiday
Aut2-1	November	Chemistry- Chemical changes • I can justify uses of metals in the reactivity series based on their chemical reactivity. • I can write balanced symbol equations, with state symbols, for the metals listed in the reactivity series reacting with oxygen, water, and acid.
Aut2-2		
Aut2-3		
Aut2-4		
Aut2-5		
Aut2-6	December	

Aut2-7		• I can evaluate in detail the investigation of metals plus acid, assessing the control of variables and the validity of conclusions drawn from the data collected. • I can describe displacement reactions using an ionic equation. • I can write balanced symbol equations, with state symbols, for displacement reactions. • I can determine and explain which species is oxidised and which species (metal atom or ion) is reduced in a displacement reaction in terms of electron transfer. • I can explain how carbon or hydrogen can be used to reduce an ore. • I can evaluate the extraction process to obtain a metal from its ore. • I can explain the reaction between a metal and an acid. • I can write ionic and half equations, including state symbols, to describe a reaction between a metal and sulfuric acid or hydrochloric acid. • I can identify and explain in detail which species is oxidised and which is reduced in a reaction. • I can explain the reaction between a metal oxide or metal hydroxide and an acid, including an ionic equation. • I can generate the formulae of salts given the names of the metal or base and the acid. • I can explain how alkalis are a subgroup of bases. • I can explain the reaction between ammonia and dilute acids to produce salts and the agricultural importance of the salts. • I can describe neutralisation using ionic equations, including the ionic equation for a carbonate plus an acid. • I can evaluate how universal indicator or a data logger can be used to determine the approximate pH of a solution. • I can use ionic equations to explain how solutions can be acidic or alkali. • I can explain how the pH of a solution changes as acid or alkali is added. • I can explain the difference between concentration and strong or weak in terms of acids and alkalis. • I can use ionic equations to explain how acids can be strong or weak. • I can quantatively explain how the concentration of hydrogen ions relates to the pH number.
		Christmas holiday
Spr1-1 Spr1-2 Spr1-3 Spr1-4 Spr1-5	January	Chemistry: energy changes • I can explain a chemical reaction in terms of energy transfer. • I can plan, carry out, and evaluate the errors in a calorimetry investigation. • I can suggest a chemical reaction for a specific purpose based on the energy change for the reaction. • I can evaluate in detail the uses of exothermic and endothermic reactions. • I can explain why chemical reactions need activation energy to start them. • I can use the particle model to explain how a chemical reaction occurs. • I can explain energy change in terms of the balance between bond making and bond breaking.
Spr1-6	February	

- I can calculate the energy needed to break the reactant bonds and the energy released when the product bonds are made.
- I can calculate the energy change for a reaction, including the correct unit.
- I can explain in terms of bond energies how a reaction is either exothermic or endothermic.
- I can describe an electrochemical cell with half-equations and ionic equations.
- I can explain why the reactions in an electrochemical cell are redox reactions and determine which species is oxidised or reduced in an electrochemical cell.
- I can evaluate the use of non-rechargeable batteries.
- I can describe the reactions in fuel cells using balanced symbol and half equations.
- I can evaluate the use of hydrogen fuel cells instead of rechargeable cells and batteries.
- I can determine and explain which species is oxidised and which is reduced in a hydrogen fuel cell

<u>Chemistry: Rate of reaction:</u>

- I can plot and use a graph to calculate the gradient to measure the initial rate of reaction.
- I can justify a chosen method for a given reaction to monitor the rate of reaction.
- I can explain why there is more than one unit for rate of reaction.
- I can use collision theory to explain in detail how increasing surface area increases the rate of reaction.
- I can use a graph to calculate the rate of reaction at specific times in a chemical reaction.
- I can explain why many collisions do not lead to a chemical reaction.
- I can use a graph to calculate the rate of reaction at specific times in a chemical reaction.
- I can calculate (1/t) and plot a graph with a more meaningful line of best fit.
- I can interpret a rate of reaction graph, including calculating the rate of reaction at specific times in a chemical reaction.
- I can explain why changing pressure has no effect on the rate of reaction for some reactions.
- I can justify quantitative predictions and evaluate in detail their investigation into the effect of concentration on rate of reaction.
- I can use a reaction profile diagram to explain in detail the effect of adding a catalyst.
- I can justify the use of catalysts in industry and in household products.
- I can explain what an enzyme is and how it works.
- I can describe an unfamiliar reversible reaction, using a balanced symbol equation with state symbols.
- I can justify the use of reversible reactions in the lab and items available in the home.
- I can justify the classification of a reaction as reversible.
- I can explain in detail the energy changes in an equilibrium system.
- I can suggest and explain a simple laboratory test which could be completed using a reversible reaction.
- I can make predictive observations of unfamiliar reversible reactions when information is supplied.
- I can explain dynamic equilibrium.

		• I can explain why the concentration of chemicals in a dynamic equilibrium remains constant. • I can predict the effect on the rate forward and reverse reactions by applying the Le Chatelier's Principle when the conditions of a dynamic equilibrium are changed. • I can explain why changing pressure has no effect on some systems. • I can justify, in detail, the compromise conditions chosen in given industrial processes.
		Half term holiday
Spr2-1 Spr2-2		<u>Chemistry: Organic</u>
Spr2-3 Spr2-4 Spr2-5 Spr2-6	March	• I can explain why fractional distillation is used to separate crude oil into fractions. • I can apply a general formula to generate a molecular formula and a displayed formula for a straight-chain alkane. • I can classify and justify the classification of a chemical as an alkane. • I can explain in detail how fractional distillation is used to separate crude oil into fractions. • I can explain how chain length affects the properties of crude oil fractions. • I can make predictions about the properties of crude oil fractions from the fraction's hydrocarbon chain length. • I can justify the use of a given fuel over another. • I can explain in detail how the production of carbon monoxide in incomplete combustion can be lethal. • I can use balanced symbol equations to calculate amounts of reactants or products in a combustion reaction. • I can use examples to explain the process of cracking and why it is so important to the petrochemical industry. • I can explain the similarities and differences between alkanes and alkenes. • I can explain, using balanced symbol equations, the reaction between bromine water and an alkene. • I can predict the word and balanced symbol equations to describe reactions between alkenes and hydrogen, water (steam), or a halogen. • I can compare and contrast the reactivity of alkanes and alkenes. • I can predict the general formula of an alkene. • I can predict the structure for primary alcohols or carboxylic acids when the number of carbon atoms is given. • I can suggest a general formula for a homologous series. • Can suggest why an organic acid is not an alcohol even though it contains an -OH functional group. • I can explain why solutions of ethanol have a pH of 7. • I can describe complete combustion reactions of a range of alcohols using balanced symbol equations. • I can plan an investigation to determine the relative energy transferred to the surroundings by the combustion of different alcohols. • I can explain, using ionic equations, why carboxylic acids are weak acids. • I can predict the products of the reactions of a range of carboxylic acids with metal carbonates and with alcohols. • I can explain the term volatile in terms of molecular forces.

	April	**Easter holiday**
Sum1-1 Sum1-2		Chemistry: Chemical analysis: • I can justify the classification of pure substances, impure substances, and formulations when data is supplied. • I can explain in detail the use of formulations. • I can calculate percentage compositions of components in a range of formulations. • I can explain why different substances and different conditions will have different Rf values. • I can calculate Rf values from a chromatogram, using an appropriate number of significant figures. • I can interpret a chromatogram to identify unknown substances. • I can write balanced symbol equations, including state symbols, for the reactions of limewater with carbon dioxide and hydrogen with oxygen. • I can explain why a glowing splint re-ignites in oxygen. • I can explain why chlorine gas turns damp indicator paper colourless. • I can evaluate flame tests as a method for identifying of positive metal ions. • I can write balanced ionic equations, including state symbols for the production of insoluble metal hydroxide. • I can explain why iron(II) hydroxide solution often changes colour when it stands in air. • I can evaluate the halide ion test. • I can write balanced ionic equations, including state symbols, for simple laboratory tests for carbonate, halide, or sulfate ions. • I can explain in detail how to identify a compound from the results of simple laboratory tests. • I can evaluate the use of instrumental techniques. • I can explain how metal ions emit light when in a flame. • I can interpret results from flame emission spectroscopy when data is given. Chemistry: Atmosphere: • I can state the composition, including formulae, of the Earth's early atmosphere. • I can describe a theory for the development of the Earth's atmosphere. • I can explain, using word equations, how gases were formed in the atmosphere and oceans were formed. • I can describe how the proportion of carbon dioxide in the early atmosphere was reduced. • I can state the composition of dry air. • I can use word equations to show how carbon dioxide can form sedimentary rocks. • I can explain the greenhouse effect. • I can explain how greenhouse gases increase the temperature of the atmosphere. • I can explain how human activity can change the proportion of greenhouse gases in the atmosphere. • I can explain the possible effects of global climate change and why they are difficult to predict. • I can explain possible methods to reduce greenhouse gas emissions.
Sum1-3 Sum1-4 Sum1-5 Sum1-6	May	

		• I can explain some of the problems in trying to reduce greenhouse gas emissions. • I can explain how sulphur dioxide and nitrogen oxides are made when fossil fuels are combusted. • I can describe the health impacts of atmospheric pollutants. • I can use balanced symbol equations to show how atmospheric pollutants are formed.
	June	**Half term holiday**
Sum2-1		Chemistry: Using resources • Composites and ceramics (TRIPLE) • Polymers (Triple) • Corrosion (TRIPLE) • Recycling • Potable water • Waste management. Revision, Assessment and Feedback
Sum2-2		
Sum2-3		
Sum2-4		
Sum2-5	July	
Sum2-6		
Sum2-7		