Key Stage 4 – Year 10 – Triple Science (Chemistry)
Curriculum Map for Students

	Year 10 (Chemistry)				
Topic Overview	**SC3 – Atomic Structure (Paper 1 and 2)**	**SC4 – The Periodic Table (Paper 1 and 2)**	**SC5/6/7 – Ionic Bonding, Covalent Bonding, Types of Substance (Paper 1 and 2)**	**SC8 – Acids and Alkalis (Paper 1)**	**SC9 – Calculations involving masses (Paper 1 and 2)**
Focus	Students will study and understand concepts including: • History of the atom • Structure of the atom • Charges and masses of subatomic particles. • Rutherford experiment • Mass and atomic number • Calculating the number of protons, neutrons and electrons in atoms. • Explaining what an isotope is. • Calculating relative atomic masses.	Students will study and understand concepts including: • Identify symbols of common elements • How Mendeleev organised the first periodic table. • Making predictions using a periodic table. • Explain how elements are organised in a modern periodic table. • Draw electronic structures of elements. • Link the group of an element to its electronic structure.	Students will study and understand concepts including: • How ions are formed. • Calculating the number of subatomic particles in ions. • Knowing what an ionic bond is. • Understanding the structure of ionic lattices. • Learning key ion formula and their names. • Learning the polyatomic ion formula and names. • Why ionic substances have high boiling and melting points. • Why can ionic substances conduct in solution not solid form. • Names of some common covalent molecules. • Know how covalent bonds are formed. • Use dot-cross diagrams to illustrate covalent bonds. • Understand the concept of valency • Why simple molecular compounds have low boiling and melting points. • Why simple molecular compounds are insulators. • What a polymer is. • Different allotropes of carbon. • Differences of different allotropes of carbon. • How different allotropes have different properties and uses. • Typical properties of metals and non-metals. • How particles are arranged in metals. • Different bonding models. • How these models can explain the properties of substances.	Students will study and understand concepts including: • Explaining common hazard symbols. • Knowing how acids and alkalis will affect indicators. • Identifying the ions in different acids and alkalis. • Calculating concentration of acids and alkalis. • Explaining how the concentration affects the pH. • Knowing the difference between strong and weak acids. • Know why metal oxides are bases. • Explain what happens during the process of neutralisation. • Explain the experimental procedure to separate a soluble salt from an acid and insoluble base. • State what happens when alkalis react with acids. • Know the process of balancing equations. • State what happens to the ions from acids and alkalis during neutralisation • Explain what a titration is. • Know how to make a soluble salt from using the titration method. • Know what happens when an acid reacts with a metal. • Know the tests for carbon dioxide and hydrogen gases. • Know the rules for solubility of common substances in water. • Know how to prepare a sample of a pure, dry insoluble salt.	Students will study and understand concepts including: • Calculating the relative formula masses of compounds. • State the difference between relative formula mass and empirical mass. • Determine the empirical formula of a compound. • Know the law of conservation of mass. • Calculate the masses of reactants and products in a reaction. • Know the concept of a mole. • Calculate the number of moles and particles in a substance. • Work out balanced equations from the masses of reactants.
Assessment	End of topic assessment (approximately 50 marks, 10 marks recall, 10 marks previous topic spaced learning)				
	Summer Year 10 Mock (Paper 1)				

Key Stage 4 – Year 11 – Triple Science (Chemistry)
Curriculum Map for Students

	Year 10 (Chemistry)
Topic Overview	**SC10/11/12/13 - Electrolytic processes** **Obtaining and using metals** **Reversible Reactions and Equilibria** **Transition Metals, Alloys and Corrosion** **(Paper 1)**
Focus	Students will study and understand concepts including: • Know what an electrolyte is. • Know what happens to the ions during electrolysis. • Explain the reactions at the different electrodes with half-equations. • Predict the products formed during different electrolysis reactions. • Explain how copper is purified using electrolysis. • State the reactivity series for different metals. • Explain what happens in a displacement reaction, and use the reactivity series to predict outcomes. • State some metals that are found uncombined in the Earth's crust. • Explain how the extraction method of a metal is related to its position in the reactivity series. • Describe biological methods to extract some metals. • Explain oxidation and reduction of chemical in terms of movement of oxygen. • State the type of reaction that occurs when metals are extracted. • Explain how the resistance to corrosion is related to its position in the reactivity series. • State the advantages to recycling a metal. • Explain what factors should be considered in a life cycle assessment of a product. • State what is meant by dynamic equilibria. • Explain the process of ammonia manufacturing. • Explain how temperature, pressure and concentration affect the equilibrium position. • State where the transition metals are found on the periodic table. • Describe the typical properties of the transition metals. • Describe the properties of iron that make it a typical tranisiton metal. • Explain why metals corrode. • Describe how the surface of iron can be protected from rusting. • Explain how sacrificial protection prevents rusting.
Assessment	End of topic assessment (approximately 50 marks, 10 marks recall, 10 marks previous topic spaced learning)
	Summer Year 10 Mock (Paper 1)

Key Stage 4 – Year 11 – Triple Science (Chemistry)
Curriculum Map for Students

	Year 11 (Chemistry)		
Topic Overview	**SC14/15/16 – Quantitative Analysis** **Dynamic Equilibria, Calculations Involving Volumes of Gases** **Chemical Cells and Fuel Cells** **(Paper 1)**	**SC17/18/19 – Groups in the Periodic Table** **Rates of reactions** **Heat energy changes in chemical reactions** **(Paper 2)**	**SC20/21 – Fuels, Earth and Atmospheric Science** **(Paper 2)**
Focus	Students will study and understand concepts including: • State what is meant by the terms theoretical and actual yield of a reaction. • Calculate the percentage yield of a reaction • Explain why the actual yield is less than the theoretical yield. • State what is meant by the term atom economy. • Calculate the atom economy of a reaction. • Describe how data is used to decide on the best way to manufacture a product. • Calculate the concentration of a solution in gdm^{-3}. • Calculate the concentration of a solution in $moldm^{-3}$. • Convert concentrations from gdm^{-3} to $moldm^{-3}$ and vice versa. • Describe the method for carrying out an acid-alkali titration. • Calculate the number of moles of solute in a given volume of solution. • Calculate the concentration of a solution using the results of an acid-alkali titration • State Avagdaro's law • State what is meant by the molar volume of a gas. • Calculate the volume of a gas, and the mass of solid involved in a chemical reaction. • State what is meant by the term 'fetilisers'. • Describe the similarities and differences between making a fertiliser in a laboratory and in a factory. • Describe how the Haber process is used in the manufacture of ammonium nitrate. • Describe how the time taken to reach equilibrium is affected by change in reaction conditions. • Describe how conditions are chosen for industrial chemical reactions. • Describe how reaction pathways are chosen for industrial processes. • Explain why batteries go flat. • Describe what happens in a hydrogen-oxygen fuel cell. • Describe the strengths and weaknesses of fuel cells.	Students will study and understand concepts including: • State the main properties of alkali metals. • Explain how alkali metals react with water. • Explain why alkali metals have different reactivities. • Explain how the physical properties of halogens change going down group 7. • Describe the test for Chlorine gas. • Describe how halogens react with metals and hydrogen. • Use displacement reactions to work out the reactivity of halogens. • Explain the reactivity of halogens. • Describe what happens to halogen atoms and halide ions during displacement. • Explain why noble gases are unreactive. • State how noble gases can be used. • Describe and explain the trend in the physical properties of the noble gases. • State what changes can occur during a reaction. • Explain how to investigate rates of reactions. • Use graphs to show the rates of reaction for different reactions. • Explain what has to happen for two particles to react. • Describe and explain the factors that can affect the rates of reaction. • Explain what a catalyst is. • Describe how catalysts work. • Discuss different biological catalysts (enzymes). • State the differences between exothermic and endothermic. • State some examples of exothermic and endothermic reactions. • Describe how to investigate heat changes in solutions. • Explain endothermic and exothermic reactions in terms of bonds. • Explain how endothermic and exothermic reactions modelled. • Calculate energy changes in reactions.	Students will study and understand concepts including: • Know what a hydrocarbon is. • Explain where hydrocarbons are formed from. • Draw simple hydrocarbon molecules. • Explain how crude oil is separated into different fractions. • Know the names and uses of the main fractions of crude oil. • Explain the difference between the different molecules found at different heights in the fractioning tower. • State what the most common hydrocarbon found in crude oil is. • Know what a homologous series is, and why alkanes form this. • Identify the chemical components of complete and incomplete combustion. • Know what problems incomplete combustion causes. • Explain why some hydrocarbon fuels release sulfur dioxide. • Explain how nitrogen oxides are formed in engines. • Identify the problems caused by acid rain. • Explain the process of cracking and why it is needed. • State what happens when cracking of fractions occurs. • Compare hydrogen and petrol as fuel sources. • State and explain the evidence for the common gases formed in the early atmosphere. • Explain why the composition of the atmosphere changed over time. • Know the test for Oxygen. • State the names of some greenhouse gases. • Explain how the greenhouse effect is caused. • Describe and explain the link between fossil fuel combustion and climate change. • Know what human activities influence the climate. • Know what the problems are due to climate change. • Know how to limit the impact of predicted climate change.
Assessment	End of topic assessment (approximately 50 marks, 10 marks recall, 10 marks previous topic spaced learning)		
	Winter Year 11 Mock (Paper 1) Spring Year 11 Mock (Paper 2)		

Key Stage 4 – Year 11 – Triple Science (Chemistry)
Curriculum Map for Students

	Year 11 (Chemistry)	
Topic Overview	**SC22/23/24 – Hydrocarbons** **Alcohols and Carboxylic Acids** **Polymers** **(Paper 2)**	**SC25/26 – Quantitate Analysis: Tests for Ions** **Bulk and Surface Properties of Matter Including Nanoparticles** **(Paper 2)**
Focus	Students will study and understand concepts including: • State the names, formulae and structures of the four smallest alkanes. • State what functional group is present in all alkanes. • Describe how the position of this functional group is shown in alkene names. • Name the products formed by the complete combustion of hydrocarbons. • Describe how bromine water can be used to distinguish between alkanes and alkenes. • Give the structures of the reactants and products when bromine reacts with ethene. • State how alcoholic drinks are produced. • Describe what chemical reactions take place during fermentation. • Explain how we can make alcohol solutions more concentrated. • State the names, formulae and structures of the four smallest alcohols. • State what functional group is present in all alcohols. • Describe the chemical properties of alcohols. • State how carboxylic acids are produced. • State the names, formulae and structures of the first four carboxylic acids. • Describe how the functional group in all carboxylic acids influence their chemical properties. • State what a polymer is. • State what polymers join together the form DNA, starch and proteins. • Explain how ethene molecules join together to form poly(ethene). • Describe how chloroethene molecules join together to form poly(chloroethene). • Describe how to deduce the structure of a monomer from the structure of a polymer and vice versa. • Describe how the uses of a polymer are related to its properties. • State what is meant by condensation polymerisation. • Describe which two functional groups react together to form a polyester. • Draw the structure of a polyester. • Describe the problems which are associated with making polymers • Describe the problems which are associated with the disposal of polymers • Describe some advantages and disadvantages of recycling polymers.	Students will study and understand concepts including: • Describe how metal ions are identified using flame tests. • Explain why chemists analyse substances using machines instead of chemical tests. • Describe how information from a flame photometer is used. • Explain why the test for an ion must only detect that ion. • Describe how metal ions are identified using sodium hydroxide. • Describe how ammonium ions and ammonia are detected. • Describe how carbonate ions and carbon dioxide are detected. • Describe how sulfate ions are detected. • Describe how halide ions are detected. • State what is meant by the term ‘ceramics’. • Describe what ceramics, polymers and metals are like. • Explain how materials are chosen for a given use. • State what is meant by the term ‘composite materials’. • Describe what composite materials are like. • Explain how materials, including composite materials, are chosen for a given use. • Explain why nanoparticulate materials have different properties from bulk materials. • Describe some of the uses of nanoparticles. • Describe some of the possible risks from nanoparticles. •
Assessment	End of topic assessment (approximately 50 marks, 10 marks recall, 10 marks previous topic spaced learning)	
	Winter Year 11 Mock (Paper 1) Spring Year 11 Mock (Paper 2)	