Carmel College Curriculum Implementation – KS4 Long term plan Subject CHEMISTRY

Content listed in purple is for separate chemistry students only. Content listed in green indicates AQA Required Practical Work. Content listed in orange is HT only.

	Year 10	Year 11
Autumn half term 1 Sequential knowledge and skills	<u>C1 – Atomic Structure</u> The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels. <u>Atomic Structure</u> All substances are made of atoms. An atom is the smallest part of an element that can exist. Students should ddefine an element descried the arrangement of particles in an element and identify ions and isotopes, draw electron configurations. Atoms of each element are represented by a chemical symbol, eg O represents an atom of oxygen, Na represents an atom of sodium. <u>Periodic Table</u> There are about 100 different elements. Elements are shown in the periodic table. Students should uunderstand how the periodic table has developed over time. Describe and explain the reaction of elements in group 1 and group 7. *<u>Separate Chemistry</u>* *Separate Science - Describe differences between transition metals and group 1* *Comparison with Group 1 elements and transition metals* *Typical properties of transition metals*	<u>C7 – Organic Chemistry</u> <u>Crude oil and fuels</u> 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. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists can take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents. Students will understand that crude oil is a mixture and be able to explain how crude oil is separated and made into a useful products. <u>Organic Reactions</u> Students will identify alkanes and alkenes and write combustion equations. *<u>Separate Chemistry</u>* *Students will draw molecules of alcohol and carboxylic acids to understand how these molecules react. Write an equation for the formation of Esters and recall why esters are industrially important. Identify polymers as addition or condensation from monomer structures to draw the polymer, from data tables identify which polymer is best to use for a range of applications.* *Structure and formula of alkenes, Reactions of alkenes* *Alcohols, Carboxylic acids, additional polymerisation* *Condensation polymerisation, Amino acids* *DNA and other naturally occurring polymers*

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Assessment Content And Methods Used To Judge Learning	***Y10 Autumn Summative Assessment*** Atomic Structure And The Periodic Table • *End Of Topic Consolidation Tasks* • *Formative Assessment* • *Required Practical Retrieval Tasks* • *Homework – Exam Style Questions*	***Y11 Autumn Summative Assessment*** Atomic Structure And The Periodic Table, Structure And Bonding, Chemical Calculations, Chemical Change, Electrolysis + Energy Changes + Rates Of Reaction. • *End Of Topic Consolidation Tasks* • *Formative Assessment* • *Required Practical Retrieval Tasks* • *Homework – Exam Style Questions*
Autumn half term 2 Sequential knowledge and skills	<u>C2 – Structure and Bonding</u> Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies. <u>Structure and Bonding</u> Students should identify there are four different types of bonds, covalent, ionic, metallic, and giant covalent. Represent ionic and covalent bonds as dot and cross diagrams and use knowledge of the bonding in compounds to explain their physical properties. ***<u>Separate Chemistry</u>*** *Understand the structure of nano particles and their uses.* *Sizes of particles and their properties* *Uses of nanoparticles*	<u>C8 - Chemical Analysis</u> 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. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work. Students will learn how to use of paper chromatography to identify unknown compounds. Recall the four gas tests. Required practical – Chromatography Required practical - Identifying ions Separates Chemistry ***<u>Separate Chemistry</u>*** *To be able to identify an ionic compound after completing all the tests for cations and anions.* Flame tests Metal hydroxides Carbonates Halides Sulfates Instrumental methods Flame emissions spectroscopy

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Assessment Content And Methods Used To Judge Learning	*Formative Assessment* Atomic Structure And The Periodic Table, Structure And Bonding • *End Of Topic Consolidation Tasks* • *Homework – Exam Style Questions* • *Peer Marked End Of Topic Assessment* • *Required Practical Completion*	*Formative Assessment* Atomic Structure And The Periodic Table, Structure And Bonding, Chemical Calculations, Chemical Change, Electrolysis + Energy Changes, Rates Of Reaction + Chemical Analysis. • *End Of Topic Consolidation Tasks* • *Homework – Exam Style Questions* • *Peer Marked End Of Topic Assessment* • *Required Practical Completion*
Spring half term 3 Sequential knowledge and skills	<u>C3 – Chemical Calculations</u> 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. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas. <u>Chemical Calculations</u> Calculations will be introduced in this topic and the calculation of masses, moles and concentration. <u>Chemical Change</u> When metals react with other substances the metal atoms form positive ions. The reactivity of a metal is related to its tendency to form positive ions. Metals can be arranged in order of their reactivity in a reactivity series. The metals potassium, sodium, lithium, calcium, magnesium, zinc, iron and copper can be put in order of their reactivity from their reactions with water and dilute acids. Students should recall the reactivity series and hence identify how metal are extracted from their ores.	<u>C9 – The Earth's Atmosphere</u> <u>The Earth's atmosphere</u> 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. Understand how the earth's atmosphere evolved and first life on earth was able to start. Identify greenhouse gases and state how global warming occurs. Explain the problems caused by global warming. Interpret date to support the theory of global warming. <u>C10 - The Earth's resources</u> <u>The Earth's resources</u> 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. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. Understand finite and renewable resources, describe how water is made safe to drink, extracting metal from ores, life cycle assessment.

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	Separate Chemistry Percentage yield Atom economy Using concentrations of solutions in mol/dm3 Use of amount of substance in relation to volumes of gases Percentage yield HT Only Moles Amounts of substances in equations Using moles to balanced equations Limiting reactants Concentration of solutions	Required practical - Water purification *Separate Chemistry* *Corrosion and its prevention* *Alloys as useful materials* *Ceramics, polymers, and composites* *The Haber process* *Production of uses of NPK fertilizers* *The Haber process* HT Only - Alternative methods of extracting metals
Assessment Content and methods used to judge learning	*Y10 Spring Summative Assessment* Atomic structure and the periodic table, Structure and Bonding, chemical calculations, chemical change. • *End of topic consolidation tasks* • *Formative assessment* • *Required Practical Retrieval Tasks* • *Homework – exam style questions*	*Y11 Spring Summative Assessment* Atomic Structure And The Periodic Table, Structure And Bonding, Chemical Calculations, Chemical Change, Electrolysis + Energy Changes, Rates Of Reaction, Chemical Analysis, the Earth's atmosphere + Earth's Resources. • *End of topic consolidation tasks* • *Formative assessment* • *Required Practical Retrieval Tasks* • *Homework – exam style questions*
Spring half term 4 Sequential knowledge and skills	C4 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. The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.	Revision End of topic consolidation tasks Peer marked end of topic assessment Leveled practical write up 10 Minute Tests Required Practical review Review of the specification checklist Retrieval Practice

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	<u>Chemical Changes</u> Acids are neutralised by alkalis (e.g. soluble metal hydroxides) and bases (e.g. insoluble metal hydroxides and metal oxides) to produce salts and water, and by metal carbonates to produce salts, water and carbon dioxide. Students should understand the term neutralisation and the pH scale. They should also understand making salts and the process of naming them. <u>Electrolysis</u> Passing an electric current through electrolytes causes the ions to move to the electrodes. Positively charged ions move to the negative electrode (the cathode), and negatively charged ions move to the positive electrode (the anode). Ions are discharged at the electrodes producing elements. This process is called electrolysis. Students will be able to describe electrolysis, identify cations and anions and construct half equations. **Required practical** - Making salts **Required practical** - Neutralisation Separates Chemistry **Required practical** – Electrolysis <u>HT Only</u> Oxidation and reduction in terms of electrons Strong and weal acids Representation of reactions at electrodes as half equations	
Assessment Content and methods used to judge learning	*Formative assessment* Atomic structure and the periodic table, Structure and Bonding, chemical calculations, chemical change + electrolysis. • *End of topic consolidation tasks* • *Homework – exam style questions* • *Peer marked end of topic assessment* • *Required Practical completion*	*Y11 Spring Formative and Summative Assessments* Atomic Structure And The Periodic Table, Structure And Bonding, Chemical Calculations, Chemical Change, Electrolysis + Energy Changes, Rates Of Reaction, Chemical Analysis, the Earth's atmosphere + Earth's Resources.

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Summer half term 5 Sequential knowledge and skills	<u>C5 - Energy Changes</u> 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. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way. Students should identify all chemical reactions as exothermic or endothermic, draw reaction profiles for reactions, describe real uses of exothermic and endothermic reactions. **Required practical** - Temperature changes *<u>Separate Chemistry</u>* Cells and batteries + Fuel cells	<u>Revision</u> End of topic consolidation tasks Peer marked end of topic assessment Leveled practical write up 10 Minute Tests Required Practical review Review of the specification checklist Retrieval Practice
Assessment Content and methods used to judge learning	*Y10 Spring Summative Assessment* Atomic structure and the periodic table, Structure and Bonding, chemical calculations, chemical change, electrolysis + Energy Changes. • *End of topic consolidation tasks* • *Formative assessment* • *Required Practical Retrieval Tasks* • *Homework – exam style questions*	
Summer half term 6 Sequential knowledge and skills	<u>C6 - Rates of Reaction</u> 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. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists	

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	and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way. Students should identify all the ways that rate of reaction can be changed. Practice in measuring rate of reaction in several different ways. Students should be confident in the analysis of rate of reaction graphs. Required practical - Rates of reaction HT Only The effect of changing conditions on equilibrium The effect of changing concentration The effect of temperature on equilibrium The effect of pressure changes on equilibrium	
Assessment Content and methods used to judge learning Assessment	*Formative assessment* Atomic structure and the periodic table, Structure and Bonding, chemical calculations, chemical change, electrolysis + energy changes + rates of reaction. • *End of topic consolidation tasks* • *Homework – exam style questions* • *Peer marked end of topic assessment* • *Required Practical completion*	