Year: Year 12
Subject: Chemistry

Term	Week	Focus	Summary	Learning Outcomes	Learning skills
Term 1.1	1	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To explore writing formulae, understand the concept of Avogadro's constant and how this information is used To explore the structure of the atom, understand what is meant by an isotope and investigate the process and uses of mass spectrometry	Know the terms 'atom', 'element', 'ion', 'molecule', 'compound', 'empirical formula' and 'molecular formula' Know that the mole (mol) is the unit for the amount of a substance and be able to perform calculations using the Avogadro constant Know the structure of an atom in terms of electrons, protons and neutrons know the relative mass and charge of protons, neutrons and electrons Know what is meant by the terms 'atomic (proton) number' and 'mass number' Use the atomic number and the mass number to determine the number of each type of subatomic particle in an atom or ion understand the term 'isotope'	Learners will be able to break down a task, decide on a suitable approach and then use their problem-solving skills to achieve a numerical answer specifically when working with Avogadro's constant (ACP Analysing). Learners will have the opportunity to monitor, evaluate and self-correct their work and reviewing their method to complete calculations (ACP Metathinking). Learners will be able to work at speed and with accuracy to achieve maximum marks in calculation questions (ACP Realising).
	2	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To review writing balanced chemical equations for different chemical reactions and compare quantitative terms for Chemistry To explore the structure of the atom, understand what is meant by an isotope and investigate the process and uses of mass spectrometry	write balanced full and ionic equations, including state symbols, for chemical reactions define and explain the terms relative atomic mass, relative molecular mass, relative formula mass and molar mass compare units including moles per litre, grams per mole and parts per million Summarise the main steps of mass spectrometry to produce a mass spectrum of a sample for analysis Interpret mass spectra to deduce the isotopic composition of a sample	Learners will practise the ability to demonstrate confidence and experiment with novel ideas such as mass spectrometry (VAA Agile). Learners will be able to work at speed and with accuracy to construct balanced chemical equations for a range of different reactions (ACP Realising)

				Process data from a mass spectrum to calculate the relative atomic mass of an element and relative abundances of isotopes Explain the charges of the ions in a mass spectrometer	
	3	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To review the calculation of the mole and apply knowledge to calculate the empirical and molecular formula from data To explore the concept of ionisation energy and explain the factors that affect the ionisation energy of an atom	Calculate the concentration of a solution in $moldm^{-3}$ and gdm^{-3} Calculate the empirical formula from data Calculate the molecular formula using the empirical formula and mass Define what is meant by ionisation energy and compare the first, second, and third ionisation energies of different elements Apply knowledge to justify why ionisation is endothermic Determine and explain the relationships between ionisation energy and number of protons, electron shielding and position of the electron in the atom	Learners will develop the ACP Analysing when interpreting given data to carry out a range of calculations to determine the empirical formula or molecular formula from given data. Learners will become proficient in converting and calculating concentration in different units (ACP Realising). Learners will have to link their learning of atomic structure to deepen their understanding of ionisation and the impact atomic structure has on this property (ACP Linking).
	4	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To explore different calculations from balanced chemical equations to determine reactant masses or quantity of products produced and demonstrate how the gas equation can be used to calculate the volume of gas produced in a reaction	Carry out calculations from a balanced chemical equation to determine the mass of reactants needed and the mass of products produced State the volume of 1 mole of any gas at standard temperature and pressure Convert units of pressure and units of temperature for use in the gas equation Calculate the volume of gas produced using pV=nRT Name and describe different orbitals in which elements can be found (s and p)	Learners will develop the ACP Linking when using generalisations relating to gases and pressure to calculate volumes of gases and gas mixtures Learners develop the ability to be flexible and open-minded when exploring new content in relation to their previous knowledge of the atomic structure (VAA Agile).

			To review knowledge of the atomic structure and develop the concept of electron configuration including orbitals and spin	Describe how electrons fill orbitals and the spin when electrons are paired Construct the electron configuration of elements (1 to 36) using Aufbau's principle Construct electron-in-box notation for elements to show the electron configuration (1 to 36) Describe the relationship between electron configuration and chemical properties	
	5	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To use calculations to show how effective a reaction is from the atom economy and percentage yield ***Required Practical:*** Conduct an experiment to measure the molar volume of a gas To explore the structure of the periodic table and explain observed trends	Calculate the percentage yield for a given reaction Calculate the atom economy for a given reaction Demonstrate theory through the completion of required practical 1 Identify the different blocks in the Periodic Table (s,p,d and f) Explain the trend in the first ionisation going across a period and down a group in the Periodic Table Construct a graph from the given data to show the periodic property of ionisation energy Apply knowledge to explain the trends in melting point and boiling point for Period 2 and 3 elements Provide reasoning to support the general trends in ionisation energy across Period 2 and 3 elements Apply knowledge to explain why first ionisation energy decreases down a group	

	6	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 2 Atomic Structure and the Periodic Table	To practice the writing of ionic and full equations for the reactions that occur for simple test-tube experiments Topic 2 Retrieval Practical, Review and Feedback	Construct the ionic and full equations including state symbols for simple displacement reactions (including the alkali metals and halogens) Describe the observations you would make for simple displacement reactions Construct the ionic and full equations including state symbols for reactions involving acids Construct the ionic and full equations including state symbols for simple test tube reactions that produce precipitates (including Group 2, Halogens) Describe the observations you would make for simple displacement reactions Evaluate your knowledge of Topic 2, review the application to exam-style questions and determine areas for development from the topic	Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).
	7	**Teacher 1** Topic 1 Formula, Equations and Amount of Substance **Teacher 2** Topic 3 Structure and Bonding	Topic 1 Retrieval Practical, Review and Feedback To explore how ionic bonds are formed, the structures and properties	Evaluate your knowledge of Topic 1, review the application to exam-style questions and determine areas for development from the topic Describe the formation of different ions and explain why these ions are formed Draw dot-and-cross diagrams to show cations and anions Name and model the structure formed by ionic compounds Summarise the formation of ionic bonds Determine the relationship between ionic radii and the strength of ionic bonds	Learners will develop the ability to work effectively within the rules of the atomic structure (ACP Analysing) when drawing crystal structures. Learners will practise to use connections from their knowledge of ionic, covalent and metallic bonding to seek generalisations about giant covalent structures and their properties (ACP Linking). Learners will have the opportunity to develop their use of scientific language with such ease that it no

				Apply your knowledge of electron configuration to justify the trend in ionic radii down a group Define the terms polarise and polarising power Discuss the features of a cation that affect the polarising power	longer requires active thinking (ACP Realising). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).
Term 1.2	**1**	**Teacher 1** Topic 4a Introduction to Organic **Teacher 2** Topic 3 Structure and Bonding	To develop knowledge of the fundamentals that will be required across the organic chemistry topics To explore how covalent bonds are formed, the structures and properties	Compare hazards and risks Describe common hazards associated with organic compounds and suggest safety precautions Construct basic risk assessments for the use of organic compounds Define a homologous Describe what is meant by a functional group Use IUPAC naming rules to name organic compounds (prefixes for compounds up to C_{10}) Draw full displayed, structural and skeletal formulae for organic compounds Name the types of structures formed by covalent substances Describe the formation of a covalent bond between two non-metal atoms and explain why these are formed Describe the formation of dative covalent bonds Draw dot-and-cross diagrams to model covalent bonds including dative covalent bonds Compare the properties of simple molecular and giant atomic structures including melting, boiling, strength and conductivity	

	2	**Teacher 1** Topic 4a Introduction to Organic **Teacher 2** Topic 3 Structure and Bonding	To develop knowledge of the fundamentals that will be required across the organic chemistry topics To explore how covalent bonds are formed, the structures and properties	Compare hazards and risks Describe common hazards associated with organic compounds and suggest safety precautions Construct basic risk assessments for the use of organic compounds Define a homologous Describe what is meant by a functional group Use IUPAC naming rules to name organic compounds (prefixes for compounds up to C_{10}) Draw full displayed, structural and skeletal formulae for organic compounds State the definition of electronegativity Discuss how polar bonds are formed Predict if a bond is polar or non-polar based on electronegativity Summarise electron pair repulsion theory Compare the repulsive forces of bonded pair-bonded pair, bonded pair-lone pair and lone pair-lone pair Predict the shapes of simple molecules and ions Describe what is meant by bond length and bond angle Know and be able to explain the shapes of, and bond angles in, $BeCl_2$, BCl_3, CH_4, NH_3, NH_4^+, H_2O, CO_2, gaseous PCl_5, SF_6 and C_2H_4	Learners will be able to generate ideas from their knowledge of sub-atomic particle charges and bonding to create shapes of molecules in 3-dimensional space (ACP Creating). Learners will practise the ability to work with big ideas related to electrostatic forces of attraction and atomic structure from previous lessons (ACP Linking).
	3	**Teacher 1** Topic 4a and 4b Introduction to Organic and Alkanes **Teacher 2** Topic 3 Structure and Bonding	To explore the homologous series of alkanes and cycloalkanes and their reactions including combustion and free radical substitutions To revise the concept of metallic bonding, the	State the general formula of the alkanes and cycloalkanes Define the terms hydrocarbon, saturated and isomers Draw and name structural isomers of alkanes and cycloalkanes up to 6 carbons Describe the process of fractional distillation Write equations to demonstrate the process of cracking and justify why this process is carried out	Learners will develop their ability to train and prepare through working on past exam questions in

			structure formed and the properties of metallic substances Topic 3 Retrieval Practical, Review and Feedback	List pollutants released by the combustion of alkanes and summarise their impact on the environment Compare the carbon neutrality of different fuels Write balanced combustion equations for alkanes Describe a metallic lattice Describe the particles found in a metallic lattice Identify the forces present in a metallic lattice List the common properties of metals Use your knowledge to explain the properties of metals including conductivity and melting point Evaluate your knowledge of Topic 3, review the application to exam-style questions and determine areas for development from the topic	order to become more proficient (VAA Hardworking).
	4	**Teacher 1** Topic 4a and 4b Introduction to Organic and Alkanes **Teacher 2** Topic 7 Intermolecular Forces	To explore the homologous series of alkanes and cycloalkanes and their reactions including combustion and free radical substitutions	Describe what is meant by a free radical Name the energy source needed to produce free radicals Summarise the different steps of free radical chain reactions including initiation, propagation and termination Construct equations to describe initiation, propagation and termination for a given reaction Construct a mechanism for the initiation, propagation and termination steps of a given reaction Give a limitation of synthesis using free radical mechanisms	

				List the three main types of intermolecular forces that occur between molecules Analyse structure and bonding within a molecule to determine the type of intermolecular forces present Determine the relationship between the type of intermolecular forces and boiling point Use your knowledge of intermolecular forces to explain the melting/boiling points of water and the density of ice compared to water	
	5	**Teacher 1** Topic 5 Alkenes **Teacher 2** Topic 7 Intermolecular Forces	To explore the homologous series of alkenes and cycloalkenes, their reactions including electrophilic addition and polymerisation	State the general formula for the alkenes and cycloalkenes Define the terms hydrocarbon, unsaturated and geometric isomers Describe the formation of a double bond Analyse an alkene to determine if it is an E or Z isomer and name the alkene Draw and name an E or Z isomer for a given alkene Summarise the method used to demonstrate that a double bond is present and describe the observations Name the catalyst used when an alkene is reacted with hydrogen to form an alkane Name the type of organic molecule formed when an alkene is reacted with a halogen or a hydrogen halide Name the reactants required to turn an alkene into an alcohol including the catalyst required Describe the process of oxidation to produce a diol from an alkene Determine the relationship between the size of a hydrocarbon chain and the melting/boiling point using intermolecular forces to justify Compare the melting/boiling point of branched and straight-chained alkanes	

				Provide evidence to support the conclusion that alcohols have a greater viscosity when compared to alkanes with the same number of carbons Describe the trend in the boiling point of hydrogen halides and explain Determine the factors that affect the solubility of ionic compounds in water and alcohols in water Analyse a structure to determine if water would be a poor solvent for a given molecule including halogenalkanes	
	6	**Teacher 1** Topic 5 Alkenes **Teacher 2** Support and Revision	To explore the homologous series of alkenes and cycloalkenes, their reactions including electrophilic addition and polymerisation	Construct a mechanism to show the electrophilic addition of bromine to ethene Construct a mechanism to show the electrophilic addition of hydrogen bromide to ethene Explain the major and minor products formed by the electrophilic addition of hydrogen bromide to ethene Discuss the stability of carbocations Draw the repeating unit of a polymer from a given monomer Draw the monomer from the repeating unit of a given polymer Justify why it is better to use biodegradable plastics and the issues with incinerating polymers	
	7	**Teacher 1 and Teacher 2**	Unit 1 Mini-Mock retrieval practice covering all Unit 1 content (Topics 1 to 5).	Evaluate your knowledge of Unit 1 content, review the application to exam-style questions and determine areas for development from the topic	Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).