KS5 Curriculum Mapping

(Chemistry)

		Term1		Term2		Term3	
		Term 1.1	Term 1.2	Term 2.1	Term 2.2	Term 3.1	Term 3.2
	Concept/ Theme	**Atomic Structure** **Amount of Substance**	**Structure and Bonding** **Periodicity**	**Redox, Group 2 and Group 7** **Intro to Organic Chemistry**	**Energetics** **Alkanes and Halogenoalkanes**	**Equilibria and Kc, Kinetics** **Alkenes and Alcohols**	
12	Knowledge	**<u>Atomic Structure</u>** • interpret simple mass spectra of elements • calculate relative atomic mass from isotopic abundance • define first ionisation energy • write equations for first and successive ionisation energies • explain how first and successive ionisation energies in Period 3 (Na–Ar) and in Group 2 (Be–Ba) give evidence for electron configuration in sub-shells and in shells **<u>Amount of Substance</u>** • write balanced equations for reactions studied • balance equations for unfamiliar reactions when reactants and products are specified. Use balanced equations to calculate: • masses • volumes of gases • percentage yields • percentage atom economies • concentrations and volumes for reactions in solutions	**<u>Structure and Bonding</u>** • relate the melting point and conductivity of materials to the type of structure and the bonding present • explain the energy changes associated with changes of state • explain the shapes of, and bond angles in, simple molecules and ions with up to six electron pairs (including lone pairs of electrons) surrounding the central atom •explain the existence of these forces between familiar and unfamiliar molecules • explain how melting and boiling points are influenced by these intermolecular forces **<u>Periodicity</u>** • explain the trends in atomic radius and first ionisation energy • explain the melting point of the elements in terms of their structure and bonding	**<u>Redox</u>** • work out the oxidation state of an element in a compound or ion from the formula • write half-equations identifying the oxidation and reduction processes in redox reactions • combine half-equations to give an overall redox equation **<u>Group 2</u>** • explain the trends in atomic radius and first ionisation energy for Group 2 elements • explain the melting point of the Group 2 elements in terms of their structure and bonding • outline simple test tube reactions to test for the presence of Group 2 ions **<u>Group 7</u>** • explain the trend in electronegativity • explain the trend in the boiling point of the elements in terms of their structure and bonding • outline simple test tube reactions to test for the presence of Group 7 ions **<u>Intro to Organic Chemistry</u>** • draw structural, displayed and skeletal formulas for given organic compounds	**<u>Energetics</u>** •calculate the molar enthalpy change for a reaction • use Hess's law to perform calculations, including calculation of enthalpy changes for reactions from enthalpies of combustion or from enthalpies of formation **<u>Alkanes</u>** •describe how fractions of alkanes and obtained •describe how and explain why long chain alkanes are cracked •show how pollutant gases are formed and describe the problems associated with them **<u>Halogenoalkanes</u>** •explain how chlorine atoms catalyse decomposition of ozone •outline the formation of halogenoalkanes via free radical substitution •outline nucleophilic substitution involving NH_3, OH^- and CN^- as nucleophiles •outline the formation of halogenoalkanes via free radical substitution	**<u>Equilibria and Kc</u>** • use Le Chatelier's principle to predict qualitatively the effect of changes in temperature, pressure and concentration on the position of equilibrium • perform calculations involving Kc **<u>Kinetics</u>** • explain how a change in temperature, concentration or a change in pressure influences the rate of a reaction • draw and interpret Maxwell-Boltzmann distribution curves for different conditions **<u>Alkenes</u>** • outline electrophilic addition mechanism alkenes reacting with hydrogen halides, halogens and sulfuric acid • explain the formation of major and minor products by reference to the relative stabilities of primary, secondary and tertiary carbocation intermediates • represent the formation of polyalkenes from alkenes **<u>Alcohols</u>** • justify the conditions used in the production of ethanol by fermentation of glucose • outline the mechanism for the formation of an alcohol by the	

				• name organic compounds limited to chains and rings with up to six carbon atoms each		reaction of an alkene with steam in the presence of an acid catalyst • explain how the method used to oxidise an alcohol determines the product formed • outline the mechanism for the elimination of water from alcohols	
13	Concept/ Theme	Rate Equations and Kp Aldehydes and Ketones Aromatic Chemistry	Acids, Bases and Buffers Amines and Amino Acids Polymers	Thermodynamics Structure Determination	Transition Metals and Reactions of Ions Electrochemistry and Periodicity		
	Knowledge	**<u>Rate Equations</u>** • perform calculations using the rate equation • explain the qualitative effect of changes in temperature on the rate constant k • perform calculations using the equation k = Ae–Ea/RT • use concentration–time graphs to deduce the rate of a reaction • use initial concentration–time data to deduce the initial rate of a reaction **<u>Kp</u>** • derive partial pressure from mole fraction and total pressure • construct an expression for K p for a homogeneous system in equilibrium • perform calculations involving K p • predict the qualitative effects of changes in temperature and pressure on the position of equilibrium and on the value of K p **<u>Aldehydes and Ketones</u>** • write overall equations for reduction reactions using [H] as the reductant • outline the nucleophilic addition mechanism for reduction reactions with $NaBH_4$ • write overall equations for the formation of hydroxynitriles using HCN	**<u>Acids, Bases and Buffers</u>** • convert concentration of hydrogen ions into pH and vice versa • calculate the pH of a solution of a strong acid from its concentration • construct an expression for Ka • perform calculations relating the pH of a weak acid to the concentration of the acid and the dissociation constant, Ka • sketch and explain the shapes of typical pH curves • calculate the pH of acidic buffer solutions **<u>Amines</u>** • Explain the difference in base strength in terms of the availability of the lone pair of electrons on the N atom •Outline the mechanisms of nucleophilic substitution reactions and the nucleophilic addition–elimination reactions of ammonia and primary amines with acyl chlorides **<u>Amino acids</u>** •Draw the structures of amino acids as zwitterions and the ions formed from amino acids: -in acid solution - in alkaline solution • draw the structure of a peptide formed from up to three amino acids	**<u>Thermodynamics</u>** • construct Born–Haber cycles to calculate lattice enthalpies using these enthalpy changes • construct Born–Haber cycles to calculate one of the other enthalpy changes • compare lattice enthalpies from Born–Haber cycles with those from calculations based on a perfect ionic model to provide evidence for covalent character in ionic compounds. • calculate entropy changes from absolute entropy values • use the relationship ΔG = ΔH – TΔS to determine how ΔG varies with temperature **<u>Structure Determination</u>** • explain why TMS is a suitable substance to use as a standard • use 1 H NMR and 13C NMR spectra and chemical shift data from the Chemistry Data Booklet to suggest possible structures or part structures for molecules • use integration data from 1 H NMR spectra to determine the relative numbers of equivalent protons in the molecule • use the n+1 rule to deduce the spin–spin splitting patterns of adjacent, non-equivalent protons, limited to doublet, triplet and quartet formation in aliphatic compounds	**<u>Transition Metals</u>** • describe the expected observations of test tube reactions involving solutions of metal aqua ions with ammonia or concentrated hydrochloric acid • explain the importance of variable oxidation states in catalysis • explain, with the aid of equations, how V_2O_5 acts as a catalyst in the Contact process • explain, with the aid of equations, how Fe^{2+} ions catalyse the reaction between I– and $S_2O_8^{2-}$ • explain, with the aid of equations, how Mn^{2+} ions autocatalyse the reaction between $C_2O_4^{2-}$ and MnO_4 **<u>Electrochemistry</u>** • use EΘ values to predict the direction of simple redox reactions • calculate the EMF of a cell • write and apply the conventional representation of a cell. • use given electrode data to deduce the reactions occurring in non-rechargeable and rechargeable cells • deduce the EMF of a cell **<u>Periodicity</u>** • explain the trend in the melting point of the oxides of the elements Na–S in terms of their structure and bonding		

		• outline the nucleophilic addition mechanism for the reaction with KCN followed by dilute acid • explain why nucleophilic addition reactions involving acidified KCN can produce a mixture of enantiomers • outline the mechanism of nucleophilic addition–elimination reactions of acyl chlorides with water, alcohols, ammonia and primary amines **<u>Aromatic Chemistry</u>** • Describe the bonding and structure of benzene • use thermochemical evidence from enthalpies of hydrogenation to account for this extra stability • outline the electrophilic substitution mechanisms of: -nitration, including the generation of the nitronium ion - acylation using AlCl3 as a catalyst	• draw the structure of the amino acids formed by hydrolysis of a peptide • explain how hydrogen bonding between base pairs leads to the two complementary strands of DNA • explain why cisplatin prevents DNA replication • explain why such drugs can have adverse effects		• explain the trends in the reactions of the oxides with water in terms of the type of bonding present in each oxide • write equations for the reactions that occur between the oxides of the elements Na–S and given acids and bases		
Extra curricular		Weekly afterschool workshops are run throughout the year					