Chemical Changes & Structures

	Key Areas	*Exemplification*
Rates of Reactions	*Average rate of reaction calculated from graph*	Calculations of the average rate of a chemical reaction from a graph of the change in mass or volume against time.

	Key Areas	*Exemplification*
Atomic structure and bonding related to properties of materials	*Nuclide notation.*	Chemists use nuclide notation to show the numbers of sub-atomic particles in an atom or ion.
	Isotopes and relative atomic mass.	Isotopes are atoms of the same element with different mass numbers.
		Relative atomic mass is the average mass of the isotopes present taking into account their relative proportions.
	Ions.	When there is an imbalance in the number of positive protons and electrons the particle is known as an ion.
	Ionic bonding. Ionic Lattices (Networks)	Ionic bonds are the electrostatic attraction between positive and negative ions. Ionic compounds form lattice structures of oppositely charged ions.
		Ionic compounds have high melting and boiling points because strong ionic bonds must be broken in order to break down the lattice.
		Dissolving also breaks down the lattice structure.
		Ionic compounds conduct electricity, only when molten or in solution due to the breakdown of the lattice resulting in the ions being free to move.
	Covalent Bonding. Covalent molecular, covalent network	In a covalent bond, the shared pair of electrons is attracted to the nuclei of the two bonded atoms.
		More than one bond can be formed between atoms leading to double and triple covalent bonds.
		Covalent substances can form either discrete molecular or giant network structures.
		Diagrams show how outer electrons are shared to form the covalent bond(s) in a molecule and the shape of simple two-element compounds.
	Physical properties of chemicals explained through bonding.	Covalent molecular substances have low melting and boiling points due to only weak forces of attraction between molecules being broken.
		Giant covalent network structures have very high melting and boiling points because the network of strong covalent bonds must be broken.
		Experimental procedures are required to confirm the type of bonding present in a substance.

	Key Areas	*Exemplification*
Metals (Unit 3)	*Metallic bonding and resulting electrical conductivity.*	Metallic bonding can explain the conductivity of metals.

	Key Areas	Exemplification
Nuclear Chemistry (Unit 3)	*Radiation process, alpha, beta and gamma radiation..*	Radioactive elements can become more stable by giving out alpha, beta or gamma radiation.
	Specific properties mass, charge and ability to penetrate different materials.	These types of radiation have specific properties such as their mass, charge and ability to penetrate different materials.
	Nuclear equations.	Nuclear equations can be written to describe nuclear reactions.
	Uses of radioisotopes.	Radioactive isotopes are used in medicine and industry.
	Half-life.	The time for half of the nuclei of a particular isotope to decay is fixed and is called the half-life.
	Use of isotopes to date materials.	Half-life for a particular isotope is a constant so radioactive isotopes can be used to date materials.

	Key Areas	Exemplification
Formulae & Reaction Quantities	*Balanced equations, including state symbols.*	Chemical and ionic formulae including group ions.
		The chemical formula of a covalent molecular substance gives the number of atoms present in the molecule.
		The formula of a covalent network or ionic compound gives the simplest ratio of atoms/ions in the substance.
	Gram formula mass	The gram formula mass is defined as the mass of one mole of a substance.
		Using the chemical formula of any substance the gram formula mass can be calculated using relative formula masses of its constituent elements.
	Calculations relating mass, volume of solutions, concentration and moles	Moles, n = mass ÷ gfm
		Moles, n = C x V or Concentration, C = n ÷ V
		The concentration of solutions in moles per litre.

	Key Areas	Exemplification
Acids & Bases	*Dissociation of water into hydrogen and hydroxide ions.*	A very small proportion of water molecules will dissociate into an equal number of hydrogen and hydroxide ions.
	pH is related to the concentration of hydrogen and hydroxide ions in pure water, acids and alkalis.	The pH is a measure of the hydrogen ion concentration.
		A neutral solution has an equal concentration of hydrogen and hydroxide ions.
		A solution with a greater concentration of hydrogen ions than hydroxide ions is an acid.
		When the reverse is true the solution is known as an alkali.
		The effect of dilution of an acid or alkali with water is related to the concentrations of hydrogen and hydroxide ions.
		When added to water, soluble metal oxides produce metal hydroxide solutions, increasing the hydroxide ion concentration.
		Soluble non-metal oxides increase the hydrogen ion concentration.
	Neutralisation.	For the neutralisation reactions of acids with alkalis or metal carbonates, the reacting species is determined by omission of spectator ions.
	Titrations.	Titration is an analytical technique used to determine the accurate volumes involved in chemical reactions such as neutralisation.
		An indicator is used to show the end-point of the reaction.