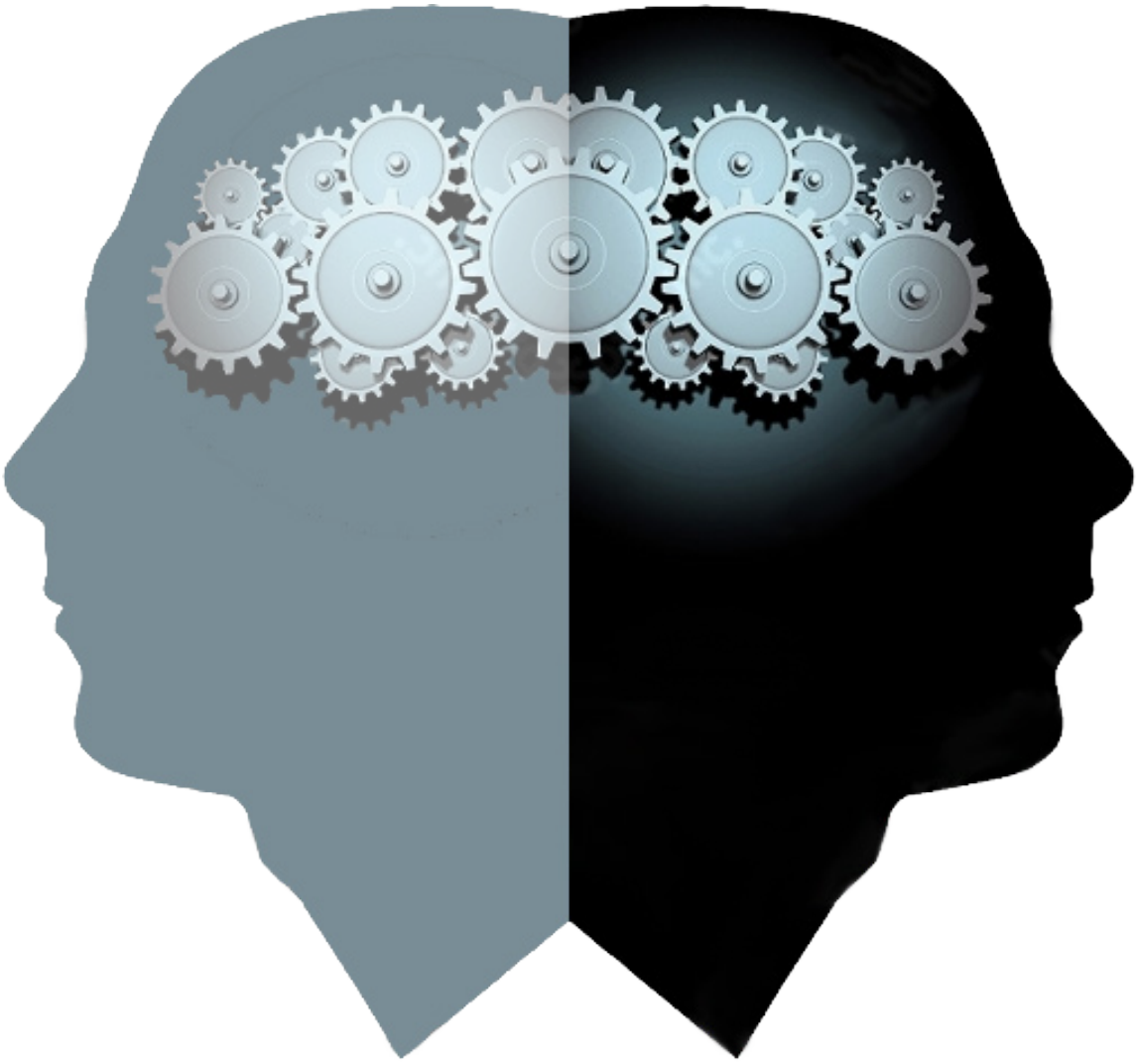
CHEMISTRY

N5 KEY AREAS



Unit 1: *Chemical Changes & Structures*

Unit 2: *Nature's Chemistry*

Unit 3: *Chemistry In Society*

Significance of Key Areas

Firstly, the *Key Areas* are tested through a series of 'basic' *2.1* questions which must be passed (50% of questions asked in each Unit) in order to qualify to sit the final exam.

You should, therefore use this booklet to focus your revision on every occasion that your teacher tells you that it is time to Test a particular *Key Area*.

Topic Tests, *Prelim* and the *Final Exam* will require you to know and understand all the other things that your teacher teaches you.

If necessary, success in the *Key Area* questions can also be used as evidence for an award at National 4 if a pupil fails to pass the final exam.

At the same time, '*Problem Solving*' skills (*2.4*) will be tested.

Secondly, in various other assessments (*2.2*, *2.3*, *Outcome 1* & the final *Assignment*) you will need to include Chemistry Theory. Often you will have been asked to do some research to expand on things learnt in class.

However, to pass these assessments, or achieve the marks avaliable, the theory must be related to the *N5 Key Areas*.

You should, therefore, also use this booklet to check that what you intend to write about is both ***relevant*** and ***at the correct (N5) level***.

1	*Chemical Changes & Structures*	*Key Areas*	*Exemplification*
1.1	*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.
1.2	*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.

1	*Chemical Changes & Structures*	*Key Areas*	*Exemplification*
1.2	*Atomic structure and bonding related to properties of materials*	Covalent Bonding. Covalent molecular, covalent network	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.
3.1	*Metals (From Unit 3)*	Metallic bonding and resulting electrical conductivity.	Metallic bonding can explain the conductivity of metals.
3.4	*Nuclear Chemistry (From 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.

1	*Chemical Changes & Structures*	*Key Areas*	*Exemplification*
1.3	*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.
1.4	*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.

1	*Chemical Changes & Structures*	*Key Areas*	*Exemplification*
1.4	*Acids & Bases*	pH is related to the concentration of hydrogen and hydroxide ions in pure water, acids and alkalis.	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.

2	*Nature's Chemistry*	*Key Areas*	*Exemplification*
2.1	*Homologous Series*	Definition	Group of compounds with similar chemical properties and the same general formula.
		Branched Chain Alkanes (up to C8)	Structural formulae can be drawn and molecular formulae written from systematic names.
			Molecules can be named systematically from structural formulae
		Cycloalkanes	The cycloalkane family is a homologous series of hydrocarbons and is identified from the name and the general formula.
			Cycloalkanes, with no more than eight carbon atoms in their longest chain, are named from their full structural formulae, shortened structural formulae and molecular formulae.
		Branched Chain Alkenes (up to C8)	Alkenes are described as unsaturated hydrocarbons and can undergo addition reactions.
			Structural formulae can be drawn and molecular formulae written from systematic names.
			Molecules can be named systematically from structural formulae
		Isomers	Isomers exist in the alkanes, branched alkanes, alkenes, branched alkenes and cycloalkanes. Isomers have different properties.
2.2	*Everyday Consumer Products*	Alcohols	An alcohol is identified from the –OH group and the ending '-ol'.
			Straight chain alcohols are named from the structure formulae. Given the names of straight-chain alcohols structural and molecular formulae can be written.
			Alcohols are effective solvents, highly flammable, and burn with very clean flames resulting in their use as a fuel.

2	*Nature's Chemistry*	*Key Areas*	*Exemplification*
2.2	*Everyday Consumer Products*	Carboxylic Acids	Carboxylic acids can be identified by the carboxyl ending, the COOH functional group and the '-oic' name ending.
			Straight-chained carboxylic acids can be identified and named from the structural formulae. Given the name of straight chained carboxylic acid the structural formulae can be drawn.
			Vinegar is a solution of ethanoic acid. Vinegar is used in household cleaning products and as a preservative in the food industry.
		Esters	An ester can be made by reacting a carboxylic acid and an alcohol.
			Some uses of esters are in food flavouring, industrial solvents, fragrances and materials.
2.3	*Energy From Fuels*	Energy Calculations involving Eh = cmΔT	Combustion reactions are exothermic reactions. The opposite of this is an endothermic reaction.
			Alkanes and alcohols can be used as fuels.
			Different fuels provide different quantities of energy and this can be measured experimentally and calculated using Eh = cmΔT.
3.2	*Properties of Plastics (Unit 3)*	Addition Polymerisation	For addition polymers: Identify monomer, polymer, repeating unit and naming of polymer from monomer name.
			Draw structures of monomers and polymers (to include 3 repeating units).
		Condensation Polymerisation	Polyesters are examples of condensation polymers
			The type of polymer can be identified from its structure.

3	*Chemistry In Society*	*Key Areas*	*Exemplification*
3.1	*Metals*	Metallic bonding and resulting electrical conductivity.	Metallic bonding can explain the conductivity of metals.
		Balanced ionic equations for reactions of metals, extraction of metals and reduction reactions.	Balanced ionic equations can be written to show the reaction of metals with water, oxygen, acids
		Electrochemical cells including a non-metal electrode.	Ion-electron equations can be written for electrochemical cells including those involving non-metals.
		Reactions of metals — electrons flow, redox reaction, oxidation, reduction.	Combinations of these reactions form redox equations
			The percentage of a particular metal in an ore can be calculated. From the balanced equations for the extraction of metals the reducing agent can be identified.
		Fuel cells and rechargeable batteries.	Fuel cells and rechargeable batteries are two examples of technologies which utilise redox reactions.
3.2	*Properties of Plastics*	Addition Polymerisation	For addition polymers: Identify monomer, polymer, repeating unit and naming of polymer from monomer name.
			Draw structures of monomers and polymers (to include 3 repeating units).
		Condensation Polymerisation	Polyesters are examples of condensation polymers
			The type of polymer can be identified from its structure.

3	*Chemistry In Society*	*Key Areas*	*Exemplification*
3.3	*Fertilisers*	The Haber process to produce ammonia.	The Haber process is one of the most important reactions in the production of fertilisers and is an example of a reversible reaction.
		Commercial production of nitrate fertilisers.	Ammonia is the starting material for the commercial production of nitric acid, which is used to produce ammonium nitrate.
		Percentage mass compositions of fertilisers.	
3.4	*Nuclear Chemistry*	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.
3.5	*Chemical Analysis*	Techniques for monitoring the environment and methods for reducing pollution and titration with calculations.	Chemists play an important role in society by monitoring our environment to ensure that it remains healthy and safe and that pollution is tackled as it arises.
			A variety of methods exist which enable chemists to monitor the environment both qualitatively and quantitatively, such as acid/base titration, precipitation, flame testing.