Chemistry at King's Academy Ringmer

End point	Knowledge acquired	Skills acquired
	YEAR 7	
5 Matter 5.1 Particles 5.2 Mixtures	- The particle model - States of matter - Melting, freezing and boiling - Evaporation, condensation and sublimation - Diffusion - Gas pressure - Pure substances and mixtures - Solutes, solvents and solutions - Solubility - Filtration - Evaporation and distillation - Chromatography **Top 5 Keywords** states of matter; property; density; solubility; filtration	- Measuring temperature - Planning investigations - Particle diagrams - Plotting temperature-time - Choosing scales - Carrying out experiments and recording observations results - Using models to explain properties - Separating mixtures - Scientific apparatus
6 Reactions 6.1 Acids and alkalis 6.2 Metals and non-metals	- Chemical reactions - Acids and alkalis - Indicators and pH - Acid strength - Neutralisation - Making salts - Elements - Chemical reactions of metals and non-metals - Metals and acids - Metals and oxygen - Metals and water - Metal displacement reactions **Top 5 Keywords** Acid and alkali; Chemical property; Reactivity; Element; Concentration	- Carrying out experiments and recording observations results - Using universal indicator - Use the pH scale to measure acidity and alkalinity. - Use models - Deduce the hazards of different acids - Design an investigation - Interpret a graph of pH changes during a neutralisation reaction. - Describe what a salt is and choose the correct name - Calculating percentages - Comparing the reactivity of metals

7 Earth 7.1 Earth Structure 7.2 Universe	- Sedimentary rocks - Igneous and metamorphic rocks - The rock cycle - Ceramics - The night sky - The Solar System - The structure of the Universe - The Earth - The Seasons - The Moon and changing ideas **Top 5 Keywords** Weathering; Erosion; Igneous; Sedimentary; Metamorphic	- Modelling Earth's structure - Describe advantages and disadvantages of a given model - Modelling sedimentary rock formation - What determines crystal size in igneous rock? - Predict observations - Carrying out experiments and recording observations results - Give a detailed descriptions and explanations (Rock cycle) - Make a conclusion and explain it. - Write a fair test enquiry question. - Identify control variables. - Identify risks and hazards and Identify control measures. - Justify decisions made from property data
YEAR 8		
5 Matter - 5.3 Elements 5.4 Periodic Table	- Elements - Atoms - Compounds - Chemical formulae - Polymers - The Periodic Table - The elements of Group 1; - The elements of Group 7 - The elements of Group 0 **Top 5 Keywords** Atom; Molecule; Compound; Chemical formula; Trend	- Use scientific vocabulary accurately - Use appropriate units - Use correct chemical nomenclature - Represent atoms, molecules, elements, mixtures, and compounds using particle diagrams. - Use observations of a pattern in chemical reactions to predict the behaviour - Use data to describe a trend in physical properties. - Carrying out experiments and recording observations results - Name compounds using their chemical formulae. - Explain how properties make substances suitable for their uses. - Identify hazards
6 Reactions 6.3 Types of reaction 6.4 Chemical energy	- That in a chemical reaction particles are rearranged - Combustion - Thermal decomposition - Conservation of mass - Exothermic and endothermic - Energy level diagrams - Bond energies **Top 5 Keywords** Reactant; Product; Fuel; Combustion; Exothermic and Endothermic	- Modelling reactions - Writing word equations from information about chemical reactions. - Identify possible hazards in a demonstration - Interpret particle diagrams and models to explain what happens in a chemical reaction. - Compare the pros and cons of fuels - Predict the products of thermal decomposition - Carrying out experiments and recording observations results - Use known masses to calculate unknown masses - Use experimental observations to distinguish exothermic and endothermic reactions. - Use a relative energy level diagrams

7 Earth 7.3 Climate 7.4 Earth resources	- Greenhouse effect - Greenhouse gases - Global warming - The carbon cycle - Climate change - Extracting metals - Recycling **Top 5 Keywords** Global Warming; Climate change; Extraction; Electrolysis; Recycling	- Design a model to explain the greenhouse effect - Evaluate claims that human activity is causing global warming or climate change. - Identify patterns in data. - Use an annotated diagram to describe the model in detail - Compare the relative effects of human-produced and natural global warming. - Interpret graphs that show trends over time, and explain their limitations. - Use equations to explain processes that exchange carbon dioxide into and out of the atmosphere. - Describe how global warming can impact on climate and local weather patterns.
YEAR 9		
5 Matter 5.5 Nanoparticles	- What nanoparticles are - Nanoparticles properties - Nanoparticles uses - Understanding surface area to volume ratio **Top 5 Keywords** Nanoparticle, nanomedicine, nanometer, carbon nanotube, properties	- Standard form - converting units (nano and micrometres) - SA:V ratio - Extract and interpret information from graphs - Defining hazards and risks - Making models - Applying properties to uses - Describe some advantages and disadvantages - Plan an investigation
5 Matter 5.6 Atomic models	- Plan an investigation - Writing a scientific method - How Models of the atom were developed and have changed over time - What Dalton, Thomson, and Rutherford discovered about the atom. **Top 5** Atom, element, electron, proton, neutron	- Plan an investigation - Writing a scientific method - Record observations from an experiment - Making models - Use atomic mass data to order elements
6 Reactions 6.5 Discovery and structure of the periodic table	- How the periodic table is structured and how this was developed - How Mendeleev's table enabled others to discover elements **Top 5 Keywords** Period, group, atomic mass, atomic number, periodic table	- Categorising and grouping - Devising a Periodic Table - Use the chemical and physical properties of different elements to arrange elements - Writing word equations from information about chemical reactions.
6 Reactions	- How electrons are arranged in atoms	- Identifying trends

6.6 atomic arrangement, properties and trends in periodic groups	- How electron configuration affects reactivity - Using observations to determine trends in reactivity - Trends in physical properties of the elements in group 1, 7 and 0 - Trends in chemical properties of the elements in group 1, 7 and 0 - Explaining trends in group 1, 7 and 0 in relation to ease of ionisation and atomic radii **Top 5 Keywords** Energy level/ shell, electron configuration, displacement reaction, inert, density	- Practical investigations - Writing word equations from information about chemical reactions.
7 Earth 7.5 Earth - separation techniques and pH	- How filtration works - How gas and paper chromatography works - How crystallisation works - The difference between evaporation and crystallisation - Saturated solutions - Applications of the above separation techniques **Top 5 Keywords** Chromatography, filtration, indicator, mobile phase, stationary phase	- Scientific drawings - Investigation skills - Analysing chromatograms - Extract and interpret information from graphs - practical investigations
7 Earth 7.6 Earth - metal reactivity and fuels	- How the reactivity series to can be used support observations - Extraction of metals - Electrolysis - Products of the combustion of fuels - Balancing equations - How harmful pollutant gases can be removed from car exhausts - Catalytic converters **Top 5 Keywords** Chromatography, filtration, indicator, mobile phase, stationary phase	- Interpret data from vehicle testing centre - Extract and interpret information from graphs - Order compounds and elements based on reactivity - Writing word equations from information about chemical reactions.
YEAR 10 (GCSE course)		
C1 Atomic structure	- The law of the conservation of mass - Balance chemical equations and formulae of substances - Differences between compounds and mixtures - How mixtures can be separated using techniques such as filtration, crystallisation, distillation, and chromatography.	- Draw the basic structure of an atom. - Diagrams of the difference between a pure element, a mixture, and a compound. - Balance given symbol equations. - Plan and carry out experiments amd separation techniques and recording observations and results

	- The development of the atomic model - The mass, charge and location of the subatomic particles and what ions and isotopes are - To write and draw electronic structures up to element 20. **Top 5 Keywords** Formulae, ions, isotope, distillation, chromatography	- Evaluate the models - Using atomic number and mass numbers of familiar atoms to determine the number of each sub-atomic particle. - Using SI units and prefixes to describe the size of an atom and its nucleus in standard form. - Writing the standard electronic configuration notation from a diagram for the first 20 elements.
C2 The periodic table	- The development of the periodic table - The work of Dalton, Newlands, and Mendeleev - The chemical properties of Group 0, Group 1, and Group 7 elements - Identify trends in properties and reactivity - Explain these in terms of the electronic structure of the elements. (HT only) - The properties and reactions of the transition elements. (TS only) **Top 5 Keywords** Group, period, periodicity, atomic radius, displacement,	- Listing significant models for ordering the elements. - Explaining how and why the ordering of the elements has changed over time. - Using electronic structure to show how metals and non-metals are different. - Linking electronic structure to how the elements are arranged in the periodic table. - Recognise trends in supplied data. - Recognising a halogen displacement reaction and explaining what happens in the reaction. - Explaining how the outer electrons experience different levels of attraction to the nucleus.
C3 Structure and bonding	- The states of matter and the particle model - Limitations of the particle model (HT only) - The energy transfers when substances change state. - That covalent bonding is the sharing of one or more pairs of electrons between non-metal atoms - Ionic bonding involves a metal and nonmetal atom transferring electrons - Metallic bonding and the delocalised sea of electrons - The difference in bonding of giant ionic structures, simple covalent molecules, and giant covalent structures - Nanoparticles and their applications (TS only) **Top 5 Keywords** Ionic, covalent , metallic, simple molecular, delocalised	- Linking how energy, movement, and attraction between particles change as a substance is heated or cooled. - Cooling curves - Dot and cross diagrams - Interpreting the formulae of familiar ionic compounds - Modelling ionic compounds - Testing conductivity - Molecular modelling - Ball and stick diagrams - Using intermolecular forces to explain properties - Comparing structures to explain properties - Researching news articles re fullerenes and graphene
C4 Chemical calculations	- Understand relative atomic mass and relative formula mass - The mole and Avogadro's constant (HT only) - To use the equation number of moles = mass (g) / Ar (HT only) - Use moles to balance symbol equations and calculate reacting masses (HT only) - Relative atomic mass, relative formula mass, and moles	- Calculate relative atomic mass - Calculate relative formula mass - Calculate reacting masses (HT only) - Calculate moles to concentrations (HT only) - Calculate yield (TS only) - Calculate atom economy (TS only) - Calculate titrations (TS only) - Carry out titrations (TS only)

	to concentrations (HT only) - Carry out calculations with concentrations in g/dm3. - Calculations for yield, atom economy and titrations (TS only) **Top 5 Keywords** relative atomic mass, relative formula mass, constant, moles, concentration	- Calculate volumes of gases (TS only)
C5 Chemical changes	- The reactivity series - The reactions of the metals with water and acids - Displacement reactions - The extraction of metals - The concepts of oxidation and reduction - Salts and how they are prepared - The pH scale - How pH relates to H+(aq) ion concentration and the difference between strong and weak acids. (HT only) - How alkalis are a subgroup of bases. - Ionic and half equations (HT only) **Top 5 Keywords** pH, salt, displacement, oxidation, reduction	- Plan and carry out experiments and recording observations and results - Use general equations to write specific word equations - Using oxidation and reduction in descriptions - Justify uses of metals based on their chemical reactivity. - Write balanced symbol equations, with state symbols - Evaluate in detail investigations - Use the reactivity series to determine if reactions occur. - Explaining how carbon or hydrogen can be used to reduce an ore. - Identify the chemical formula of the salt - Write ionic and half equations, including state symbols - Preparing a pure, dry sample of a soluble salt from an insoluble substance and a dilute acid.
C6 Electrolysis	- Ionic compounds can undergo electrolysis when molten or in solution - Explain the movement of particles during electrolysis - The reactions that occur at the electrodes - The extraction of aluminium - How to investigate the electrolysis of a solution - Predict the products of electrolysis - Write balanced half equations. (HT only) **Top 5 Keywords** Electrolysis, aqueous, molten, cryolite, brine	- Plan and carry out electrolysis and recording observations and results - Writing half equations - Understanding the effect of water on electrolysis - Using OIL RIG - Explaining the use of cryolite and graphite anodes - Linking to industrial uses
C7 Energy changes	- Energy transfers that occur during chemical reactions - Exothermic reactions - Endothermic reactions - Describe uses of exothermic and endothermic reactions - The quantitative energy transfers in a reaction - Bond energies (HT only) - Chemical cells (TS only) - Fuel cells (TS only)	- Interpret experimental data - Identifying if a reaction is exothermic or endothermic - Sketching and interpreting reaction profile diagrams - Calculating bond energies (HT only) - Bond diagrams (HT only) - Applying understanding of the reactivity series and electrolysis to chemical cells and fuel cells (TS only) - Investigating chemical cell

	Top 5 Keywords exothermic, endothermic, activation energy, reaction profile, bonds	
YEAR 11 (GCSE course)		
C8 Rates and equilibrium	- The factors that affect the rate of a reaction, including temperature, surface area, concentration, and pressure - Explain the effect of each factor on the rate of reaction using collision theory - That each factor increases the frequency of effective collisions, not just the number of collisions - Explain the effect of catalysts on the rate of a reaction in terms of providing an alternative reaction pathway with a lower activation energy - Reversible reactions and dynamic equilibrium - Apply their knowledge on endothermic and exothermic reactions to equilibrium reactions - Predict the effect of temperature changes on the reversible reactions and the position of the equilibrium - Use Le Châtelier's principle to explain the effect of temperature and pressure on the position of equilibrium (HT only) **Top 5 Keywords** Rate factor, frequency, collision theory, catalyst, equilibrium	- Calculating the mean rate of reaction. - Calculating the rate of reaction at a specific time. - Plot and use a graph to calculate the gradient to measure the initial rate of reaction. - Use tangents to calculate rate (HT only) - Justify a chosen method for a given reaction to monitor the rate of reaction. - Use collision theory to explain how increasing factors increase the rate of reaction. - Safely complete experiments on how factors affect the rate of a reaction. - Justify quantitative predictions - Evaluate in investigations - Use ideas about proportionality. - Use reaction profiles in explanations
C9 Crude oil and fuels	- Hydrocarbons and the alkanes - The reactions of hydrocarbons, including combustion (both complete and incomplete) and cracking - Write balanced symbol equations for the complete combustion of hydrocarbons - Describe the conditions of cracking - Describe the test for alkenes (a product of cracking) - Crude oil as a source of hydrocarbons and the fractional distillation of crude oil - How the size of the hydrocarbon molecule affects its properties, including viscosity, boiling point, and flammability **Top 5 Keywords** Fraction, hydrocarbon, viscosity, saturated, cracking	- Name and draw the displayed formula of the first four alkanes - Interpreting tables of boiling point - Displayed formulae - Classify alkanes - Apply general formulae - Bar charts - Compare properties of fractions - Summarise trends - Use standard lab tests for gases - Calculate amounts of reactants - Evaluate dangers of incomplete combustion - Balancing equations

C10 Organic reactions (TS only)	- More organic functional groups – alkenes, alcohols, carboxylic acids, and esters. . - The reactions and conditions of alkenes (with halogens, - water, and hydrogen), - Alcohols (combustion, oxidation, and reaction with sodium), and carboxylic acids (to make esters). - Why carboxylic acids are called weak acids **Top 5 Keywords** Alkene, alcohols, carboxylic acids, ester, homologous series	- Identify, name, and draw the structural formula of the first four alkenes, alcohols, and carboxylic acids - Identify, name, and draw the ester ethyl ethanoate - Predict the word and balanced symbol equations - Compare and contrast the reactivity of alkanes and alkenes. - Use general formulae - Classify an organic compounds - Comparing the reactions of alcohols - Link volatility to molecular forces.
C11 Polymers (TS only)	- Different types of manufactured polymers, including addition polymers and condensation polymers - Poly(ethene) - Basic principles of condensation polymerisation (HT only) - Natural polymers, including polysaccharides, proteins, and DNA. - The basic structure of DNA. - How amino acids react together to form proteins (HT only) - The difference between the monomer and the repeating unit of the polymer. **Top 5 Keywords** Monomer, polymer, addition, condensation, amino acid	- Identify an addition polymer from polymer and monomer diagrams - Drawing the monomer from the polymer and the polymer from the monomer - Draw other addition polymers and associated monomers - Identify the types of monomers that form natural polymers - Interpreting formulae - Labelled diagrams - Extracting DNA from kiwifruit
C12 Chemical analysis	- The difference between a pure substance, a mixture, and a formulation - What is meant by purity - Chromatography experiments - Analyse a chromatogram, both qualitatively and quantitatively using Rf values - The different experimental tests for gases, including both the procedure and positive result. - Experimental tests for positive and negative ions (TS only) - Flame emission spectroscopy (TS only) **Top 5 Keywords** Pure, formulation, Rf value, precipitate, emission spectroscopy	- Use melting point and boiling point data can be used to determine the purity of a substance - Calculate percentage composition of components in a range of formulations. - Describe and safely carry out a method to make a paper chromatogram. - Calculate Rf values from given data. - Calculate Rf values from a chromatogram, using an appropriate number of significant figures. - Interpret a chromatogram to identify unknown substances. - Interpret results to identify a gas that is present. - Identify a metal ion from the colour of a flame or the colour of the hydroxide precipitate. - Ionic equations - Safely carry out testing for carbonates, halides, and sulfate ions.

		- Interpret instrumental results of flame emission spectroscopy
C13 The Earth's atmosphere	- The volcanic activity theory of the origin of the atmosphere - Describe the history of the atmosphere and timescales involved. - How it has evolved over time - General composition of the atmosphere how it has changed and how the atmosphere is currently being affected by human activity - Greenhouse gases and effect - Human activities that are thought to cause global warming, and some of the effects this has on the climate of the Earth - Carbon footprint - The effect of other pollutants on the Earth, including carbon monoxide, sulfur dioxide, nitrogen oxides, and particulates **Top 5 Keywords** Atmosphere, greenhouse effect, carbon footprint, pollutant, particulates	- Interpret evidence concerning other theories, and be able to evaluate them. - Develop their working scientifically skills - Evaluating models - Interpreting and evaluating evidence for scientific theories - Calculate carbon footprint - Use balanced symbol equations to explain how gases were formed - Interpret pie charts - Make flow charts - Evaluate the scale, risk, and environmental impact of global climate change. - Justify why reducing greenhouse gas emissions can be difficult to achieve. - Evaluate the use of products, services, or events in terms of their carbon footprint
C14 The Earth's resources	- The difference between finite and renewable resources - Understanding of finite and renewable resources should be applied to the need to reuse and recycle - Ways of reducing the use of finite resources - Specific resources that we use, including water and metals (in particular copper) - Different ways that water is treated, both to create potable water and to remove waste products - Metal-ore extraction and electrolysis (HT only) - Alternative biological extraction of copper (HT only) **Top 5 Keywords** Finite, renewable, potable, phytomining, bioleaching	- Carry out life cycle assessments on products. - Describe and classify a resource as finite or renewable when information is given. - Explain the use of natural, sustainable, and finite resources. - Interpret information from different formats including graphs, charts, tables, and prose. - Draw conclusions consistent with information provided from graphs, charts, tables, and prose and evaluate the validity of the data. - Write balanced symbol equations to explain metal extraction techniques. - Write ionic equations to explain metal extraction techniques and identify the species being oxidised or reduced
C15 Using our resources (TS only)	- Rusting - how both water and air are required for iron to corrode - Methods for preventing rusting – barrier methods and sacrificial methods - Alloys, polymers, ceramics, glass, and composites - The Haber process and how it is carried out economically on an industrial scale - Why the industrial conditions for the Haber process are described as a compromise	- Identify key properties and link these to their common uses - List some ways to prevent rusting. - Write balanced equations to describe rusting and identify species that are oxidised and reduced. - Evaluate an alloy in terms of its properties and uses. - Use data about the properties to suggest a suitable plastic or alloy - Evaluate a plastic in terms of its properties and uses. - Compare quantitatively the physical properties of glass and

	- Importance of the Haber process in the production of ammonia, an important feedstock in the production of fertilisers, both in the laboratory and industrially alongside potassium and phosphorus fertilisers. **Top 5 Keywords** Rusting, alloy, ceramic, composite, compromise	clay ceramics, polymers, composites, and metals. - Write a word equation to describe the Haber process. - Evaluate the Haber process using atom economy and LCA to determine its environmental impact.