	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Theme/Big Idea	**Elements of Life (EL)** This topic explores the origins, structure and behaviour of matter, from the formation of elements in the universe to their role in the human body and everyday life. Students develop an understanding of atomic structure, isotopes, electron configurations, the periodic table, bonding and molecular structure, before applying these concepts to moles, ions, salts, concentration and titrations. The theme connects fundamental chemical principles to real-world contexts such as stars, seawater, batteries, fertilisers and the human body.	**Elements of Life (EL)** This topic explores the origins, structure and behaviour of matter, from the formation of elements in the universe to their role in the human body and everyday life. Students develop an understanding of atomic structure, isotopes, electron configurations, the periodic table, bonding and molecular structure, before applying these concepts to moles, ions, salts, concentration and titrations. The theme connects fundamental chemical principles to real-world contexts such as stars, seawater, batteries, fertilisers and the human body.	**Elements of the Sea (ES)** Allows for the exploration of the chemistry of halogens and halide salts through their presence and use in seawater and industrial processes. Students develop an understanding of halogen properties, redox reactions, electrolysis, inorganic nomenclature and chemical equilibrium, including equilibrium calculations and titrations. The theme also considers the benefits and risks of chlorine and introduces atom economy and sustainable approaches to chemical manufacture.	**Elements of the Sea (ES)** Allows for the exploration of the chemistry of halogens and halide salts through their presence and use in seawater and industrial processes. Students develop an understanding of halogen properties, redox reactions, electrolysis, inorganic nomenclature and chemical equilibrium, including equilibrium calculations and titrations. The theme also considers the benefits and risks of chlorine and introduces atom economy and sustainable approaches to chemical manufacture.	**What's in a medicine (WM)** Students explore the chemistry of medicines, using aspirin as a context for understanding organic functional groups and the development of pharmaceutical compounds. Students investigate alcohols, phenols, carboxylic acids and esters, alongside chemical tests and analytical techniques such as infrared and mass spectrometry. The theme also develops practical skills in organic synthesis, purification and thin-layer chromatography, while introducing the principles of green chemistry and more sustainable approaches to chemical manufacture.	**What's in a medicine (WM)** Students explore the chemistry of medicines, using aspirin as a context for understanding organic functional groups and the development of pharmaceutical compounds. Students investigate alcohols, phenols, carboxylic acids and esters, alongside chemical tests and analytical techniques such as infrared and mass spectrometry. The theme also develops practical skills in organic synthesis, purification and thin-layer chromatography, while introducing the principles of green chemistry and more sustainable approaches to chemical manufacture.

	Developing Fuels (DF) Explores fuels as a context for understanding energy changes, organic chemistry and the environmental impact of combustion. Students develop an understanding of enthalpy changes, hydrocarbons, combustion, cracking, alkenes, alcohols and polymerisation, alongside quantitative chemistry involving gases. The theme also explores molecular structure, bonding and isomerism, atmospheric pollutants, catalysis and the potential of hydrogen and biofuels as alternative fuels for the future.	**Developing Fuels (DF)** Explores fuels as a context for understanding energy changes, organic chemistry and the environmental impact of combustion. Students develop an understanding of enthalpy changes, hydrocarbons, combustion, cracking, alkenes, alcohols and polymerisation, alongside quantitative chemistry involving gases. The theme also explores molecular structure, bonding and isomerism, atmospheric pollutants, catalysis and the potential of hydrogen and biofuels as alternative fuels for the future.	**Ozone (OZ)** Allows students to explore the composition and chemistry of the atmosphere, with a focus on the role and sustainability of the ozone layer. Students develop an understanding of gas composition, electromagnetic radiation, reaction rates, catalysis and radical reactions through the formation and destruction of ozone. The theme also introduces haloalkanes, intermolecular bonding and nucleophilic substitution, while considering the environmental impact of CFCs and HFCs and the importance of protecting the ozone layer.	**Ozone (OZ)** Allows students to explore the composition and chemistry of the atmosphere, with a focus on the role and sustainability of the ozone layer. Students develop an understanding of gas composition, electromagnetic radiation, reaction rates, catalysis and radical reactions through the formation and destruction of ozone. The theme also introduces haloalkanes, intermolecular bonding and nucleophilic substitution, while considering the environmental impact of CFCs and HFCs and the importance of protecting the ozone layer.	**Chemical Industry (CI)** Exploring the chemistry of crop production and industrial processes, with a focus on how chemical reactions are optimised to meet practical and economic needs. Students develop their understanding of nitrogen chemistry, redox reactions, kinetics and equilibrium through the industrial production of nitric acid, sulfuric acid and ethanoic acid. The theme considers how factors affect reaction rates and equilibrium yields, alongside the costs, benefits, hazards and wider societal and environmental impacts of industrial chemical processes.	**Chemical Industry (CI)** Exploring the chemistry of crop production and industrial processes, with a focus on how chemical reactions are optimised to meet practical and economic needs. Students develop their understanding of nitrogen chemistry, redox reactions, kinetics and equilibrium through the industrial production of nitric acid, sulfuric acid and ethanoic acid. The theme considers how factors affect reaction rates and equilibrium yields, alongside the costs, benefits, hazards and wider societal and environmental impacts of industrial chemical processes.

Content What are they learning? (including keywords)	**What are they learning** **Elements of Life (EL)** Students develop their understanding of atomic structure, isotopes and the formation of elements, including nuclear fusion and the development of models of the atom. They explore electron configurations, atomic spectra and the periodic table, linking electronic structure to the properties of elements. Students develop their understanding of bonding, molecular structure and molecular shapes, before applying the concept of amount of substance (moles) to reacting masses, concentrations and chemical equations. The topic also develops understanding of ions, Group 2 chemistry, salts and acid–base titrations,	**What are they learning** **Elements of Life (EL)** Students develop their understanding of atomic structure, isotopes and the formation of elements, including nuclear fusion and the development of models of the atom. They explore electron configurations, atomic spectra and the periodic table, linking electronic structure to the properties of elements. Students develop their understanding of bonding, molecular structure and molecular shapes, before applying the concept of amount of substance (moles) to reacting masses, concentrations and chemical equations. The topic also develops understanding of ions, Group 2 chemistry, salts and acid–base titrations,	**What are they learning** **Elements from the Sea (ES)** Students investigate the chemistry of the halogens and halide ions, including trends in reactivity and reactions between halogens and halides. They develop their understanding of redox chemistry and electrolysis, including oxidation states, half-equations and the identification of oxidising and reducing agents. The topic introduces inorganic nomenclature, qualitative analysis and precipitation reactions, alongside the preparation and properties of hydrogen halides. Students then develop their understanding of dynamic equilibrium and the equilibrium constant, Kc, considering how concentration, temperature and pressure affect equilibrium. The topic concludes with	**What are they learning** **Elements from the Sea (ES)** Students investigate the chemistry of the halogens and halide ions, including trends in reactivity and reactions between halogens and halides. They develop their understanding of redox chemistry and electrolysis, including oxidation states, half-equations and the identification of oxidising and reducing agents. The topic introduces inorganic nomenclature, qualitative analysis and precipitation reactions, alongside the preparation and properties of hydrogen halides. Students then develop their understanding of dynamic equilibrium and the equilibrium constant, Kc, considering how concentration, temperature and pressure affect equilibrium. The topic concludes with	**What are they learning** **What's in a Medicine? (WM)** Students explore the chemistry of medicines and organic compounds, using aspirin as a context for understanding functional groups and organic reactions. They study alcohols, phenols, carboxylic acids, esters and carbonyl compounds, including their structures, properties and reactions. Students develop their understanding of organic synthesis and purification, including reflux, distillation, separating funnels, recrystallisation, melting point determination and thin-layer chromatography. The topic also introduces mass spectrometry and infrared spectroscopy as analytical techniques for identifying organic compounds, alongside the	**What are they learning** **What's in a Medicine? (WM)** Students explore the chemistry of medicines and organic compounds, using aspirin as a context for understanding functional groups and organic reactions. They study alcohols, phenols, carboxylic acids, esters and carbonyl compounds, including their structures, properties and reactions. Students develop their understanding of organic synthesis and purification, including reflux, distillation, separating funnels, recrystallisation, melting point determination and thin-layer chromatography. The topic also introduces mass spectrometry and infrared spectroscopy as analytical techniques for identifying organic compounds, alongside the

	including qualitative tests for ions. **Keywords:** atomic structure, proton, neutron, electron, isotope, mass number, atomic number, nuclear fusion, electron configuration, atomic spectra, ionisation energy, periodic table, Group 2, ionic bonding, covalent bonding, dative covalent bonding, molecular shape, electron-pair repulsion, moles, Avogadro constant, concentration, ions, salts, titration. **Developing Fuels (DF)** Students explore energy changes in chemical reactions, including enthalpy change, enthalpy of combustion, formation and neutralisation, bond enthalpies and Hess cycles. The topic introduces organic chemistry and hydrocarbons, including the structure, nomenclature and	including qualitative tests for ions. **Keywords:** atomic structure, proton, neutron, electron, isotope, mass number, atomic number, nuclear fusion, electron configuration, atomic spectra, ionisation energy, periodic table, Group 2, ionic bonding, covalent bonding, dative covalent bonding, molecular shape, electron-pair repulsion, moles, Avogadro constant, concentration, ions, salts, titration. **Developing Fuels (DF)** Students explore energy changes in chemical reactions, including enthalpy change, enthalpy of combustion, formation and neutralisation, bond enthalpies and Hess cycles. The topic introduces organic chemistry and hydrocarbons, including the structure, nomenclature and	atom economy and the risks and benefits associated with the use of chlorine. **Keywords:** halogens, halide ions, chlorine, bromine, iodine, redox, oxidation, reduction, oxidation state, half-equation, oxidising agent, reducing agent, electrolysis, anode, cathode, precipitation, silver halides, hydrogen halides, dynamic equilibrium, Kc, equilibrium position, atom economy. **The Ozone Story (OZ)** Students explore the composition of the atmosphere and develop their understanding of the electromagnetic spectrum, particularly infrared, visible and ultraviolet radiation and their interactions with matter. They investigate the formation and destruction of ozone through radical reactions, developing their understanding	atom economy and the risks and benefits associated with the use of chlorine. **Keywords:** halogens, halide ions, chlorine, bromine, iodine, redox, oxidation, reduction, oxidation state, half-equation, oxidising agent, reducing agent, electrolysis, anode, cathode, precipitation, silver halides, hydrogen halides, dynamic equilibrium, Kc, equilibrium position, atom economy. **The Ozone Story (OZ)** Students explore the composition of the atmosphere and develop their understanding of the electromagnetic spectrum, particularly infrared, visible and ultraviolet radiation and their interactions with matter. They investigate the formation and destruction of ozone through radical reactions, developing their understanding	principles of green chemistry. **Keywords:** alcohol, phenol, carboxylic acid, ester, aldehyde, ketone, carbonyl, oxidation, esterification, dehydration, substitution, organic synthesis, reflux, distillation, recrystallisation, melting point, TLC, mass spectrometry, IR spectroscopy, functional group, green chemistry **The Chemical Industry** **(CI)** Students explore **industrial chemistry** through the production of nitric acid, sulfuric acid and ethanoic acid, using these processes to develop their understanding of nitrogen chemistry, kinetics and equilibrium. They study rate equations, orders of reaction, rate constants, half-lives and the Arrhenius equation, using experimental data to	principles of green chemistry. **Keywords:** alcohol, phenol, carboxylic acid, ester, aldehyde, ketone, carbonyl, oxidation, esterification, dehydration, substitution, organic synthesis, reflux, distillation, recrystallisation, melting point, TLC, mass spectrometry, IR spectroscopy, functional group, green chemistry **The Chemical Industry** **(CI)** Students explore **industrial chemistry** through the production of nitric acid, sulfuric acid and ethanoic acid, using these processes to develop their understanding of nitrogen chemistry, kinetics and equilibrium. They study rate equations, orders of reaction, rate constants, half-lives and the Arrhenius equation, using experimental data to

	reactions of alkanes, alkenes and alcohols. Students study cracking, catalysis, combustion and polymerisation, alongside the mechanisms of electrophilic addition and the concept of structural and E/Z isomerism. Quantitative chemistry is applied to gas volumes and combustion reactions, with consideration of atmospheric pollutants and the potential role of hydrogen and biofuels in a more sustainable energy future. **Keywords:** halogens, halide ions, chlorine, bromine, iodine, redox, oxidation, reduction, oxidation state, half-equation, oxidising agent, reducing agent, electrolysis, anode, cathode, precipitation, silver halides, hydrogen halides, dynamic equilibrium, Kc, equilibrium position, atom economy.	reactions of alkanes, alkenes and alcohols. Students study cracking, catalysis, combustion and polymerisation, alongside the mechanisms of electrophilic addition and the concept of structural and E/Z isomerism. Quantitative chemistry is applied to gas volumes and combustion reactions, with consideration of atmospheric pollutants and the potential role of hydrogen and biofuels in a more sustainable energy future. **Keywords:** halogens, halide ions, chlorine, bromine, iodine, redox, oxidation, reduction, oxidation state, half-equation, oxidising agent, reducing agent, electrolysis, anode, cathode, precipitation, silver halides, hydrogen halides, dynamic equilibrium, Kc, equilibrium position, atom economy.	of reaction kinetics, activation enthalpy, collision theory and catalysis. The chemistry of haloalkanes, including CFCs and HFCs, is introduced alongside intermolecular bonding and nucleophilic substitution. Students consider the environmental significance of ozone, including its role in protecting against UV radiation and the effects of ozone depletion and atmospheric pollution. **Keywords:** atmosphere, ozone, electromagnetic spectrum, infrared, visible, ultraviolet, radiation, radical, free radical, photodissociation, kinetics, rate of reaction, activation enthalpy, collision theory, catalyst, haloalkane, CFC, HFC, nucleophilic substitution, intermolecular bonding, ozone layer, photochemical smog.	of reaction kinetics, activation enthalpy, collision theory and catalysis. The chemistry of haloalkanes, including CFCs and HFCs, is introduced alongside intermolecular bonding and nucleophilic substitution. Students consider the environmental significance of ozone, including its role in protecting against UV radiation and the effects of ozone depletion and atmospheric pollution. **Keywords:** atmosphere, ozone, electromagnetic spectrum, infrared, visible, ultraviolet, radiation, radical, free radical, photodissociation, kinetics, rate of reaction, activation enthalpy, collision theory, catalyst, haloalkane, CFC, HFC, nucleophilic substitution, intermolecular bonding, ozone layer, photochemical smog.	determine reaction rates and kinetic parameters. Students develop their understanding of equilibrium constants and equilibrium position, considering how temperature, pressure and concentration affect industrial yields. The topic concludes by evaluating the optimum conditions for industrial processes, including the costs, benefits, hazards and wider societal impacts of chemical manufacture. **Keywords:** nitrogen chemistry, nitrate, ammonium, nitrogen oxides, kinetics, rate, rate constant, order, rate equation, half-life, Arrhenius equation, activation energy, rate-determining step, equilibrium, Kc, equilibrium position, yield, industrial process, optimisation, raw materials, energy costs, hazards, benefits, sustainability.	determine reaction rates and kinetic parameters. Students develop their understanding of equilibrium constants and equilibrium position, considering how temperature, pressure and concentration affect industrial yields. The topic concludes by evaluating the optimum conditions for industrial processes, including the costs, benefits, hazards and wider societal impacts of chemical manufacture. **Keywords:** nitrogen chemistry, nitrate, ammonium, nitrogen oxides, kinetics, rate, rate constant, order, rate equation, half-life, Arrhenius equation, activation energy, rate-determining step, equilibrium, Kc, equilibrium position, yield, industrial process, optimisation, raw materials, energy costs, hazards, benefits, sustainability

Skills How are they learning it?	**PAG1 - Moles determination** – measurement of mass and gas volume; reacting masses/moles Amount of substance, moles, reacting masses, gas volumes, stoichiometry	**PAG2 - Acid–base titration** – standard solutions, burette/pipette, indicators Concentration, standard solutions, acid–base titrations, moles **PAG3 - Enthalpy determination** – measuring temperature change Enthalpy changes, calorimetry, energy transfer, neutralisation	**PAG 4 - Qualitative analysis of ions** – identification of cations and anions Ion tests, precipitation reactions, qualitative analysis, Group 2 chemistry	**PAG 9 - Rates of reaction – continuous monitoring** Rates of reaction, continuous monitoring, half-life, data processing	**PAG 5 - Synthesis of an organic liquid** – reflux, separating funnel, distillation Organic synthesis, alcohols, haloalkanes, purification techniques	**PAG 6- Synthesis of an organic solid** – recrystallisation, filtration, melting point, TLC Organic synthesis, aspirin, purification, recrystallisation, TLC, melting point **PAG 10 - Rates of reaction – initial rates method** Initial rates, rate equations, orders of reaction, rate constants
Key Questions	**Elements of Life (EL)** How has our understanding of atomic structure developed, and what evidence supports our current model of the atom? How are elements formed in the universe, and what role does nuclear fusion play? How does electron configuration explain	**Elements of Life (EL)** How do atoms bond together, and how does bonding determine the shapes and properties of molecules and compounds? How can the amount of a substance be measured and calculated using moles, concentrations and titrations?	**Elements from the Sea (ES)** How do the properties and reactivities of the halogens change down the group? How can redox reactions and electrolysis be used to produce useful chemicals from seawater? How can chemical tests be used to identify halide ions	**Elements from the Sea (ES)** How can equilibrium be controlled to maximise the yield of an industrial chemical process? How can chemical processes be made more efficient through concepts such as atom economy? **The Ozone Story (OZ)**	**What's in a Medicine? (WM)** How does the structure of organic molecules determine their chemical properties and reactions? How can functional groups be identified and used to distinguish between organic compounds? How can chemists synthesise, separate	**What's in a Medicine? (WM)** How can spectroscopic techniques be used to identify and determine the structure of organic molecules? How can the principles of green chemistry make the production of medicines more sustainable?

	the chemical and physical properties of elements? **Developing Fuels (DF)** How can we measure and explain the energy released or absorbed during chemical reactions? How does the structure of hydrocarbons determine their physical properties and chemical reactions?	**Developing Fuels (DF)** How can crude oil be converted into useful fuels and chemical feedstocks? How do molecular structure, bonding and isomerism affect the properties and reactions of organic molecules? How can we develop more sustainable fuels while reducing the environmental impact of combustion?	and other inorganic substances? **The Ozone Story (OZ)** How does electromagnetic radiation interact with molecules in the atmosphere? How is ozone formed and destroyed, and what role do radical reactions play?	What factors affect the rate of chemical reactions, and how can catalysts change reaction rates? How does the structure of haloalkanes influence their reactions? Why is the ozone layer important, and how can chemistry help us understand and protect it?	and purify useful organic compounds such as medicines? **The Chemical Industry (CI)** How can chemists control reaction rates to make industrial processes more efficient? How can experimental data be used to determine rate equations, reaction orders and rate constants?	**The Chemical Industry (CI)** How does equilibrium affect the yield of industrial chemical processes? How can the conditions of an industrial process be optimised to balance yield, rate, cost and safety? How should the costs, benefits, risks and environmental impacts of industrial chemistry be evaluated?
Assessment (specific assessed piece(s); milestone(s))	**Peer assessment** – EL1 – 9 past paper questions (Booklet) DF1-9 past paper questions (Booklet) **2xMarking Milestone: EL and DF –** Past Paper question **1xSummative:** October Assessment **CPAC assessments –** PAG1	**Peer assessment** – EL1 – 9 past paper questions (Booklet) DF1-9 past paper questions (Booklet) **2xMarking Milestone: EL and DF -**Past Paper questions **2xSummative synoptic assessments: -** EL and DF topic **CPAC assessments** PAG2 and PAG3	**Peer assessment** – ES1 – 7 past paper questions (Booklet) OZ1-7 past paper questions (Booklet) **2xMarking Milestones: ES and OZ -**Past Paper questions **CPAC assessments** – PAG 4 -	**Peer assessment** – ES1 – 7 past paper questions (Booklet) OZ1-7 past paper questions (Booklet) **2xMarking Milestones: ES and OZ -**Past Paper questions **2x Summative synoptic assessments -** ES and OZ topic **CPAC assessments –** PAG 9	**Peer assessment** – WM1 – 8 past paper questions (Booklet) 1 x AS paper a week **2xMarking Milestones: WM and CI -**Past Paper questions **CPAC assessments** PAG 5 **-**	**Peer assessment** – WM1 – 8 past paper questions (Booklet) 1 x AS paper a week **1x Summative assessment** – End of year exams and AS Papers 1 and 2 **2x Summative synoptic assessments -** WM and CI topic **CPAC assessments** PAG 6 and 10

Appendix 1

CPAC 1:

Follows written procedures (a) Correctly follows instructions to carry out the experimental techniques or procedures.

CPAC 2:

Applies investigative approaches and methods when using instruments and equipment (a) Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting. (b) Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments when necessary. (c) Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled. (d) Selects appropriate equipment and measurement strategies in order to ensure suitably accurate results.

CPAC 3:

Safely uses a range of practical equipment and materials (a) Identifies hazards and assesses risks associated with these hazards, making safety adjustments as necessary, when carrying out experimental techniques and procedures in the lab or field. (b) Uses appropriate safety equipment and approaches to minimise risks with minimal prompting.

CPAC 4:

Makes and records observations (a) Makes accurate observations relevant to the experimental or investigative procedure. (b) Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions.

CPAC 5:

Researches, references and reports (a) Uses appropriate software and/or tools to process data, carry out research and report findings. (b) Sources of information are cited demonstrating that research has taken place, supporting planning and conclusions.