**Chemistry Curriculum Map – Key Stage 4**

**Year 10**

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| **Autumn 1** | **Autumn 2** | **Spring 1**  | **Spring 2** | **Summer 1**  | **Summer 2** |
| **SC5-7 Bonding and Structure – Paper 1 and 2** In this unit we will look at the fundamental forces of attraction that hold atoms and molecules together. These are essential to understand physical changes and chemical reactions. | **SC8 Acids and Alkalis  - Paper 1**In this unit we explore the nature of acidic and alkaline solutions, and investigate their most important reactions properties and uses. | **SC9 Calculations involving Masses - Paper 1 and 2**This unit will help you to use relative atomic masses to calculate relative formula masses of elements and compounds, calculate the concentration of a solution and work out empirical and molecular formulae of compounds. | **SC10,11 and 13 Electrolytic Processes / Metals / Reversible Reactions and Equilibria  -  Paper 1**This unit will help you learn more about reactivity, oxidation and reduction, the advantages of recycling,  | **Summer PPE Exams and revision****SC14: Quantitative analysis/calculations involving volumes of gases**This unit will help you to learn more about reaction pathways. | **SC12, 15 and 16: Dynamic equilibria, chemical and fuel cells**This unit covers about the Haber process and what happens during electrolysis.SC15 covers fertiliser and the Haber process, and factors affecting equilibrium. SC16 looks at chemical cells and fuel cells. |
| **Assessment:** * End of topic test
* Six mark question
 | **Assessment:** * End of topic test
* Six mark question
 | **Assessment** * End of topic test
* Six mark question
 | **Assessment:** * End of topic test
* Six mark question
 | **Assessment:** PPE’s | **Assessment:** * End of topic test
* Six mark question
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| **Builds upon:****From KS3:*** The particle model of matter
* How Dalton’s ideas about atoms and molecules helped explain the properties opf matter
* How elements are arranged in the periodic table

**From KS4 CC4:*** How to use the periodic table to predict and model the arrangement of electrons in atoms
 | **Builds upon:** **From KS3:*** Solubility, solutes, solvents and solutions
* Common international hazard symbols
* The use of indicators to test the pH of solutions
* What happens during simple neutralisation reactions

**From KS4 SC5-7*** Ionic and covalent bonding and properties
* Ionic formula
 | **Builds upon:****From KS3:*** How to represent elements and compounds using symbols
* How mass is conserved during changes of state and chemical reactions
* How to show chemical reactions using equations

**From KS4 SC3-4 and SC8:*** Balancing equations
* Using the periodic table
* Relative atomic mass
 | **Builds upon:** **From KS3:*** Oxidation and displacement reactions
* The reactivity series

**From KS4 SC4, SC5 and SC8:*** Anions and cations in ionic compounds
* Writing balanced chemical equations with state symbols
* How the elements are arranged in the periodic table
 | **Builds upon:** * Conservation of mass
* Reacting masses calculation
* Concentration calculations
* Moles calculations
* Mr calculations
 | **Builds upon:** * Dynamic equilibria
* Acids base reactions
* Electrolysis
* Redox and half equations
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| **Introduces:*** How ionic, covalent and metallic bonds are formed
* The formation of lattice and molecular structures
* How the physical properties of a substance are linked to its bonding and structure
 | **Introduces:** * The ions in acids and alkalis and how their concentrations are linked to pH
* The reactions between acids and different types of bases
* Different indicators that can be used in titrations
* How soluble and insoluble salts can be prepared in the laboratory
* Balancing chemical equations
 | **Introduces:** * How to calculate relative formula masses of elements and compounds
* How to work out empirical and molecular formulae of compounds
* How to calculate the mass of reactants or products in a reaction
* How to calculate the concentration of a solution
* The Avogadro constant (H)
 | **Introduces:** * More about reactivity, oxidation and reduction
* How metals can be extracted
* The advantages of recycling metals
* The factors involved in a life-cycle assessment of a product
* What happens during electrolysis and electroplating
* Equilibria in chemical reactions
* The Haber process
* Half equations (H)
* Properties of transition metals
* Properties and uses of metals and their alloys
 | **Introduces:** * Yield calculations including reason why yield is lower than actual
* Atom economy calculations
* Concentration calculations in mol/dm3 and g/dm3
* Making a standard solution method
* Titration calculations and recap method
* Molar volume of a gas calculations including Avogadro gas law
 | **Introduces:** * Fertilisers and the Haber process including the specific conditions required and considering compromise
* Comparing lab and industry production of chemicals
* Factors affecting position of equilibrium including rate
* Chemical cells: Why do batteries go flat
* fuels cells pros and cons
* need to be able to compare the different types of cells
* High equations (higher only)
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**Year 11**

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| **Autumn 1**  | **Autumn 2** | **Spring 1** | **Spring 2** | **Summer 1** | **Summer 2** |
| **SC17-19 Groups in the Periodic Table. Rates of Reaction. Heat Energy Changes in Chemical Reactions.**This unit introduces you to alkalis, halogens, displacement reactions and noble gases, rates of reaction and catalysts, exothermic and endothermic reactions and energy changes in reactions. | **PPE’s** **SC 20-21****Fuels, Earth and atmospheric science**SC20 covers hydrocarbons, fractional distillation of crude oil, the alkane homologous series, complete and incomplete combustion, fuel and pollution. SC21 looks at the earth's atmosphere. | **SC22-24 Hydrocarbons, Alcohols & carboxylic acid, Polymers**This unit covers alkanes and alkenes and will look at ethanol production and carboxylic acids. | **PPE’s** **SC25-26 Qualitative analysis: test for ions, Bulk and surface properties of matter including nanoparticles**In this unit, you will learn:* How to identify metal ions
* the chemical tests for various non-metal ions and for ammonia gas
* about instrumental methods of analysis and their advantages
* how to compare the physical properties of different materials
* what composite materials are
* how and why materials are chosen for particular uses
* about nanoparticles and their properties, uses and possible risks
 | **revision** |   |
| **Assessment:** * End of topic test
* Six mark question
 | **Assessment:** * End of topic test
* Six mark question
 | **Assessment** * End of topic test
* Six mark question
 | **Assessment:** * End of topic test
* Six mark question
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| **Build upon:** * Periodic table including groups and periods
* Electronic configuration
* Elements & compounds
* Reactivity of metals with water & acid
* Properties of metals word and symbol equations
* Observations
* Redox (for higher only)
* Particle model
* Enzyme activity relating to rates of reactions in biology

  | **Builds upon:** * Use of fractional distillation
* Fuels as a source of energy
* Acidity of non-metal oxides
* Impact of CO2 on the atmosphere and human impacts
* Bonding of carbon atoms
 | **Builds upon:*** Combustion of fuels
* Properties of polymers
* Definition of homologous series
 | **Builds upon:** * Cations and anions including polyatomic ions
* Test for CO2
* Properties of ceramics, polymers, metals and composite materials
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| **Introduces:** * Describe and explain reactivity of group 1 metals
* Reactions of group 1 with oxygen and water
* Physical trends of group 7
* Describe and explain reactivity of group 7
* Halogens are diatomic molecules
* Test for Cl2 gas
* Reactions of group 1 with group 7 including predictions based on position in periodic table
* Reactions of halogens with hydrogen
* Observations from group 7 displacement reactions with explanations
* Devise an experiment to prove reactivity from displacement reactions
* Higher only – understand halogen displacement reactions are redox reactions and explain why
* Explain reactivity of noble gases, uses and trends in physical properties
* Describe and explain how reaction rates change over time
* Calculate rates of reactions (see below)
* Describe ways in which to investigate rates of reactions e.g. volume of gas formed, forming precipitate, colour change and mass change
* Describe and explain factors that affect rates of reaction using collision theory
* Draw and interpret rate graphs
* Describe what a catalyst is and how it works
* Draw a reaction profile for a reaction with and without a catalyst, highlighting the activation energy
* Describe endothermic and exothermic reactions and give examples
* Draw simple reaction profiles of endothermic and exothermic reactions
* Describe a method to determine if a reaction is endothermic or exothermic
* Knowing that breaking bonds is endothermic and making bonds is exothermic (BENDOMEXO)
* bond energy calculations from values provide
 | **Introduces:** * Definition of crude oil and natural gas and their use as fuels
* That the
* Above are non-renewable fossil fuels
* Definition of a hydrocarbon as a compound of hydrogen and carbon ONLY (this is a 2 mark answer)
* Name the different fractions of crude oil and their uses
* Describe and explain how a fractionation column separates the fractions of crude oil
* Describe and explain the trends in physical properties of the different fractions of crude oil.
* Understand what is meant by homologous series in terms of alkanes
* Be able to name and draw the first few alkanes (including molecular and display formula)
* Recall the general formula for alkanes (see below)
* Describe and explain the trend in physical properties of the alkanes
* Describe and explain the similar chemical properties of alkanes
* Word and balanced equations for both complete and incomplete combustion
* Tests for the products of complete combustion
* The issues with the products of incomplete combustion
* How sulphur dioxide is formed from impurities in fuels and its environmental effects
* How oxides of nitrogen are formed from combustion and their environmental effects
* Use of catalytic converters to reduce pollutant emission from combustion engines.
* Understand the supply and demand of hydrocarbons
* Describe and explain cracking and its importance
* Alternative fuels for cars such as Hydrogen including advantages and disadvantages
* Describe the early atmosphere in terms of gases present and where they came from
* Describe how the oceans formed from the earth cooling.
* Name different greenhouse gases.
* Evidence for the increase in oxygen in the early atmosphere
* Describe the modern atmosphere and reasons for the change in atmospheric gas composition.
* Describe the greenhouse effect including being able to draw/ interpret the diagram
* Test for oxygen using a smouldering splint
* Evaluate the evidence for climate change including ice core samples and sea level rise data.
* Understand the effect of climate change and how these can be limited.
 | **Introduces:** * Alkanes are saturated hydrocarbons
* Alkanes: general, structural and molecular formula
* Alkenes are unsaturated hydrocarbons
* Alkenes: general, structural and molecular formula
* Description and examples of structural formulas, how to draw isomers of compounds
* Identify and state numbers of different types of bonds in alkanes and alkenes
* Combustion of alkanes and alkenes in terms of oxidation
* Use of bromine water as a test to distinguish between alkanes and alkenes.
* Addition reactions of alkenes
* How to produce ethanol through fermentation.
* Word and balanced equation for production of ethanol.
* Formula & names of alcohols
* Alcohols as renewable fuels
* Equations for oxidation of alcohols to carboxylic acids + water
* Functional group of carboxylic acids and naming
* General & structural formula of carboxylic acids
* Equations for reaction between metals/ metal compounds and carboxylic acids
* Addition polymerisation, covalent bonds between carbon atoms in monomers
* Be able to draw polymers from monomers & identify repeat units of a polymer using structural formula (including polyesters – see below)
* Naming and roles/ properties of synthetic and naturally occurring polymers
* Process of condensation polymerisation between an alcohol and carboxylic acid to form esters + water
* Identify ester functional group and ester linkages in polyesters
* Properties of synthetic polyesters
* Identify advantages and disadvantages of synthetic polymers
* Identify methods for disposing & recycling plastics including related issues
* Difference between recycling and reusing
 | **Introduces:** * Method of how to carry out flame tests and explain each step
* Positive flame test results for metal cations
* Theory of flame photometery as a improved instrumental method
* Method for precipitation method with sodium hydroxide to identify metal cations and ammonium ion including precipitate colour for positive results
* Test for ammonia using litmus paper and HCl
* Test for carbonates using HCl to produce CO2
* Test for sulphates using HCl and barium sulphate
* Test for halide ions using silver nitrate and colours for positive results
* Balanced and word equations for the above reactions
* Ionic equations for reactions (higher only)
* Observations including precipitates and colours
* Know what ceramics are, their properties and uses.
* Uses of different plastics (though this has been covered in previous topic)
* Explain what a composite material is, give examples and list properties.
* Be able to calculate the size (surface area and volume) of a nanoparticle
* Uses of nanoparticles in e.g. suncream and silver for antibacterial purposes and any potential drawbacks.
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