

Chemistry

Chemistry is the study of matter, how it interacts and why this is useful to humankind. We will foster curiosity through expert teaching and engaging practical work. Our intent is for students to understand the nature of matter, how ideas have changed over time, and how this has relevance in their life. We will enable students to become informed citizens and understand how chemistry and science in general will be able to solve issues facing the planet.

The Chemistry Story, Years 7-11

In chemistry, students learn a series of model to explain their experiences in the world, and that these models change over time as experimentation and observation reveals new evidence. They begin by revisiting the particle model and its explanation of solids, liquids and gases: material Students will be familiar with from primary schools. Once they are secure in their understanding of the building blocks of different chemical substances, students move onto study how these substances combine in chemical reactions, whilst developing the practical and mathematical skills necessary to be young chemists. They progress onto learning about how chemicals are separated through a variety of processes.

Once students understand how chemicals behave, they move onto atomic theory: a more detailed and sophisticated model that allows them to understand and explain the chemical reactions they have experienced in technical terms. Students explore the periodic table and the periodic trends within it. They go onto combine their knowledge of atomic theory, practical and mathematics skills, and chemical reactions through an in-depth study of metals.

Students are now ready to revisit the atomic model and add in an understanding of sub-atomic particles. Armed with this knowledge, they are able to revisit periodic trends, and explain them in detail using the sub-atomic model. They are also better able to explain their observations in the real world, answering questions such as ‘why do metals conduct?’ and ‘why is diamond harder than graphite?’ Students are also able to use their understanding of the sub-atomic model to explain chemical reactions in more detail, model them mathematically, and use chemical reactions to create new, useful substances.

The next step is to turn to the practical explanation of chemistry, learning how chemists can explain the world and, ultimately, change it for the better. Thus, students learn about chemical testing, about the uses of hydrocarbons and their political, economic, social and environmental consequences. They learn how chemists analyse the Earth’s atmosphere and how it has changed over time; they learn about climate change and other contemporary environmental issues and how these are reported in the issue; finally, they learn how chemists are working to solve these problems for future generations.

Programme of study Years 8, 9, 10 & 11 Chemistry

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 7	The particle model		Acids and alkalis		Mixtures and separation	
Year 8	Atoms, elements and compounds		The Periodic Table		Metals and their uses	
Year 9	Atomic structure and separation techniques	Structure and bonding	The Periodic Table	Energy changes in chemical reactions	Chemical calculations	Intervention and challenge
Year 10	Energy changes in chemical reactions and reactivity series	Electrolysis	Rates of chemical change	Crude oil and fuels	Chemical analysis	Intervention and challenge
Year 11	Atomic structure, separation and Periodic Table	Bonding	Chemical analysis and using resources	Reactions of acids, making salts	Examination	

GCSE specification: AQA

Year 7 and 8 Chemistry fundamentals

Term and topic:	Fundamental knowledge	Entitlement vocabulary
Year 7, Term 1: The Particle Model	<p>Use particle theory to describe the properties of solids, liquids and gases</p> <ul style="list-style-type: none"> • Draw particle diagrams for solids, liquids and gases • Uses the diagrams to explain the relative forces between particles and therefore the properties of solids, liquids and gases <p>Write a hypothesis</p> <ul style="list-style-type: none"> • Develop a scientific question that leads to a hypothesis • Discuss the need for accurate and reliable results that form evidence for or against a hypothesis 	Particle, solid, liquid, gas, compress, flow, particle, volume, forces, hypothesis, evidence, data
Year 7, Term 2: Mixtures and Separation	<p>Describe what a solution is using technical terms</p> <ul style="list-style-type: none"> • Be able to identify if there is a solute dissolved in a solvent by the change in mass of the solution even though it may not be visible. <p>Use filtration and heating to separate a mixture</p> <ul style="list-style-type: none"> • Plan an investigation to separate a mixture using filtration. • Draw and label the equipment used and use it correctly; • Devise a way to separate a mixture with a soluble solute using evaporation and crystallisation. • Use and label Bunsen burner, gauze, evaporating basin. 	Solvent, solute, solution, filter paper, filter funnel, conical flask, tripod, gauze, filter, evaporate, beaker, filtrate, soluble, insoluble, mixture, evaporation, crystallization, bunsen burner, evaporating basin
Year 7, Term 3: Acids and Alkalis	<p>Use the UI scale to discuss the strength of an acid, alkali or neutral solution.</p> <ul style="list-style-type: none"> • Discuss the colour change and pH change of acids and alkalis and identify their relative strength on the UI scale. • Give examples of acidic, alkaline and neutral substances of various strengths and place them on the scale. • Match substances to the scale and interpret the scale in examination questions. <p>To write a risk assessment</p> <ul style="list-style-type: none"> • Be able to identify the hazards of using acids and alkalis from hazard symbols • identify risks and how to use precautions • Tabulate this information to form a risk assessment for a specific reaction. 	Risk, hazard, precaution, acid, alkali, neutral, flammable, risk, hazard, irritant, toxic, corrosive, explosive, pH, universal indicator.

Term and topic:	Fundamental knowledge	Entitlement vocabulary
Year 8 term 1: Atoms, elements and compounds	<p>Be able to explain the difference between atoms, elements and compounds.</p> <ul style="list-style-type: none"> • Explain why symbols are used on the periodic table and that what an element appears as and behaves as are known as its properties. • Give some examples of properties of some of the elements. • Give examples of molecules and compounds, and identify them in a diagram <p>To describe the differences between metals and non-metals</p>	Atom, element, compound, mixtures, periodic table, molecule, ductile, sonorous, conductor, brittle, electrical and thermal conductivity, density,

	<ul style="list-style-type: none"> Compare metals and non-metals and their properties through a series of practicals. Give examples of metals that display particular properties Discuss non-metals as insulators and link non-metals properties to uses of specific insulating materials 	malleability, flexibility and melting points
Year 8 term 2: The Periodic Table	<p>What are the differences between an element and a compound?</p> <ul style="list-style-type: none"> Explain that an element is the simplest form of a substance and that everything is made from one or a combination of elements Identify elements from their symbol, mass or atomic number <p>To investigate chemical and physical changes</p> <ul style="list-style-type: none"> Describe, and give examples of physical changes and identify examples from observations. Explain that chemical change are irreversible and are accompanied by colour changes, heat changes, effervescence or changes in smell. Explain the pattern in reactions of the group 1 metals and other groups in the periodic table 	Element, atom, compound, reactant, product, physical, chemical, reactivity, reversible, conduction, boiling point, melting point, state of matter, anomalous, melting, freezing, evaporation, sublimation
Year 8 term 3: Metals and their Uses	<p>State the uses of metals and say which property makes them suitable for this use</p> <ul style="list-style-type: none"> Identify a metal from a material's properties Explain the real-world significance of corrosion <p>To investigate how metals react with acids</p> <ul style="list-style-type: none"> Investigate how different metals react with different acids of varying concentrations. Investigate how lumps of metal react with acids compared to powdered metals. Be able to use a delivery tube and a measuring cylinder / gas syringe to collect gas given off from these reactions Be able to identify independent, dependent and control variables for these experiments. Be able to explain that metals and acids form a salt and hydrogen and the squeaky pop test for hydrogen gas. Give specific examples of these reactions 	Strong, hard, malleable, sonorous, conductor, ductile, unreactive, catalyst, corrosion, observation, hydrogen, effervescence, salt, insulator

Year 9, 10 and 11 Biology Fundamentals

Term and topic:	Fundamental knowledge	Entitlement vocabulary
Year 9 autumn term: Atomic structure and separation techniques. Structure and bonding	<ul style="list-style-type: none"> Can describe the differences between an element, compound and mixture Can state the different separation techniques and say what they can be used for Can label a diagram of the atom and state the charges of each particle Can describe an ionic lattice and state the main properties of ionic compounds Can describe a covalent bond and can recognise a covalent compound from its name, formula or a diagram showing bonds Can recognise the structures of diamond and graphite and list their main physical properties 	Element, compound, mixture, reactant, product, equation, formulae. Nucleus, neutron, electron, proton, isotope, configuration. Positive, negative, neutral. Distillation, filtration,

		chromatography, condense, boil. Ionic, covalent, electrostatic, oxidise, reduce, giant molecular, metallic.
Year 9 spring term: The Periodic Table Energy changes	<ul style="list-style-type: none"> • Can identify groups and periods and link them to electronic structure • Can name the first three Alkali Metals and the first four Halogens and describe their main properties • Can describe the difference between exothermic and endothermic reactions • Can sketch a simple reaction profile diagram and define activation energy 	Period, group, trend, Mendeleev, properties, Alkali metals, halogens, reactivity, Noble gases, Exothermic, endothermic, activation energy, bonds, calorimetry,
Year 9 summer term: Chemical calculations	<ul style="list-style-type: none"> • Can use the periodic table to find the relative atomic mass of all elements • Can calculate the relative formula mass for familiar compounds when the formula is supplied and without brackets 	Relative atomic mass, relative formula mass, moles, excess, limiting reagent,

Term and topic:	Fundamental knowledge	Entitlement vocabulary
Year 10 autumn term: Energy changes and reactivity series Electrolysis	<ul style="list-style-type: none"> • Can recall what a displacement reaction is and use this to determine whether a reaction between a metal and a particular metal salt will happen or not • Can state the different methods for making salts and identify which salt will be made (hydrochloric and sulfuric acid only) • Can describe the pH scale and use universal indicator to identify as substance as acidic, alkaline or neutral • Can define electrolysis and write a word equation to define the electrolysis of a molten ionic compound • Can state that oxygen can be produced at the anode and hydrogen at the cathode during some electrolysis reactions • Can describe the difference between exothermic and endothermic reactions • Can sketch a simple reaction profile diagram and define activation energy • 	
Year 10 spring term: Rate of chemical change	<ul style="list-style-type: none"> • Can state a definition for rate of reaction and describe and follow a method to monitor it • Can state the factors that affect the rate of a reaction and describe the effect that they have • Can state the definition of a hydrocarbon and an alkane • Can state the names and uses of the different fractions from crude oil 	

Crude oil and fuels	<ul style="list-style-type: none"> • Can define complete and incomplete combustion and write a word equation for both 	
Year 10 Chemical Analysis summer term:	<ul style="list-style-type: none"> • Can state what a pure substance and a formulation are • Can describe how to make a chromatogram and calculate an R_f value • Can describe how to test for oxygen, hydrogen, carbon dioxide and chlorine gas 	

Term and topic:	Fundamental knowledge	Entitlement vocabulary
Year 11 autumn term: Atomic structure, separation techniques and Periodic Table	<ul style="list-style-type: none"> • Can describe the differences between an element, compound and mixture • Can state the different separation techniques and say what they can be used for • Can label a diagram of the atom and state the charges of each particle • Can identify groups and periods and link them to electronic structure • Can name the first three Alkali Metals and the first four Halogens and describe their main properties • Can describe an ionic lattice and state the main properties of ionic compounds • Can describe a covalent bond and can recognise a covalent compound from its name, formula or a diagram showing bonds • Can recognise the structures of diamond and graphite and list their main physical properties 	
Year 11 spring term: Chemical analysis and using resources Reactions of acids and making salts	<ul style="list-style-type: none"> • Can state what a pure substance and a formulation are • Can describe how to make a chromatogram and calculate an R_f value • Can describe how to test for oxygen, hydrogen, carbon dioxide and chlorine gas • Can state the purpose of the Haber process, the conditions needed and the word equation for the reaction • Can name the elements in an NPK fertiliser and describe where the raw materials come from • Can recall what a displacement reaction is and use this to determine whether a reaction between a metal and a particular metal salt will happen or not • Can state the different methods for making salts and identify which salt will be made (hydrochloric and sulfuric acid only) • Can describe the pH scale and use universal indicator to identify a substance as acidic, alkaline or neutral 	
Year 11 summer term:	<ul style="list-style-type: none"> • Exams 	