IDSALL SCHOOL

Chemistry Curriculum Vision

Chemistry begins in the stars. ...

Chemistry is the science describing matter and its transformations and is central to virtually all areas of modern science and technology. Chemistry is called the central science because all scientists study chemicals at some level

The Chemistry curriculum at Idsall School aims to foster scientific curiosity where students learn through inquiry and hands on learning. We have a strong emphasis on practical skills, which develop not only deep scientific understanding but also key transferable skills such as teamwork, leadership, and organisation. Our students are able to utilise their chemical knowledge and understanding to understand important issues that affect our society.

YEAR 7 CURRIUCLUM OVERVIEW - CHEMISTRY

The Big Picture: Intent

This year grounds pupils in the key concepts which underpin chemistry as subject and ensures they have a firm understanding of the key topics of particles and their behaviour, Elements, atoms and compounds, Acids and alkalis. These are fundamental foundation topics in chemistry and future learning will be built on the deep understanding and ability to apply the concepts learnt in this year.

The curriculum is knowledge rich and builds upon prior learning in order to reinforce understanding at a deeper level. The Chemistry curriculum aims to foster scientific curiosity where students apply their theory through the use of learn inquiry based practical. We emphasise practical skills, which develop not only important scientific understanding but also key transferable skills such as critical thinking, teamwork, leadership, and organisation.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary

Implementation:

The 3 units are: Particles & their behaviour; Elements, atoms and compounds; Acids & alkalis.

Particle Theory: Student's understand states of matter and will apply the particle model to explain the physical properties of substances in the solid, liquid, and gas states, as well as changes of state (including sublimation), gas pressure and diffusion.

Elements, atoms and compounds: Student's study elements mixtures and compounds at molecular level. They learn about the periodic table and use of chemical symbols to identify elements, how to name compounds and use word equations to describe reactions. They begin to develop an understanding of conservation of mass in chemical reactions which is a core principle of chemistry.

Acids and Alkalis: Student's study acids and alkalis and develop an understanding od the pH scale, indicators and how neutralisation works

Each unit has separate key study skills and these will be fostered through observation, practical and independent practical skills.
Students study skills will be developed through in class and independent assessment preparation.
We ensure that we also prepare students in both practical and mathematical skills, for them to fully access the curriculum and explore investigations scientifically.

Key Summative Assessments:

Baseline assessments will take place in the Autumn term.

Formal end of unit tests will take place at the end of each unit.

Cumulative end of Year exams in the summer term.
Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:
Baseline Testing
Particles and their behaviour

Spring Term:
Elements, atoms and compounds.

Summer term:
Acids and Alkalis
Year 7 exam.

Impact:

A deeper understanding of ***cells and their effects on organisms*** is key substantive knowledge that we want students to know by the end of year 7
We want to pupils to feel they are real scientists by the end of Year 7; competent and comfortable in their practical skills e.g. handling glassware, using lab equipment, making accurate observations as well as having a sound understanding of some of the key concepts across Chemistry. Students will have increased understanding and confidence in Chemical substantive and disciplinary knowledge and be able to apply new skills to a variety of new and challenging scientific concepts. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments. Our students will be able to utilise their chemical knowledge and understanding to understand important issues that affect the world.

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning (KS2)	Future Learning (Y8)
Particles and their behaviour.	**Maths:** Use data to draw a cooling curve Density calculations **Literacy:** Prefixes/ suffixes of words. Correct use of key words Use of tier 2 & 3 scientific language in writing **Sc1 – working scientifically:** Use of scientific equipment and measurement. Modelling: Particles are an abstract concept as they are too small to see. Linking the particle model to real-life observation of properties in order to understand abstract concepts. Model diffusion using a variety of methods	• Definitions of material and substance. • Factors in the particle model that determine properties of materials. • Properties of substances in different states. • Particle arrangement, separation and movement in different states. • Density and states of matter. • Melting and boiling points. • Diffusion.	States of matter Changes of state Properties of materials	Separating techniques
Elements, atoms and compounds.	**Maths:** Using molecular models, they will demonstrate that, when chemical reactions take place, the atoms of the reactants are rearranged and joined together differently to form the products. Ratios of simple compounds. **Literacy:** Correct use of key words Key terms (ELEMENT, MIXTURE, COMPOUND), (REVERSIBILITY) Element symbols Use of tier 2 & 3 scientific language in writing Scientific conventions and communication worldwide effectively about substances and materials. Equation writing **Sc1 – working scientifically:** Use experimental work to demonstrate examples of chemical and physical changes	• Definitions of atom, element, molecule and compound. • What the Periodic Table shows. • Chemical symbols of elements. • The differing properties between a compound and the elements whose atoms are in it. • Chemical change (permanent) • Physical change (temporary) • Writing and interpreting chemical formulae. • Writing and interpreting chemical names.	• Properties of Materials • Formation of new materials	The periodic table

	Classify substances according to definitions learned • Compare the origin of different element names			
Acids and Alkalis.	**Maths:** Graphing Equation writing **Literacy:** Scientific conventions and communication worldwide effectively about substances and materials. Key terms (ACID, ALKALI, BASE, INDICATOR), pH scale, (SALT, NEUTRALISATION)) **Sc1 – working scientifically:** Modelling: Chemical reactions are an abstract concept. They happen on an atomic level. Use of models to visualise what is happening and the benefits and limitations of these models. Predicting the salt formed from acids and metals or bases. Determine what makes a good indicator based on quantitative vs qualitative data Draw coloured diagrams of the pH scale	• Definitions of acid, alkali, base, neutralisation reactions and salt. • Describing hazards linked to using acids and alkalis and how to control those risks. • The difference between concentrated and dilute solutions in terms of particles. • The pH scale and pH ranges of acidic, neutral and alkaline solutions. • How pH changes in neutralisation reactions.	Formation of new materials	Metals and acids

YEAR 8 CURRIUCLUM OVERVIEW - Chemistry

The Big Picture – Intent:

Students build upon their prior learning adding challenge and diversity, revisiting and extending previously learnt concepts further developing scientific knowledge, skills and thinking. Students study the periodic table, separating techniques and metals and acids building upon the key fundamentals learnt in year 7. The curriculum is knowledge rich, constantly building upon prior knowledge in order to reinforce understanding at a deeper level.

We intend for our students to develop into confident, resilient, and reflective learners who enjoy Chemistry and move on and up to be successful at KS3, GCSE, A-Level and beyond. Chemistry lessons will focus on the substantive knowledge and content, but in addition teach methods of enquiry and investigation to stimulate creative thought. Pupils will learn to ask questions and begin to appreciate the way Chemistry will affect their future on a personal, national and global level.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

In Year 8 chemistry there are 3 units of study:
Periodic Table: Following the introduction of the Periodic Table as a way of organising the elements, the positions of the metallic and non-metallic elements can be discussed using findings from the investigations into their properties. Introduction to the terms 'groups' (vertical columns) and 'periods' (horizontal rows) and identify elements given their group and period number in the Periodic Table.
Separating techniques: Students develop understanding of pure & impure substances and mixtures. They use a variety of practical techniques to investigate solubility, filtration, evaporation, distillation and chromatography.

Metals and Acids: Students study the reaction of metals with acids and oxygen and how metals are obtained from naturally occurring ores. Extraction of metals is taught using the reactivity series and students use practical techniques to carry out displacement reactions. Students also study the development and use of ceramics, polymers and composites in the world.

Each unit has separate key study skills and these will be fostered through observation, practical and independent practical skills. Students study skills will be developed through in class and independent assessment preparation. We ensure that we also prepare students in both practical and mathematical skills, for them to fully access the curriculum and explore investigations scientifically.

Key Summative Assessments:

Formal End of unit tests will take place at the end of each unit.
Cumulative end of Year exams in the summer term.

Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:
Periodic table

Spring Term:
Separating techniques

Summer term:
Metals and Acids
Year 8 exam.

Impact:
Students will have increased understanding and confidence in Chemical substantive and disciplinary knowledge and be able to apply new skills to a variety of new and challenging scientific concepts. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments. We aim for our students to develop into confident, resilient, and reflective learners who enjoy chemistry and are able to place it in context and link it to the other scientific disciplines and to their experience of the world at large.

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning (KS2-Y7)	Future Learning (Y9)
Periodic table.	**Maths:** using data on physical and chemical properties of elements to identify trend in groups Identifying trends and patterns in data to predict unknown properties. **Literacy:** Key terms & definitions in context. **Sc1:** Predictions and models to record observations and understand scientific concepts. Identify from properties suitable uses of a substance or material.	• The meaning of the terms physical and chemical properties. • The uses and physical and chemical properties of typical metals and non-metals. • Groups and periods in the Periodic table and trends in the properties of elements in Groups or Periods. • Group 1, Group 7 & Group 0 physical properties, trends in melting and boiling points and reactivity as appropriate.	**KS2: Properties and changes of materials** • Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal).	Reactions Key Concepts Atoms, elements & compounds
Separating techniques.	**Maths:** Use a temperature-time melting point graph to determine if a substance is pure. **Literacy:** Key terms & definitions in context. **Sc1:** Identifying trends and patterns in data to predict unknown properties. Predictions and models to record observations and understand scientific concepts. Using scientific equipment precisely and safely. **Modelling:** Particles are an abstract concept as they are too small to see. Linking the particle model to real-life observation of properties in order to understand abstract concepts.	Meaning of pure, mixture, solute, solvent, solution, dissolve and solubility. Compare mixtures and compounds. Explain dissolving and evaporation using the particle model. Explain how filtration works and some uses of filtration. Describe how to use evaporation or distillation to separate a substance from a solution. Describe how to chromatography to identify unknown substances in mixtures.	**KS2: Properties and changes of materials** • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. **Y7: Particles and their behaviour** • Definitions of material and substance. • Factors in the particle model that determine properties of materials. • Properties of substances in different states.	Key Concepts Atoms, elements & compounds

			• Particle arrangement, separation and movement in different states. • Density and states of matter. • Melting and boiling points.	
Metals and other materials.	**Maths:** Identifying trends and patterns in data to predict unknown properties. **Literacy:** Key terms & definitions in context. **Sc1:** Using scientific equipment precisely and safely to carry out investigations into the reactivity of metals with a variety of substances. Identify from properties suitable uses of a substance or material. **Modelling:** Particles in reactions that cannot be seen.	• Reactions of metals with acids, oxygen and water. • Word equations for the reactions of metals with acids, oxygen and water. • Extracting metals from their ores, including when carbon can be used. • Describing the properties of some ceramics. • Explaining the properties of some polymers. • Explaining the properties of some composites. • Explaining how the properties of ceramics, polymers and composites make them suitable for their uses.	**KS2: Properties and changes of materials** • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. **Y7: Particles and their behaviour** • Definitions of material and substance. • Factors in the particle model that determine properties of materials. • Properties of substances in different states. • Particle arrangement, separation and movement in different states. • Density and states of matter. • Melting and boiling points	Reactions

YEAR 9 CURRIUCLUM OVERVIEW - Chemistry

The Big Picture – Intent.

In Year 9 students draw together their chemistry learning in KS3 ready to apply knowledge and understanding to KS4 topics. The application of topic knowledge in Year 7 and 8 demands linking of concepts learnt and an increased demand in terms of conceptual understanding. Students further study reactions, the earth and the key concepts of atoms, elements and compounds. The curriculum encompasses the national curriculum and follows a spiral structure, building upon prior knowledge in order to develop understanding at a deeper level. We aim for our students to develop into confident, resilient, and reflective learners who enjoy science and move on and up to be successful at KS3, GCSE and A-Level.

Chemistry lessons will focus on the substantive knowledge and content, but in addition teach methods of enquiry and investigation to stimulate creative thought. Pupils will learn to ask questions and begin to appreciate the way Chemistry will affect their future on a personal, national and global level.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

In Year 9 chemistry there are 3 units:
Reactions: Students learn about conservation of energy in chemical reactions, transfer of energy to and from the surroundings and investigate different types of chemical reaction. Pupils use molecular models to demonstrate the re arrangement of atoms during chemical reactions. Students develop their understanding of the reactivity series which is a key concept in chemistry.
The Earth: Students study the structure of Earth and the composition of the Earth's atmosphere. This unit also encompasses weathering, types of rock and the carbon cycle. This unit has clear cross curricular links to Geography
Key Concepts: Atoms, elements & compounds:
Students further develop their understanding of the differences between compounds and mixtures and separation techniques. Students study crude oil as a source of hydrocarbons and apply their knowledge of separating mixtures to the separation of crude oil. Students will apply knowledge regarding how the size of the hydrocarbon molecule affects its properties, including viscosity, boiling point, and flammability.

Each unit has separate key study skills and these will be fostered through observation, practical and independent practical skills. Students study skills will be developed through in class and independent assessment preparation. We ensure that we also prepare students in both practical and mathematical skills, for them to fully access the curriculum and explore investigations scientifically.

Key Summative Assessments:

Formal End of unit tests will take place at the end of each unit.

Cumulative end of Year exams in the summer term.

Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:
Reactions

Spring Term:
The earth

Summer term:
Key Concepts:
Atoms, elements & compounds.
Year 9 exam.

Impact:
The Chemistry curriculum aims to foster scientific curiosity where students learn through inquiry. We have a strong emphasis on practical skills, which develop not only deep scientific understanding but also key transferable skills such as teamwork, leadership, and organisation. Our students are able to utilise their chemical knowledge and understanding to understand important issues that affect our society.

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning	Future Learning (GCSE)
Reactions	**Maths:** Using ratios to predict outcomes of reactions and balancing products and reactants. **Literacy:** Key terms & definitions in context. **Sc1:** Using scientific equipment precisely and safely.	• Reactions of metals with acids, oxygen and water. • Comparing the patterns of reactivity of metals with acids, oxygen and water. • Describing decomposition reactions. • Use ratios in chemical formulae and equations. • Describe the total mass of reactants is equal to the total mass of products in a chemical reaction. • Endothermic and exothermic reactions.	**KS2:** • Properties of Materials • Formation of new materials • Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal). **KS3 Elements, atoms and compounds:** • Definitions of atom, element, molecule and compound. • What the Periodic Table shows. • Chemical symbols of elements. • The differing properties between a compound and the elements whose atoms are in it. • Chemical change (permanent) • Physical change (temporary) • Writing and interpreting chemical formulae. • Writing and interpreting chemical names. **KS3 Acids and Alkalis.** • Describing hazards linked to using acids and alkalis and how to control those risks	C3 structure and bonding C5 Chemical changes C7 Energy changes

The Earth	**Maths:** Calculating percentages of gases in the atmosphere Displaying and interpreting data on graphs **Literacy**: Key terms & definitions in context. **Sc1:** Identifying trends and patterns in data to predict unknown properties. Using scientific equipment precisely and safely. Identify from properties suitable uses of a substance or material. **Modelling:** Particles and processes in the earth's atmosphere and crust cannot be seen.	The composition of the earth and atmosphere. The process of making sedimentary, igneous and metamorphic rock. Explaining the properties of sedimentary, igneous and metamorphic rock. Describing how carbon moves between carbon stores in the carbon cycle. Describing the greenhouse effect, global heating and climate change. Explaining why global hating occurs.	**KS2: Rocks** • Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Recognise that soils are made from rocks and organic matter. **KS3: Properties and changes of materials** • Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal).	C5 Chemical changes C12 The earth's resources

Key Concepts **Atoms: elements & compounds**	**Maths:** using ratios in formulas to predict chemical formulas. Balancing equations **Literacy:** Key terms & definitions in context. **Sc1:** Using scientific equipment precisely and safely. Identify from properties suitable uses of hydrocarbons. **Modelling:** Atoms, molecules, compounds and hydrocarbons.	• That atoms are made up of sub-atomic particles. • How atoms bond to each other in element and compounds. • The formula of key elements and compounds. • That crude oil is a mixture of differing length hydrocarbons. • How to separate crude oil into fractions. • The uses of hydrocarbons as fuels. • How and why larger, les useful hydrocarbons are cracked to form smaller ones.	**KS2:** • Properties of Materials • Formation of new materials • States of matter • Changes of state **KS3 Elements, atoms and compounds:** • Definitions of atom, element, molecule and compound. • What the Periodic Table shows. • Chemical symbols of elements. • The differing properties between a compound and the elements whose atoms are in it. • Chemical change (permanent) • Physical change (temporary) • Writing and interpreting chemical formulae. • Writing and interpreting chemical names. **KS3: Particles and their behaviour.** • Definitions of material and substance. • Factors in the particle model that determine properties of materials. • Properties of substances in different states. • Particle arrangement, separation and movement in different states. • Density and states of matter. • Melting and boiling points.	C1 Atomic structure C9 Crude oil and fuels

YEAR 10 CURRICULUM OVERVIEW: Trilogy Chemistry

The Big Picture – Intent:

The Chemistry curriculum aims to foster scientific curiosity where students learn through inquiry. We have a strong emphasis on practical skills, which develop not only deep scientific understanding but also key transferable skills such as teamwork, leadership, and organisation. Our students are able to utilise their chemical knowledge and understanding to understand important issues that affect our society.

The Chemistry papers cover the following topics:

Paper 1 – (Topics 8-12): Atomic structure, Periodic table, Structure & bonding, Chemical calculations, Chemical changes, Electrolysis, Energy changes

Paper 2 – (Topics 13-17): Rates & equilibrium, Crude oil & fuels, Chemical analysis, The Earth's atmosphere, The Earth's resources.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

Students undertaking combined science have 10 science lessons a fortnight.

The units taught in Year 10 chemistry are: *Atomic structure, Periodic table, Structure & bonding, Chemical calculations, Chemical changes, Electrolysis , Energy changes.*

At Key Stage 4 most students follow AQA GCSE Combined Science Trilogy. The specification covers Biology, Chemistry and Physics. This is a linear course with all the examinations at the end of year 11. Students will sit six examinations, two in Biology, two in Chemistry and two in Physics. Each examination is one hour and fifteen minutes in length and worth 16.7% of the final grade. Students can be entered at either Foundation or Higher tier and will attain the equivalent of two GCSEs at 9-1 grades. There are six papers: two biology, two chemistry and two physics. Students are exposed to a knowledge-rich, spiralised curriculum, with the introduction of aspirational career pathways embedded in all units, ranging from pathologists to electrical engineers. Additionally, students are given the opportunity to discuss 'big questions' around the moral, social and ethical implications of many areas of science

Students learn about science through purposeful practical activities as part of day-to-day teaching and learning. Students will also undertake required practicals in class in order to deepen their understanding of scientific concepts and develop their skills of investigating, observing, experimenting and testing the validity of scientific concepts ideas.

Key Summative Assessments:

All units include:

- Retrieval homework
- Live marking
- Low stake quizzing
- End of Unit Tests

Required practical tasks:

- Making salts
- Electrolysis

Autumn Term:

Chemistry: Atoms.

Spring Term:
Chemistry: Bonding and moles.

Summer term:
Chemistry: Chemical reactions.

Impact:

By the end of Year 10 students will be confident with the fundamental and more complex principles, knowledge and application of this knowledge in chemistry.

They will be able to apply their chemistry knowledge and skills to both familiar and unfamiliar situations using the analytical, questioning and critical thinking skills that they will have developed during their study of chemistry in year 10.

Prior Knowledge

KS2:

- Properties of Materials
- Formation of new materials
- Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal).
-

KS3 Elements, atoms and compounds:

- Definitions of atom, element, molecule and compound.
- What the Periodic Table shows.
- Chemical symbols of elements.
- The differing properties between a compound and the elements whose atoms are in it.
- Chemical change (permanent)
- Physical change (temporary)
- Writing and interpreting chemical formulae.
- Writing and interpreting chemical names.
-

KS3 Acids and Alkalis.

- Definitions of acid, alkali, base, neutralisation reactions and salt.
- Describing hazards linked to using acids and alkalis and how to control those risks.
- The difference between concentrated and dilute solutions in terms of particles.
- The pH scale and pH ranges of acidic, neutral and alkaline solutions.
- How pH changes in neutralisation reactions.

KS3: Properties and changes of materials

Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal)

KS3: Particles and their behaviour.

- Definitions of material and substance.
- Factors in the particle model that determine properties of materials.
- Properties of substances in different states.
- Particle arrangement, separation and movement in different states.
- Density and states of matter.
- Melting and boiling points.

Content	**Disciplinary Knowledge (Skills)** This is the actions taken within a topic to gain substantive knowledge	**Substantive Knowledge** This is the specific, factual content for the topic, which is connected into a careful sequence of learning.

Atomic Structure	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Mass number and atomic number • Numbers of protons, electrons and neutrons • Isotope calculations - relative isotope mass • Ions – when atoms gain or lose an electron, they become an ion • Calculation of RFM / RMM • Chemical equations (*inc half equations & ionic equations HT only)* **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Apply knowledge of experimental work to explain the idea that models change over time. • Apply charges on Atoms and ions to determine numbers of subatomic particles • Use the periodic table to determine the number of different subatomic particles and the position of electrons. • Using scientific equipment precisely and safely.	• History of atomic models • Plum pudding model, nuclear model (gold foil experiment), Chadwick, Bohr model, • Mass, charge + location of subatomic particles • Definitions of mass number and atomic number • Chemical equations • Separating mixtures • Fractional distillation • Paper chromatography • Electron structure • Ions • Isotopes • Calculation of RFM / RMM • Chemical equations (*inc half equations & ionic equations HT only)*

The Periodic Table	**Maths**: Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Displaying and interpreting data on graphs • Interpreting data around density, melting & boiling points and reactivity of elements • Understanding the relationship between group/period number and the structure/reactivity of an element • Calculate RAM to an appropriate level of precision **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Research different scientists to enforce the idea that theories change over time and based on experimental observations • Apply knowledge of experimental work to explain the idea that models change over time. • Use Mendeleev's table to make predictions • Explain that reactivity is linked to distance, shielding and nuclear charge (HT only) • Using scientific equipment precisely and safely. • Apply charges on Atoms and ions to determine numbers of subatomic particles • Use the periodic table to determine the number of different subatomic particles and the position of electrons.	• Development of the Periodic Table • Electronic structure and the periodic table • Groups and Periods • Group 1 • Group 7 • Reactivity trends • Properties • Transition elements • Explaining trends
Structure and Bonding	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Ions – when atoms gain or lose an electron, they become an ion • Formulae of ions • Calculation of RFM / RMM • Balancing products and reactants in equations • Multiplying brackets in equations • Conservation of mass calculations	• States of matter - Arrangement of particles in solids liquids and gases; Names for processes to convert between states of matter; Formulations • Atoms into Ions • Ionic bonding • Giant ionic structures • Covalent Bonding • Giant covalent structures • Simple Molecules

	Literacy: Key terms & definitions in context. Use and understanding of GSCE command words Literacy through the use of GCSE exam questions Ionic formula literacy **Sc1:** • Apply Particle theory to explain observations • Apply knowledge of stability of a full outer Full outer shell to draw bonding diagrams • Write formulae for compounds • Balance reaction equations • Draw dot cross diagrams • Compounds behave differently to their constituent elements • Using scientific equipment precisely and safely. • Compounds behave differently to their constituent elements	• Fullerenes and graphene • Metallic bonding • Properties of metals and alloys • Giant metallic structures • Nanoparticles
Chemical Calculations	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Balancing products and reactants in equations • Multiplying brackets in equations • Conservation of mass calculations • Moles • Correctly use standard Form and significant figures in chemical calculations • Manipulate data in order to draw valid conclusions. **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Use the law of conservation of mass to balance equations • Compare the Environmental / economic implications of reactions using atom economy calculations	• Relative masses and moles • Avogadro's constant • Empirical formula • Reacting mass calculation • Limiting reagent • *% yield (HT only)* • *Atom economy(HT only)* • Equations and calculations • From masses to balanced equations • Expressing concentrations

Chemical Changes	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Balancing products and reactants in equations • Multiplying brackets in equations • Conservation of mass calculations • **Literacy:** Key terms & definitions in context. Use and understanding of GSCE command words Literacy through the use of GCSE exam questions **Sc1:** • Predict reactions of group 7 using displacement reactions • Write ionic equations • Carry out risk assessments for practical work	• Reactivity series • Displacement Reactions • Extracting metal and reduction • *Oxidation and reduction (HT Only)* • Reactions of acids – making salts • Salts from insoluble bases • Soluble salts • Neutralisation and the pH scale • *Strong and weak acids (HT Only)* • ***Required Practical***: Salts
Electrolysis	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Balancing products and reactants in equations • *Electrolysis half equations (HT Only)* **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** Discuss the link between reactivity and product formed • Use knowledge of reactivity to determine the most appropriate method of metal extraction • Evaluate of data to draw conclusions	• Introduction to electrolysis • Electrolytes • Changes at electrodes • Extraction of aluminium • Electrolysis of aqueous solutions • *Electrolysis half equations (HT Only)* • ***Required Practical***: Electrolysis

Energy Changes	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Balancing products and reactants in equations • Calculate enthalpy change using the knowledge that Bond breaking and making is endothermic / exothermic (*HT Only)* **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Carry out practical work to demonstrate that energy is conserved • Draw energy level diagrams including activation energy and showing the role of a catalyst	• Exothermic and endothermic reactions • Using energy transfers from reactions • Reaction Profiles • *Bond energy calculations (HT only)*

YEAR 11 CURRICULUM OVERVIEW: Trilogy Chemistry

The Big Picture – Intent: Y11 Combined Chemistry Science:

The Chemistry curriculum aims to foster scientific curiosity where students learn through inquiry. We have a strong emphasis on practical skills, which develop not only deep scientific understanding but also key transferable skills such as teamwork, leadership, and organisation. Our students are able to utilise their chemical knowledge and understanding to understand critical issues that affect our society.

The Chemistry papers cover the following topics:

Paper 1 – (Topics 8-12): Atomic structure, Periodic table, Structure & bonding, Chemical calculations, Chemical changes, Electrolysis, Energy changes

Paper 2 – (Topics 13-17): Rates & equilibrium, Crude oil & fuels, Chemical analysis, The Earth's atmosphere, The Earth's resources.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

Students undertaking combined science have 10 science lessons a fortnight.

The units taught in Year 10 chemistry are: *Rates & equilibrium, Crude oil & fuels, Chemical analysis, The Earth's atmosphere, The Earth's resources.*

At Key Stage 4 most students follow AQA GCSE Combined Science Trilogy. The specification covers Biology, Chemistry and Physics. This is a linear course with all the examinations at the end of year 11. Students will sit six examinations, two in Biology, two in Chemistry and two in Physics. Each examination is one hour and fifteen minutes in length and worth 16.7% of the final grade. Students can be entered at either Foundation or Higher tier and will attain the equivalent of two GCSEs at 9-1 grades. There are six papers: two biology, two chemistry and two physics. Students are exposed to a knowledge-rich, spiralised curriculum, with the introduction of aspirational career pathways embedded in all units, ranging from pathologists to electrical engineers. Additionally, students are given the opportunity to discuss 'big questions' around the moral, social and ethical implications of many areas of science

Students learn about science through purposeful practical activities as part of day-to-day teaching and learning. Students will also undertake required practicals in class in order to deepen their understanding of scientific concepts and develop their skills of investigating, observing, experimenting and testing the validity of scientific concepts ideas.

Key Summative Assessments:

All units include:

- Retrieval homework
- Live marking
- Low stake quizzing
- End of Unit Tests

Required practical tasks:

- Rates of reactions
- Chromatography
- Use chemical tests to identify unknown compounds
- Water

Autumn Term:

Rates & equilibrium
Crude oil & fuels, Chemical analysis,

Spring Term:
The Earth's atmosphere,
The Earth's resources.

Summer term:
GCSE Exams

Impact:

By the end of the Year students will be confident with the fundamental and more complex principles, knowledge and application of this knowledge in all three subject areas. Their practical skills will have developed both in discussing variables and describing methods but also analysing data, interpreting results and suggesting improvements. It is also hoped that links can be made between other sciences as they develop as complete scientists.

Prior Knowledge

KS2:

- Properties of Materials
- Formation of new materials
- Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal).
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KS3 Elements, atoms and compounds:

- Definitions of atom, element, molecule and compound.
- What the Periodic Table shows.
- Chemical symbols of elements.
- The differing properties between a compound and the elements whose atoms are in it.
- Chemical change (permanent)
- Physical change (temporary)
- Writing and interpreting chemical formulae.
- Writing and interpreting chemical names.
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KS3 Acids and Alkalis.

- Definitions of acid, alkali, base, neutralisation reactions and salt.
- Describing hazards linked to using acids and alkalis and how to control those risks.
- The difference between concentrated and dilute solutions in terms of particles.
- The pH scale and pH ranges of acidic, neutral and alkaline solutions.
- How pH changes in neutralisation reactions.

KS3: Properties and changes of materials

- Compare and group together everyday materials on the basis of their properties, Including their hardness, solubility, transparency, conductivity (electrical and thermal)

KS3: Particles and their behaviour.

- Definitions of material and substance.
- Factors in the particle model that determine properties of materials.
- Properties of substances in different states.
- Particle arrangement, separation and movement in different states.
- Density and states of matter.
- Melting and boiling points.

KS4: see Year 10 curriculum overview

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.
Rates & Equilibrium	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Calculate mean rate and rate at a point in time • Interpret data to draw accurate conclusions • Analyse data to assess the most favourable reaction conditions. **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Draw graphs and use them to draw conclusions from data • Apply knowledge of Control variables to design experimental work • Identify anomalies and explain how they are caused. • Use correct terminology when assessing validity of data • Carry out practical work to generate data to support theory work • Make predictions about the position of equilibrium when changes are made to Conditions • State the definition of rate of reaction • Apply collision theory to explain the effect of concentration, temperature, surface area and catalysts on rate of reaction.	• Calculating rate of reaction • Activation energy • Collision theory • 4 factors affect rate – concentration, surface area, temperature, and catalyst • Units of rate • Reversible reactions & energy • Practical methods for studying rate • Dynamic equilibrium *(HT only)*

Crude Oil & Fuels	**Maths**: Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Calculating alkane and alkene chemical formulas • Balancing equations **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Make links between molecular size, boiling point and viscosity • Draw displayed formulae and structural formulae • Apply knowledge of separation techniques • Use knowledge of addition reactions to predict products for reactions of alkene compounds	• Hydrocarbons • Fractional distillation • Burning hydrocarbons • Cracking • Alkanes • Alkene reactions • Addition polymers
Organic reactions	***Maths**:* *Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers.* • *How to draw displayed formula* • *How to represent the displayed formulae and molecules of alcohols, carboxylic acids and esters* • *Balanced equations for the combustion of alcohol* ***Literacy:*** • *Key terms & definitions in context.* • *Use and understanding of GSCE command words* • *Literacy through the use of GCSE exam questions* • *Define alkenes, ethene, propene, butene and pentene* ***Sc1*** • *How alkenes react with oxygen in air* • *The products of the reaction of the first 4 alkenes with hydrogen, water, chlorine, bromine and iodine* • *The names and formulas of the first 4 members of the alcohols, carboxylic acids and the ester – ethyl ethanoate*	• *Reaction of alkenes* • *Structures of alcohols, carboxylic acids and esters* • *Reactions and uses of alcohols* • *Carboxylic acids and esters*

	• *What is formed in the reaction of alcohols with sodium and when they are oxidised* • *How to recognise carboxylic acids from their properties* • *Why carboxylic acids are described as weak acids* • *How to make esters*	
Polymers	***Maths****:* *Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers.* • *How to recognise addition polymers and monomers from their displayed formulae* • *How to draw diagrams to represent the formation of a polymer from a given alkene monomer* ***Literacy:*** • *Key terms & definitions in context.* • *Use and understanding of GSCE command words* • *Literacy through the use of GCSE exam questions* ***Sc1*** • *How to relate the repeating unit of a polymer to its monomer* • *To describe the functional groups in the* • *To describe how polyesters are formed monomers* • *To describe how sugars can undergo polymerisation* • *To describe how amino acids react together* • *To describe the formation of polypeptides and proteins by condensation polymerisation* • *To describe the basic structure of monomers used to make DNA* • *To describe how monomers are arranged in DNA*	• *Addition polymerisation* • *Condensation polymerisation* • *Natural polymers* • *DNA*

Chemical analysis	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Calculate retention factor • How to use melting point data to distinguish pure from impure substances • Interpreting results of flame emission spectroscopy given appropriate data **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions **Sc1:** • Apply knowledge of physical properties to determine the most appropriate separation method • Apply Particle theory to explain observations • *How to identify examples of useful mixtures called formulations when given appropriate information* • *How to use flame tests to identify ions* • *Describe the precipitates formed in the reactions that produce insoluble hydroxides* • *How to identify – carbonates, halides, sulfates* • *Advantages of instrumental methods compared with traditional chemical tests*	• Pure substances and mixtures • Analysing chromatograms • Testing for gases • Tests of positive ions • Test for negative ions • Instrumental analysis
The Earth's atmosphere	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Analyse data to draw relevant conclusions (evaluating quality of evidence) • Calculate the composition of gases in the atmosphere **Literacy:** • Apply a knowledge of timescales to discuss the limitations of scientific evidence • Apply knowledge of photosynthesis to explain changes in the atmosphere over time. **Sc1:** • Explore the importance of peer review and communicating results	• History of the atmosphere • Composition of the modern atmosphere • Greenhouse gases and global climate change • Carbon footprints

	• Understand how the Earth's atmosphere has changed over time and the contributing factors to this.	
The Earth's resources	**Maths:** Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers. • Compare products based on lifecycle assessment using data given **Literacy:** • Key terms & definitions in context. • Use and understanding of GSCE command words • Literacy through the use of GCSE exam questions • Explain how properties are linked to use of a material. **Sc1:** • Understand and be able to explain the difference between finite and renewable resources	• Finite and renewable resources • Life cycle assessments • Water and alternative methods for extracting *water (HT only)* • Extracting metals from ores *(HT only)* • Recycling
Using our resources	***Maths:*** *Multiple equations and mathematical processes that students will need to employ. This makes up 20% of the marks available in the chemistry papers.* *• Compare products based on lifecycle assessment using data given* • *Interpret and evaluate composition and uses of alloys given appropriate information* ***Literacy:*** • *Key terms & definitions in context.* • *Use and understanding of GSCE command words* • *Literacy through the use of GCSE exam questions* • *Explain how properties are linked to use of a material.* • *Define alloys and give common examples* ***Sc1:*** • *How experimental results can show the conditions necessary for rusting* • *Describe how to protect iron form rusting* • *Explain why metals are alloyed* • *Explain how the properties of polymers depend on their monomers* • *How changing reactions affects polymers* • *Differences between thermosetting and thermosoftening polymers*	• *Rusting* • *Useful alloys* • *The properties of polymers* • *Glass, ceramics and composites* • *Making ammonia – Haber process* • *The economics of the Haber process* • *Making fertilisers in the lab* • *Making fertilisers in industry*

	• *Comparison of Qualitative and physical properties of glass, clay, ceramics, polymers, composites and metals* • *Relate properties of materials to their use* • *Explain why ammonia is important and why fertilisers are needed* • *Describe the raw materials needed to make ammonia* • *Relate commercially used conditions for the Haber process to availability and cost of raw materials and energy* • *Explain how ammonia can be neutralised* • *Describe how to prepare a fertiliser in a lab* • *Explain why compounds of nitrogen, phosphorus and potassium are used as fertilisers* • *Describe how compounds use in fertilisers are obtained* • *Compare industrial production fo fertilisers with lab preparations*	