GUMLEY HOUSE SCHOOL FCJ

# Curriculum Mapping: Science

**Overall Aims:**
We offer a science curriculum that evokes curiosity, excitement and understanding about the world around them through the specific disciplines of biology, chemistry and physics whilst supporting the Fundamental British Values. The curriculum also ensures progression of skills and cumulative learning, building on and supporting the children's metacognitive learning strategies through effective pedagogical and vocabulary rich teaching. Subject specific vocabulary is taught and built upon as topics are revisited to ensure conceptual understanding in order to be used accurately and precisely.

We know that our children learn through enquiry-based learning, thus science at Gumley has been structured to ensure that our students have first-hand science experiences from the beginning of their learning journey. This allows for independent exploration and investigation that then leads to progression of communication. Our students have access to science themed days, Science Club and STEM science events. These experiences, along with our progressive, creative curriculum, will enable our children to thrive as educated citizens of the future and through a growth mind-set approach, know that their learning has no limits. Our children understand that 'what you are is God's gift to you, what you become is your gift to God'. *(See end of these charts for description on End of Year Aims)*

| Year group | School year Implementation<br>Intended learning knowledge, skills, experiences… | | | | | | NC Criteria<br>Literacy<br>Numeracy<br>Careers<br>Diversity | End of Year Aims (impact) |
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| | **Autumn 1** | **Autumn 2** | **Spring 1** | **Spring 2** | **Summer 1** | **Summer 2** | | |
| **Year 13 Biology** | Biology:<br>Unit 6: Organisms Respond to Changes in Environment<br><br>Unit 7: Genetics, population, evolution and ecosystems | Biology:<br>Unit 6: Organisms Respond to Changes in Environment<br><br>Unit 7: Genetics, population, evolution and ecosystems | Biology:<br>Unit 8: Control of Gene Expression | Biology:<br>Essay practice and exam preparation | Biology:<br>Exam preparation | Biology:<br>N/A | Literacy<br>UCAS<br><br>Work experience<br>Participation in Olympiads<br>Medical society and career talks | By the end of this course, students should:<br>• have developed essential knowledge and understanding of different areas of the subject and how<br>they relate to each other<br>• have developed and demonstrate a deep appreciation of the skills, knowledge and understanding of<br>scientific methods<br>• have developed competence and confidence in a variety of practical, mathematical and problem |

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| **12 Biology** | Biology:<br>Unit 1: Biological Molecules<br><br>Unit 2: Cells | Biology:<br>Unit 1: Biological Molecules<br><br>Unit 2: Cells | Biology:<br>Unit 3: Organisms exchange substances with their environment<br><br>Unit 4: Genetic information and variation | Biology:<br>Organisms exchange substances with their environment<br><br>Unit 4: Genetic information and variation | Biology:<br>Unit 5: Energy transfer in and between organisms | Biology:<br>Revision, exam technique, essay skills | | solving skills<br>• have developed their interest in and enthusiasm for the subject, including developing an interest in further study and careers associated with the subject<br>• understand how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society. |
| **13 Chemistry** | Chemistry:<br>3.1.8 Thermodynamics<br>3.3.7 Optical isomerism<br>3.3.8 Aldehydes and ketones | Chemistry:<br>3.1.12 Acids and Bases<br>3.3.9 Carboxylic acids and derivatives<br>3.3.10 Aromatic chemistry<br>3.3.11 Amines | Chemistry:<br>3.1.11 Electrode potentials and electrochemical cells<br>3.2.5 Transitions metals<br>3.3.12 Polymers<br>3.3.13 Amino acids, proteins and DNA<br>3.1.9 Rate equations | Chemistry:<br>3.2.6 Reactions of ions in aqueous solutions<br>3.2.4 Properties of period 3 elements and their oxides<br>3.3.15 NMR<br>3.1.10 Equilibrium constant and homogeneous systems<br>3.3.16 Chromatography<br>3.3.14 Organic synthesis | Chemistry:<br>Paper 3 revision<br>Paper 1 revision | Chemistry:<br>Paper 2 revision<br>Study leave | Numeracy<br>Students develop excellent mathematical skills to solve problems<br><br>Diversity<br>They have a good understanding of how science research is global and involves many different nationalities<br><br>Literacy<br>UCAS<br><br>Work experience<br>Participation in Olympiads<br>Medical society and career talks | Students are able to interpret and analyse spectra for various industrial separations.<br>Students apply investigative approaches and methods when using instruments and equipment.<br><br>They safely use a range of practical equipment and materials with knowledge of COSHH and risk assessments.They can also write scientific reports, with good research skills, including references.<br><br>A-level Chemistry is studied over two years, with exams at the end of the second year. Students understand advanced topics in the areas of Physical Chemistry, Inorganic Chemistry and Organic Chemistry.<br>A Level Chemistry attempts to answer the big question ‘what is the world made of’ and it’s the search for this answer that makes this subject so fascinating. From investigating how one substance can be changed drastically into |

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| | | | | | | | | another, to researching a new wonder drug to save millions of lives, the opportunities that chemistry provides are endless. Chemistry, like all sciences, is a practical subject. Throughout the course students have carried out practical activities including: • measuring energy changes in chemical reactions • tests for identifying different types of compound • different methods for measuring rates of reaction • studying electrochemical cells • preparation of organic solids and liquids • an advanced form of chromatography. |
| **12 Chemistry** | Chemistry: 3.1.1 Atomic structure<br><br>3.1.3 Bonding | Chemistry: 3.1.2 Amount of Substance<br><br>3.1.5 Kinetics<br><br>3.3.1 Intro to organic chemistry | Chemistry: 3.1.4 Energetics<br><br>3.3.2 Alkanes<br><br>3.3.3 Halogen alkanes | Chemistry: 3.1.6 Chemical equilibrium<br><br>3.1.7 Oxidation, reduction and redox equations<br><br>3.3.4 Alkenes<br><br>3.3.5 Alcohols | Chemistry: 3.2.1 Periodicity<br><br>3.2.2 Group 2 alkaline earth metals<br><br>3.2.3 Group 7 halogens<br><br>3.3.6 Organic analysis | Chemistry: Revision and End of year test | Numeracy<br>Students develop excellent mathematical skills to solve problems, through various calculations,<br>Careers & Diversity<br>They work in a team and solve practical problems using critical thinking.<br>Work experience<br>Participation in Cambridge Chemistry Challenge,<br>Medical society and career talks. | Students are able to Interpret and analyse data.<br><br>They are able to interpret and analyse spectra for various industrial separations.<br><br>Students apply investigative approaches and methods when using instruments and equipment |
| **13 Physics** | Physics: Module 5: Thermal physics<br><br>Module 6: Electric fields and | Physics: Module 5: circular motion<br><br>Module 6: Capacitors | Physics: Module 5: Oscillations Gravitational Fields<br><br>Module 6: Nuclear and | Physics: Module 5: Astrophysics and cosmology<br><br>Module 6: Medical | Physics: Revision and exam prep | Physics: Revision and exam prep | Literacy<br>A large amount of focus placed on answering longer 6 mark questions relating to seen and unseen practical work. | Students will build on the knowledge and skills gained the first year of the course and will work to expand their knowledge of mechanics, thermal physics, astrophysics, atomic and radioactive physics and medical physics. They will continue to |

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| | electromagnetism, | | particle physics | imaging | | | Numeracy<br>Embedding into every section of every chapter.<br><br>Careers<br>Book/article report on the real world applications of the content that usually goes beyond the scope of the course. UCAS selection and how best to use physics as part of their personal statement.<br><br>Diversity<br>Students are encouraged to engage in the history of some of the more fundamental scientific theories and not have a solely Eurocentric view of research and development. | develop their analytical skills in practical work helping them to become an independent and critical thinker. |

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| **12 Physics** | Physics:<br>Mod 1:<br>Development of practical skills<br><br>Module 2:<br>Foundations of physics<br><br>Module 4:<br>Electricity, charge, current | Physics:<br>Mod 2:<br>Foundations of physics<br><br>Module 4:<br>Electricity, energy, circuits | Physics:<br>Module 3:<br>Work energy and power<br><br>Module 4:<br>Waves | Physics:<br>Module 3:<br>Materials<br><br>Module 4:<br>Waves<br>And quantum physics | Physics:<br>Mod 3:<br>Newton's laws<br><br>Module 3:<br>Motion, forces in action | Physics:<br>Revision, end of year exams<br>Begin Yr13 autumn content | Literacy<br>Focus on new keywords and command words. Beginning to learn how to structure an answer appropriate to A Level content.<br><br>Numeracy<br>Embedded in every section of every chapter.<br><br>Careers<br>Students encouraged to take up work placements in the summer term and attend online and in person university days.<br>British Physics Olympiad in summer term. | Students will start by bridging the gap between GCSE and A-Level. They will then quickly move on to study mechanics (forces and motion), materials, electricity, light and waves as well as wave particle duality. Students will learn to adapt to new styles of questioning whilst also enhancing their skill set in practical work. This year will lay a strong foundation for the more challenging concepts they will meet in Year 2. |
| *Transition into Further Education* | | | | | | | | |
| **11 Biology** | Biology:<br>Inheritance, variation and evolution | | Biology:<br>Homeostasis<br>1- IVF/ contraception<br>2- reaction time required practical<br>3- collecting data from RP/ data on contraception<br>4- timing and accuracy/ precision. | Biology:<br>Revision/Exam Preparation | Biology:<br>Revision/Exam Preparation | Numeracy<br>Literacy<br>Career talk<br>Diversity | | Studying the GCSE curriculum students will be taught the three sciences on rotation, developing the following three strands:<br><br>**Scientific understanding:** Understanding and applying scientific understanding to explain phenomena in everyday life.<br><br>**Mathematical Skills:** Use a range of Mathematical skills to manipulate, analyse and evaluate data.<br><br>**Working Scientifically Skills**: Working scientifically is the sum of all the activities that scientists do |

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| | | | | | | | | and is designed to encourage the development of knowledge and understanding in science through opportunities for experimentation. |
| **Year 11 Chemistry** | | Chemistry: Chemical analysis<br>1- Identify formulations given appropriate information.<br>2-Interpret chromatograms and calculate $R_f$ values.<br>3-Recall the tests for four common gases. | | Chemistry: Using resources<br>1-Distinguish between finite and renewable resources.<br>2-Explain what is needed to provide potable water for all<br>3-Carry out a procedure to produce potable water from salt solution.<br>4-Evaluate methods and suggest possible improvements and further investigations<br>5-Describe how sewage is treated. | Chemistry: Paper 1 revision | Chemistry Paper 2 revision | Communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations Applying the cycle of collecting, presenting and analysing data, including:<br>presenting observations and other data using appropriate methods.<br>translating data from one form to another.<br>Carrying out and representing mathematical and statistical analysis.<br>representing distributions of results and making estimations of uncertainty.<br>interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions<br>presenting reasoned explanations, including relating data to hypotheses<br>being objective, | Students should be able to explain everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments. They should be able to interconvert units and use an appropriate number of significant figures in calculations.<br>Students should be able to evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error<br>Students further apply their understanding of different chemical reactions and explain how we can carry out Chemical Analysis to identify the products of reactions. Students carry out a range of qualitative tests to detect specific chemicals. The tests are based on reactions that could produce a gas, or a colour change or a precipitate. Students understand that The Earth's atmosphere is forever changing which can be due to human activity or natural cycles. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions to reduce the impact of human activity. Students have a deeper understanding of |

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| | | | | | | | evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error. | how chemistry is part of their lives and the impact of using resources. They understand that industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources and energy, to reduce waste and the environmental impact in the manufacture of these products. Combined science students have completed 10 Chemistry units throughout KS4. Triple science also completed 10 units and also learnt additional content about previous Chemistry units. Students have established a good understanding of Chemistry and can relate this to real life applications. |
| **Year 11 Physics** | Physics:<br>5. Forces<br>6.5.1 Forces and their interactions<br>6.5.2 Work done and energy transfer<br>6.5.3 Forces and elasticity | Physics:<br>5. Forces<br>4.5.4 Forces and motion<br>4.5.5 Momentum | Physics:<br>7. Electromagnetism<br>6.7.1 Permanent and induced magnetism, magnetic forces and fields<br>6.7.2 The motor effect | Physics:<br>Revision for GCSEs | Physics:<br>Revision for GCSEs | Physics:<br>Revision for GCSEs | Numeracy<br>Vocabulary, units, symbols and nomenclature developing their use of scientific vocabulary and nomenclature recognising the importance of scientific quantities and understanding how they are determined interconverting units using an appropriate number of significant figures in calculations<br><br><u>Literacy</u><br>The development of scientific thinking<br>the ways in which scientific methods and | Students will cover the final two topics in physics - Forces and Electromagnetism. These can be the most challenging topics but using as many real world examples as possible they will learn to make sense of these difficult areas. If students are taking Triple Science, they will now broaden their understanding of all chapters taught to date in addition to studying Space Science where students will learn about the evolution of our solar system and the universe. |

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| **Year 10 Biology** | | Biology: Organisation | | | | Biology: Ecology<br>1- understand evidence for global warming<br>2- required practical sampling<br>3- data on pollution/ food chains/ global warming<br>4- Measuring biodiversity | Numeracy<br>Literacy<br>Career talk<br>Diversity | Studying the GCSE curriculum students will be taught the three sciences on rotation, developing the following three strands:<br>Scientific understanding: Understanding and applying scientific understanding to explain phenomena in everyday life.<br>Mathematical Skills: Use a range of Mathematical skills to manipulate, analyse and evaluate data.<br>Working Scientifically Skills: Working scientifically is the sum of all the activities that scientists do and is designed to encourage the development of knowledge and understanding in science through opportunities for experimentation. |
| **Year 10 Chemistry** | Chemistry: Quantitative Chemistry<br>1- The mole, concentration<br>2- Mass changes<br>3- Mass Changes<br>4- Calculating moles, balancing equations, concentration | Chemistry: Chemical Changes<br>1-Reactivity series, pH, Electrolysis<br>2- Metal oxides, extraction of metals, RP8, pH, RP9<br>3- Metal oxides, reactivity series, RP8, pH, RP9 | Chemistry: Rates of Reaction<br>1- collision theory<br>2- RP11<br>3- RP11<br>4- calculating rates, rate of change | Chemistry: Hydrocarbons<br>1- Polymerisation<br>2-<br>3- Combustion<br>4- Alkanes, cracking, alkenes, polymerisation | Chemistry: The Atmosphere<br>1- The greenhouse effect, climate change, carbon footprint<br>2-<br>3-<br>4- The greenhouse effect, climate change | | Further develop the ways in which scientific methods and theories develop over time using a variety of concepts and models to develop scientific explanations and understanding.<br>1. The development of scientific thinking<br>2. Experimental skills and strategies<br>3. Analysis and evaluation<br>4. Vocabulary, units, | Students are able to select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables<br>Students are able to recognise the importance of peer review of results and of communication of results to a range of audiences.<br>Students have built on their chemistry knowledge and understand Chemical changes during reactions and have learnt how scientists can predict exactly what new substances would be |

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| | | 4-Metal oxides, RP8, pH, Electrolysis | | | | | symbols and nomenclatureNumeracy - Chemical quantities: translating data from one form to another carrying out calculations and rearranging formulae. | formed and use this knowledge to develop a range of different materials. Students can use their previous knowledge on how atoms react and apply this to Quantitative chemistry, where they will determine the formulae of compounds and equations for reactions. This is useful in industry to determine the purity of chemical samples and to monitor the yield from chemical reactions. Students can explain the rate and extent of chemical change and can identify the factors that can speed up or slow down the rate of reactions. Students can explain how Organic chemistry relates to real life. They understand that we can modify organic molecules through reactions, to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents. |
| **Year 10 Physics** | Physics:<br>2. Electricity<br><br>6.2.1 Current, potential difference and resistance<br><br>6.2.2 Series and parallel circuits<br><br>6.2.3 Domestic uses and safety | | Physics:<br>6. Waves<br><br>6.6.1 Waves in air, fluids and solids<br><br>6.6.2 Electromagnetic waves | | Physics:<br>Revise for end of year tests | | Literacy<br>The development of scientific thinking<br>the ways in which scientific methods and theories develop over time<br>using a variety of concepts and models to develop scientific explanations and understanding<br>Experimental skills and strategies<br>planning experiments to make observations, test hypotheses or explore phenomena | In Year 10, students will cover the fundamental topics of Electricity and Waves. They will be able to deepen their understanding of how simple circuits work to gain a greater understanding of how everyday electrical items work. Students will carry out practical work to broaden their understanding of series and parallel circuits as well as the classic ripple tank experiment for waves. |

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| | | | | | | | carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations<br><br>Numeracy<br>Use of equations embedded into both chapters. | |
| **Year 9 Biology** | Biology: Cell Biology<br>1- Primitive cells, stem cells<br>2- Microscopes, osmosis<br>3- osmosis<br>4- osmosis, SA:V | | Biology: Bioenergetics<br>1- food production<br>2- photosynthesis required practical<br>3- limiting factors<br>4- photosynthesis required practical | Biology: Infection and response<br>1- pathogens, making new drugs<br>2- developing new drugs<br>3- building immunity, new drugs<br>4- immunity, new drugs, antibiotics | | Revisit and intervention lessons on all year 9 topics to help with retrieval & application. | Numeracy<br>Literacy<br>Career talk<br>Diversity | Studying the GCSE curriculum students will be taught the three sciences on rotation, developing the following three strands:<br>**Scientific understanding**: Understanding and applying scientific understanding to explain phenomena in everyday life.<br>**Mathematical Skills**: Use a range of Mathematical skills to manipulate, analyse and evaluate data.<br>**Working Scientifically Skills**: Working scientifically is the sum of all the activities that scientists do and is designed to encourage the development of knowledge and understanding in science through opportunities for experimentation. |
| **Year 9 Chemistry** | Chemistry: Atomic structure and periodic table<br>1- Experimental evidence for discovery of scientific skills | Chemistry: Structure and Bonding<br>1- Visualise and represent 2D and 3D forms including two dimensional | | Chemistry: Energy changes<br>1-Consider how reactions are used to heat or cool their surroundings. | | Revisit and intervention lessons on all year 9 topics to help with retrieval & application. | 1. The development of scientific thinking- the ways in which scientific methods and theories develop over time<br>using a variety of concepts and models to develop scientific | Students understand scientific methods and development of new theories<br>They are able to evaluate data showing awareness of random and systematic errors.<br>They are able to present observations and other data using appropriate methods. |

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| | and models, predict properties of elements in the periodic table.<br>2-Relate the number of charged particles in atoms to their position in the periodic table.<br>3-Relate each element's electron configuration to its position in the periodic table.<br>4- New scientific vocabulary, calculating relative atomic mass and an understanding of units. | representations of 3D objects.<br>2-Identify ionic compounds from structures.<br>3-Explain the limitations of diagrams and models.<br>4-Draw dot and cross diagrams for small molecules.<br>5--Deduce molecular formulae from models and diagrams.<br>6--Use data to predict the states of substances<br>7-Giant covalent structures<br>8-Properties of metals and alloys<br>9-Relate the sizes of nanoparticles to atoms and molecules<br>10-Explain that there may be risks associated with nanoparticles. | | 2-Investigate how these temperature changes can be controlled.3-Show the difference between exothermic and endothermic reactions using energy profiles.<br>4-Use bond energies to calculate overall energy changes.<br>5- | | | explanations and understanding<br>-appreciating the power and limitations of science and considering ethical issues which may arise explaining every day and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments<br>-evaluating risks both in practical science and the wider societal context, including perception of risk<br>- recognising the importance of peer review of results and of communication of results to a range of audiences<br>2. Experimental skills and strategies<br>- using scientific theories and explanations to develop hypotheses and applying knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments. | Students have developed their knowledge and learnt about Chemistry at a more advanced KS4 level. Students understand Atomic structure and the periodic table and know how to predict possible reactions and the reactivity of elements from their positions in the periodic table. Students also can explain Bonding, structure and the properties of matter and can use theories to explain the physical and chemical properties of materials. Students learnt that energy changes are an important part of chemical reactions. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. |

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| | | | | | | | Making and recording observations and measurements using a range of apparatus and methods<br>evaluating methods and suggesting possible improvements and further investigations.<br>Career talk<br>Diversity | |
| **Year 9 Physics** | Physics:<br>3. Particle model of matter<br><br>6.3.1 Changes of state and the particle model<br><br>6.3.2 Internal energy and energy transfers<br><br>6.3.3 Particle model and pressure | | Physics:<br>4. Atomic Structure<br><br>6.4.1 Atoms and isotopes<br><br>6.4.2 Atoms and nuclear radiation | | Physics:<br>2. Electricity<br><br>6.2.1 Current, potential difference and resistance<br><br>6.2.2 Series and parallel circuits<br><br>6.2.3 Domestic uses and safety | Revisit and intervention lessons on all year 9 topics to help with retrieval & application. | Numeracy<br>Analysis and evaluation<br>applying the cycle of collecting, presenting and analysing data, including:<br>presenting observations and other data using appropriate methods<br>translating data from one form to another<br>carrying out and representing mathematical and statistical<br>analysis<br>interpreting observations and other data, including identifying<br>patterns and trends, making inferences and drawing conclusions.<br>Measurement<br>understand and use SI units<br>use and derive simple equations and carry out appropriate calculations | In Year 9 students will make a transition from Key Stage 3 to GCSE science where they will expand their knowledge and understanding of topics familiar to them but also start to learn brand new areas of physics. Students will be able to deepen their understanding of how simple circuits work to gain a greater understanding of how everyday electrical items work. Students will carry out practical work to broaden their understanding of series and parallel circuits |

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| | | | | | undertake basic data analysis including simple statistical techniques<br>Literacy<br>Vocabulary, units, symbols and nomenclature developing their use of scientific vocabulary and nomenclature recognising the importance of scientific quantities and understanding how they are determined<br>Diversity<br>Use of energy in different parts of the world in terms of availability, effects on the environment and resource depletion | |
| *Key Stage 3 End Point* | | | | | | |
| **Year 8 Biology** | Biology: Human Systems<br>1- smoking<br>2- enzymes & dissection<br>3- diet calculations<br>4- enzymes | Biology: Genetics and Inheritance<br>1- discovering DNA or evolution<br>2- measuring biodiversity<br>3- variation<br>4- measuring biodiversity results | n/a | | Numeracy<br>Literacy<br>Diversity<br>Science club | Students will study how genes are inherited, and how systems work together in the human body.<br>In lessons, and through independent science projects, students will learn how to independently plan experiments, identify variables and interpret results. They will also develop their analytical, evaluative and communication skills. |
| **Year 8 Chemistry** | n/a | **Chemical Reactions**<br>2. Antacid investigation<br>Reactivity and displacement reactions<br>3. Antacid Investigation<br>4. Antacid Investigation | **Chemistry of the atmosphere**<br>1- Composition of the Earth and its structure<br>2-The rock cycle and formation of igneous, sedimentary and metamorphic rocks. | | Working scientifically NC:<br>1. Scientific attitudes<br>2. Experimental skills and investigations | Students are able to understand that scientific methods and theories developed as earlier explanations are modified to take account of new evidence and ideas. |

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| | | **Chemical Changes**<br>1 -Burning & Comparing Fuels. Energy in food experiments<br>2- Burning & Comparing Fuels. Energy in food experiments<br>3 - analysis of data from burning fuels experiments<br>4 - Burning & Comparing Fuels. Energy in food experiments<br><br>. | 3-The carbon cycle<br>4-Earth as a source of limited resources and the efficacy of recycling.<br>5-Introduction to climate change due to human activity. | 3. Analysis and evaluation<br>4. Measurement<br><br>Experimental skills and investigations<br>ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience<br><br>Analysis and evaluation<br>Numeracy - analysing data : apply mathematical concepts and calculate results<br>present observations and data using appropriate methods, including tables and graphs<br>interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions<br>present reasoned explanations, including explaining data in relation to predictions and hypotheses. | They use present observations and data using appropriate methods, including tables and graphs<br>They should be able to understand SI units and chemical Nomenclature. Students further develop their working scientifically skills in year 8.<br>Students have built on the theory learnt last year about the periodic table & atomic structure and understand that when different chemical reactions occur, atoms are rearranged in order for reactants to become products. Students are able to complete different experiments and understand the properties and reactivity of metals and non-metals. Students are able to carry out neutralisation reactions between acids and alkalis and understand their properties. |
| **Year 8 Physics** | Electricity Magnetism<br><br>Series and parallel circuits,Bar magnets and mag field lines, Different magnets and field strength,Making Electromagnet | n/a | Forces, gravity and the solar system | Numeracy<br>Measurement<br>1) Understand and use SI units<br>2) Use and derive simple equations and | In Year 8, we stretch the students' knowledge of Physics further and introduce them to the more demanding topics of Electricity, Magnetism and Electromagnetism. They will carry out practical work on how to build circuits and make |

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| | | | | carry out appropriate calculations<br>3) undertake basic data analysis including simple statistical techniques<br><br><u>Literacy</u><br>Analysis and evaluation interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions. | electromagnets. In the Forces chapter they will also learn about Gravity and Space. |
| **Year 7 Biology** | **Cells & Respiration**<br>1- Microscopy<br>2- Microscopy<br>3- Yeast investigation<br>4- Yeast investigation | N/A | **Plants & Ecosystems**<br>1- Seed germination and dispersal<br>2- Seed germination and dispersal<br>3- Sampling<br>4- Sampling | Numeracy<br>Literacy<br>Diversity<br>Science club<br><br>Working scientifically NC:<br>1. Scientific attitudes<br>2. Experimental skills and investigations<br>3. Analysis and evaluation<br>4. Measurement | Students will learn about different types of cells, how we study them, and how they release energy by respiration. They will also study how plants function, and how organisms work together in an ecosystem, including field studies.<br><br>Students will build upon their KS2 knowledge to further develop their scientific fluency. They will learn how to plan experiments, obtain evidence and interpret results. They will also learn how to use specialist science equipment and develop their analytical skills. |
| **Year 7 Chemistry** | Chemistry: 1. States of matter and Separating mixtures.<br><br>- Students develop conceptual understanding of particles and how scientists use models to explain solids, liquids and gases.<br>They study a number of separation techniques used in | Chemistry:<br>Periodic Table & Atomic Structure<br>1-Conservation of Mass<br>2- Conservation of Mass, Conductivity<br>3- Murder Mystery, Conductivity<br>4- Conservation of Mass | n/a | NC: The particulate nature of matter/ Atoms, elements and compounds/ Pure and impure substances.<br><br>Working scientifically NC:<br>1. Scientific attitudes | Students understand how to carry out experiments safely and have the fundamental skills needed to become a scientist. Students understand the properties of the states of matter and can describe how to carry out techniques for separating mixtures.<br>Periodic Table. Students understand that scientific methods |

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| | scientific laboratories. | | | 2. Experimental skills and investigations<br>3. Analysis and evaluation<br>4. Measurement<br>Science club<br><br>Diversity<br>How science research is Global involving people around the globe. | and theories developed as earlier explanations are modified to take account of new evidence and ideas. They are able to use appropriate equipment, techniques and material to do laboratory work while following health and safety guidelines. Students know the role of different scientists, atomic structure and can describe the changes that Mendeleev made when he developed the modern periodic table. |
| **Year 7 Physics** | N/A | **Energy & Heat Transfer**<br>Taking temperature, Expansion and contraction, Energy from fuels | **Waves**<br>Detection of sound<br>Light and colour | <u>Numeracy:</u><br>Measurement<br>undertake basic data analysis including simple statistical techniques<br><u>Literacy:</u><br>Analysis and evaluation<br>present observations and data using appropriate methods, including tables and graphs<br>interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions<br>Diversity<br>The challenges and differences faced by different countries and communities around the world in terms of access to enough energy to meet their needs. | This year lessons will primarily focus on introducing the key fundamental topics of forms of Energy and how heat energy is transferred. Students will also study waves and learn how light moves and changes as it travels through the universe. |

**KS4: Working Scientifically**

1. The development of scientific thinking
   - the ways in which scientific methods and theories develop over time
   - using a variety of concepts and models to develop scientific explanations and understanding
   - appreciating the power and limitations of science and considering ethical issues which may arise
   - explaining everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments
   - evaluating risks both in practical science and the wider societal context, including perception of risk
   - recognising the importance of peer review of results and of communication of results to a range of audiences

2. Experimental skills and strategies
   - using scientific theories and explanations to develop hypotheses
   - planning experiments to make observations, test hypotheses or explore phenomena
   - applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments
   - carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations
   - recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative
   - making and recording observations and measurements using a range of apparatus and methods
   - evaluating methods and suggesting possible improvements and further investigations

3. Analysis and evaluation
   - applying the cycle of collecting, presenting and analysing data, including:
     - presenting observations and other data using appropriate methods
     - translating data from one form to another
     - translating
     - carrying out and representing mathematical and statistical analysis
     - representing distributions of results and making estimations of uncertainty
     - interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions
     - presenting reasoned explanations, including relating data to hypotheses
     - being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error
   - communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations

4. Vocabulary, units, symbols and nomenclature
   - developing their use of scientific vocabulary and nomenclature
   - recognising the importance of scientific quantities and understanding how they are determined
   - using SI units and IUPAC chemical nomenclature unless inappropriate
   - using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano)
   - interconverting units
   - using an appropriate number of significant figures in calculations

**KS3: Working Scientifically**

1. Scientific attitudes
   - pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility
   - understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review
   - evaluate risks

2. Experimental skills and investigations
   - ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
   - make predictions using scientific knowledge and understanding
   - select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables
   - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety
   - make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements
   - apply sampling techniques

3. Analysis and evaluation
   - apply mathematical concepts and calculate results
   - present observations and data using appropriate methods, including tables and graphs
   - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
   - present reasoned explanations, including explaining data in relation to predictions and hypotheses
   - evaluate data, showing awareness of potential sources of random and systematic error
   - identify further questions arising from their results

4. Measurement
   - understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature
   - use and derive simple equations and carry out appropriate calculations
   - undertake basic data analysis including simple statistical techniques