BUDMOUTH ACADEMY WEYMOUTH

# Curriculum Statement - SCIENCE

| | |
|---|---|
| **Our Intent:** | |
| **What is the vision (big picture) for your subject?** | Our Science curriculum aims to equip students with a profound understanding of the world in which they live, fostering critical thinking, addressing misconceptions, and creating responsible citizens. |
| **What are the key concepts that underpin your subject?** | Biology; To understand living organisms, their interactions with the environment, and apply biological knowledge to improve human health and address global challenges. Chemistry; To foster a deep understanding of chemistry topics, build essential scientific skills, and inspire students to pursue further study in the field Physics; To demonstrate effective use of calculations and the calculation process |
| **Which key themes are repeated over time?** | In secondary science, students learn to plan investigations, identify variables, and use equipment safely and accurately. They record results, identify patterns, draw conclusions, and evaluate how reliable and accurate their methods were. Clear communication is important, so they're expected to use scientific vocabulary and explain their ideas clearly. Alongside this, they apply maths skills like using graphs, calculating values, and working with formulas, as well as thinking critically about unfamiliar data and real-world scientific claims. |
| **What knowledge and skills will students have at the end of each key stage?** | KS2 - asking questions, observing closely, performing simple tests, identifying and classifying, using observations to suggest answers, and gathering and recording data |
| | KS3 - developing a strong understanding of scientific inquiry, conducting investigations, analysing and interpreting data, and communicating scientific ideas effectively |
| | KS4 - the ability to design and conduct scientific investigations, analyse and interpret data, communicate scientific findings, and critically evaluate scientific information |
| | KS5 - developing advanced scientific understanding and analytical skills. Students build on their existing knowledge and apply it to new situations and problems, engaging in critical thinking, research, and data analysis |
| **Does your curriculum intent match or exceed the breadth of the National Curriculum/Subject specification?** | Our Science curriculum follows the National Curriculum and allows for breadth and greater depth of knowledge and skills, to ensure a well-rounded education that meets the needs of all pupils, including those with special educational needs, while also allowing for creativity and innovation. We will be using the summer term to upskill students in KS3 in preparation for KS4 practical skills and method writing. |
| **How do you ensure that learning is sequenced effectively over time in your subject?** | National Curriculum/Standards-Based Planning: We align learning with the national curriculum ensuring progression from concrete to abstract ideas.<br>Spiraling Structure: Concepts are revisited at increasing levels of complexity. For example, students might encounter cells in Year 7, revisit with microscopes and functions in Year 8, and then study mitosis and DNA in Year 9&10.<br>Build Conceptual Progression - We begin with core ideas (e.g., particle model, forces, ecosystems) before introducing higher-order applications (e.g., chemical reactions, Newton's laws, food webs).<br>Integrate Cognitive Science Principles - Spaced Retrieval: Key concepts and skills are revisited periodically (e.g., starter questions, low-stakes quizzes).<br>Interleaving: Mix related topics (e.g., energy and forces) so students learn to apply knowledge flexibly.<br>Cumulative Assessment: End-of-topic assessments include previous content to encourage long-term retention.<br>Scaffold Scientific Inquiry and Skills - Skill Progression: Practical skills like hypothesising, using equipment, graphing, and evaluating results are introduced step-by-step.<br>Use Assessment to Inform Sequencing - Formative Checks: Regular questioning and/or exit tickets and/or whitebaords to help identify misconceptions or gaps.<br>Connect Across Disciplines and Topics - Cross-topic Links: For example, I ensure students understand energy in physics (Yr 7) before discussing photosynthesis (Y9/10) or respiration (Yr 10) in biology.<br>Real-World Relevance: Sequencing is influenced by current events, seasonal opportunities (e.g., plant growth in spring), and interdisciplinary themes (e.g., sustainability). |
| **How have you decided what knowledge and skills you want students to learn in your subject?** | We have considered and reflected upon which skills (critical thinking, communication, independence) will best equip students for success in later life and science study. |
| **How do you plan to cater for cultural capital e.g. trips, visits, enrichment, careers, applied learning, real word application & power skills development?** | Educational trips and visits to science museums, research institutions, and local industries to expose students to real-world scientific environments and career paths. Careers talks and workshops with professionals from various scientific fields to inspire students and provide insight into STEM careers. Applied learning projects that connect scientific theory with real-life problems, encouraging practical problem-solving and innovation. Development of power skills like critical thinking, communication, collaboration, and resilience through group work, presentations, and reflective activities integrated into the curriculum. Trips - Winchester Science Centre (7) , GCSE Science Live (9 and 10), We the Curious (Proposed yr 8). |
| **What are your main instruments of the curriculum used to implement, deliver, and assess your curriculum effectively? (Materials should privilege thinking over task completion - memory is the residue of thought)** | The main methods we use, alongside other pedagogical methods, to make sure the students are thinking about the curriculum content are regular whole-class checking for understanding (using whiteboards), think pair share and cold calling. These methods also help the teacher to assess students understanding, address misconceptions and mastery. Other 'instruments' we use to help with the delivery of the curriculum are introducing concepts in small steps & chunking, modelling and scaffolding. |
| **How is homework used to encourage, enthuse and develop pupils' skills and understanding?** | KS3 -Yr 7 literacy homework , Seneca Learing provinding live feedback making science revision resources. Homework is linked to current and prior content, and is used to develop recall and scientific literacy.<br><br>KS4 - Interactive exam questions and Seneca Learning (promoting improved understanding through the videos) providing live feedback , regular in setting<br><br>KS5 - Promoting independent study through exam practice and students making regular revision resources. Approximately 1 hour independent study per 1 hour long lesson. Homeworks include literacy tasks aimed at broadening the students rounded knowledge of the subject area. |
| **How are you ensuring that each teacher has the requisite subject knowledge to teach effectively?** | Need to have subject specific CPD (not something we currently have). Learning walks and observations. Culture of collaboration. |
| **Our Implementation:** | |
| **What will we see when we drop into your subject lessons and why?** | Do now activity, check for understanding, (eg whiteboards and cold calling), Independent task, AFL (eg green pens, whiteboards etc). |
| **How do you adapt or tailor your curriculum to meet the needs of students with different starting points (KS2 data)?** | Some strategies regularly used within the department include: use of writing templates, scaffolded learning opportunites within the lesson, differentiated and probing questioning, use of think, pair, shares to scaffold and encourage participation, use of Do-now extension tasks & MWB to assess what students know early on in the lesson, using group work involving a stronger student and a weaker student in that area, setting by ability with STEM group. |
| **How do you stretch students who are high prior attainment?** | Use questioning to encourage students to elaborate and make links and deepen their critical thinking. For example, probing questioning. Linking to realife examples current/recent scientific advancements<br>Using relevant resources from the next key stage. Include synoptic tasks for example, exam questions that require them to link more than one concept. |
| **How do you support and scaffold (visual, verbal & written) for students who are SEND?** | Used when applicable; I do, we do, you do. Use of learning booklets with different levels of questions. Identifying students with SEND on seating plans. Teachers are aware of student needs. Learning objectives are outlined. Use of modeling when applicable to demonstrate thought process. Use of AFL techniques to establish understanding and re-shape the lesson when necessary. |
| **How do you support students who are disadvantaged?** | Identification on seating plans. Teachers aware of disadvantaged students. KS4 disadvantaged students are given revision guides in core subjects. KS3 and 4 are provided with learning booklets and knowledge organisers. |
| **Our Impact:** | |
| **How are you monitoring implementation in your subject area?** | I monitor implementation through a multi-layered approach to ensure consistency and quality across KS3 to KS5. This includes: Regular lesson observations and learning walks to check that teaching practices align with our curriculum goals and school policies. Reviewing teachers' lesson plans and schemes of work to confirm that curriculum changes are properly integrated and delivered. Analysing student performance data and assessment outcomes to identify trends and areas needing additional support or intervention. Holding scheduled departmental meetings to discuss progress, share best practices, and address any challenges with implementation. Gathering feedback from both staff and students to refine our teaching strategies and curriculum content continuously. This comprehensive monitoring allows us to maintain high standards and ensure that curriculum developments translate into effective classroom practice and improved student outcomes |
| **How do you check the rigour in planning and resourcing in your subject area?** | Scrutiny of lesson plans and schemes of work to ensure they are comprehensive, aligned with curriculum objectives, and differentiated to meet varied student needs. Cross-referencing resources with curriculum requirements to confirm all necessary materials, equipment, and digital tools are available and up to date. Regular audits of laboratory and classroom resources to guarantee safety standards and sufficiency for practical experiments and activities. Collaborative planning sessions with teachers to promote thorough preparation and share high-quality resources, ensuring consistency across year groups. Feedback mechanisms from teachers and students to identify gaps or areas where additional support or resources may be required. This approach ensures that planning is purposeful, challenging, and well-supported by the appropriate resources, fostering an engaging and effective learning environment |
| **How do you use assessment in your subject area?** | Monitor student progress continuously, allowing teachers to identify misconceptions and adjust instruction accordingly. Evaluate understanding and mastery of key scientific concepts at the end of units or terms through tests, practical tasks, and project work. Inform curriculum planning by analyzing assessment data to pinpoint areas where students struggle and adapting teaching sequences to address those gaps. Provide timely feedback to students to support their learning and help them set clear targets for improvement. Track long-term progress across KS3 to KS5 to ensure students are on track to meet or exceed expected standards and to prepare them for external exams. |
| **How do assessments identify gaps in students' knowledge and their ability to apply that knowledge fluently and accurately?** | Formative assessments such as quizzes, class discussions, and practical tasks provide immediate insights into students' understanding during lessons. This helps teachers spot misconceptions or partial understanding early. Targeted questioning and problem-solving exercises assess whether students can apply their knowledge fluently and accurately to new or complex scenarios, rather than just memorizing information. Analysis of assessment data highlights patterns where groups or individuals struggle, showing specific topics or skills that need reinforcement. Use of practical and inquiry-based assessments evaluates students' ability to carry out scientific methods and apply theoretical knowledge to real-world problems. Regular DIRT feedback sessions with students focus on areas needing improvement and encourage metacognition—helping students recognise their own learning gaps. |
| **How is knowledge remembered in your subject?** | Long-term knowledge retention is crucial for building understanding across KS3 to KS5. We support this through: Regular spaced retrieval practice, where students revisit key concepts and facts over time to strengthen memory. Cumulative assessments and quizzes that encourage students to recall previously learned material alongside new content. Use of concept maps and knowledge organisers to help students connect ideas and see the bigger picture. Practical applications and experiments that reinforce theoretical knowledge through hands-on experience, making learning more memorable. Encouraging metacognitive strategies such as self-quizzing and summarising to help students take ownership of their learning and identify gaps. |

BUDMOUTH ACADEMY WEYMOUTH
AN ASPIRATIONS ACADEMY

# Curriculum Overview: SCIENCE

| | | Autumn Term 1 | Autumn Term 2 | Spring Term 1 | Spring Term 2 | Summer Term 1 | Summer Term 2 |
|---|---|---|---|---|---|---|---|
| Year 7 | | **How Science Works**<br>Students explore how science helps us understand the world by learning to ask questions, make predictions, carry out investigations, and draw conclusions based on evidence.<br>**Cells**<br>Students discover that all living things are made of cells, learning about their structure, function, and how they work together to form tissues and organs. | **Particles**<br>Students learn that all substances are made of tiny particles, and explore how their arrangement and movement explain the properties of solids, liquids, and gases.<br>**Forces**<br>Students investigate how forces affect the movement and shape of objects, including contact and non-contact forces like friction, gravity, and magnetism. | **Body Systems**<br>Students explore how the human body works by learning about key systems such as the circulatory, respiratory, and digestive systems, and how they work together to keep us alive.<br>**Atoms and the Periodic Table**<br>Students are introduced to atoms as the basic building blocks of matter and learn how the Periodic Table helps us organize and understand different elements. | **Energy**<br>Students learn what energy is, how it can be transferred or transformed, and explore different types of energy like heat, light, and kinetic energy. | **Chemical Reactions**<br>Students investigate how substances can change during chemical reactions, learn to spot the signs of a reaction, and understand the difference between physical and chemical changes. | **Reproduction**<br>Students study how living things reproduce, including human puberty, the structure and function of reproductive systems, and life cycles in animals and plants.<br>**Sound**<br>Students learn how sound is made by vibrations, how it travels through different materials, and how we hear and measure it. |
| Year 8 | | **Chemical Reactions**<br>Students investigate how substances interact to form new materials, explore evidence of chemical change, and learn to represent reactions using word and symbol equations.<br>**Light**<br>Students explore how light travels, how it reflects and refracts, and how we see objects and colours through the behaviour of light rays. | **Body Systems & Biological Processes**<br>Students build on their understanding of the human body by studying processes like respiration, digestion, and circulation, and how these systems work together to keep us healthy.<br>**Plants and Photosynthesis**<br>Students learn how plants make their own food through photosynthesis, the role of sunlight, water, and carbon dioxide in this process, and why plants are essential for life on Earth. | **Metals and Materials**<br>Students learn about the properties of metals and other materials, how they're used in everyday life, and how chemical reactions can change or combine them.<br>**Motion and Pressure**<br>Students explore how objects move and the forces involved, including how pressure is created and its effects in gases, liquids, and solids. | **Inheritance**<br>Students discover how traits are passed from parents to offspring, including the role of genes, DNA, and variation in living organisms.<br>**Sound**<br>Students deepen their understanding of sound as a type of energy made by vibrations, exploring how it travels, how we hear it, and how it's used in technology. | **The Earth**<br>Students investigate Earth's structure, the rock cycle, and how natural processes like erosion, weathering, and plate movement shape our planet over time.<br>**Electricity**<br>Students learn how electric circuits work, including current, voltage, resistance, and how electricity powers devices in the real world. | **Magnetism**<br>Students explore magnetic forces, fields, and how magnets interact with materials, as well as how magnetism links to electricity in electromagnets and motors.<br>**Space**<br>In this topic, students explore the structure of the Solar System, the movement of celestial bodies, and how these movements cause phenomena such as day and night, seasons, and phases of the Moon |
| Year 9 | | **Cell Structures**<br>Students explore the structure and function of prokaryotic and eukaryotic cells, learning how key components like the nucleus, mitochondria, ribosomes, and cell membranes support life processes.<br>**Atomic structure**<br>Students explore the structure of atoms, including protons, neutrons, and electrons, and learn how atomic number, mass number, and isotopes help explain the properties of elements.<br>**Molecules and Matter**<br>Students study the particle model of matter, learning how molecules behave in solids, liquids, and gases, and how changes in temperature and pressure affect their state and movement. | **Cell Division**<br>Students learn how cells reproduce through processes like mitosis, understanding its role in growth, repair, as well as the importance of maintaining genetic stability.<br>**The Periodic Table**<br>Students learn how elements are organized in the periodic table based on their atomic number and properties, and how this arrangement helps predict the behaviour and reactivity of different elements.<br>**Energy Conservation and Dissipation**<br>Students learn that energy can be transferred usefully, stored, or dissipated, but is always conserved overall, and explore how energy dissipation leads to less efficient systems. | **Cellular Transport**<br>Students explore how substances move in and out of cells through processes like diffusion, osmosis, and active transport, and understand how these mechanisms maintain cellular balance.<br>**Rates of reaction**<br>Students investigate how factors such as temperature, concentration, surface area, and catalysts affect the speed of chemical reactions and learn how to measure and interpret reaction rates.<br>**Energy Transfer by Heating**<br>Students explore how energy is transferred through conduction, convection, and radiation, and learn how these processes affect temperature changes in solids, liquids, and gases. | **Plant Structures and Photosynthesis**<br>Students study the key structures of plants, such as roots, stems, and leaves, and learn how photosynthesis in chloroplasts converts light energy into chemical energy to produce glucose and oxygen.They also explore factors that affect the rate of photosynthesis, including light intensity, carbon dioxide concentration, and temperature.<br>**Rates of reaction**<br>Students investigate how factors such as temperature, concentration, surface area, and catalysts affect the speed of chemical reactions and learn how to measure and interpret reaction rates.<br>**Energy Resources**<br>Students investigate different sources of energy, including renewable and non-renewable resources, and consider their advantages, disadvantages, and environmental | **Digestive System**<br>Students learn how the human digestive system breaks down food into nutrients through mechanical and chemical processes, and how these nutrients are absorbed into the bloodstream to provide energy and support growth.<br>**Quantitative Chemistry**<br>Students learn how to use chemical equations and calculations to determine the amounts of reactants and products, including concepts like moles, relative formula mass, and percentage composition.<br>**Electrical Circuits**<br>Students learn how electrical circuits work by studying components like cells, resistors, and switches, and explore how current, voltage, and resistance affect circuit behaviour. | **Enzymes**<br>Students explore how enzymes act as biological catalysts to speed up chemical reactions in the body, including factors that affect enzyme activity such as temperature and pH.<br>**Energy Changes in Reactions**<br>Students learn how chemical reactions can release energy (exothermic) or absorb energy (endothermic), and how to represent these changes using energy profiles.<br>**Electricity in the Home**<br>Students explore how electrical energy is supplied and used safely in homes, including the role of circuits, fuses, circuit breakers, and the importance of electrical safety. |
| Combined GCSE | Year 10 | **Cardiovascular and Respiratory Systems**<br>Students study how the cardiovascular system transports oxygen, nutrients, and waste products through the blood, while the respiratory system enables gas exchange, bringing oxygen into the body and removing carbon dioxide.<br>**Structure and Bonding - Ionic & Covalent**<br>Students learn how atoms bond together by transferring or sharing electrons to form ionic and covalent bonds, and how these bonding types affect the properties of substances.<br>**Radioactivity**<br>Students learn about the spontaneous decay of unstable atomic nuclei, the types of radiation emitted (alpha, beta, gamma), and the properties, risks, and uses of radioactive materials. | **Respiration**<br>Students learn how cells release energy from glucose through aerobic and anaerobic respiration, understanding the chemical reactions involved and the importance of respiration for all living organisms.<br>**Structure and Bonding - Covalent and Metallic**<br>Students explore how metal atoms bond by sharing a 'sea of electrons,' which explains properties like conductivity, malleability, and high melting points in metals.<br>**Forces in Balance**<br>Students explore how balanced and unbalanced forces affect the motion of objects, learning to calculate resultant forces and understand equilibrium in everyday situations. | **Communicable and Non-Communicable Diseases**<br>Students understand the differences between communicable diseases, which are caused by pathogens and can be spread between individuals, and non-communicable diseases, which are long-term conditions often linked to lifestyle or genetics.<br>**Chemical Changes**<br>Students learn how chemical changes involve the formation of new substances with different properties, and how to identify evidence of these changes such as color change, gas production, or temperature change. Students explore the reactions between acids and metals, acids and alkalis, and learn how to identify acids and alkalis using pH scale, as well as understand neutralization and salt formation.<br>**Motion**<br>Students study how objects move by analysing speed, velocity, acceleration, and the effects of forces, using graphs and calculations to describe motion. | **Preventing Disease**<br>Students learn about ways to prevent the spread of diseases, including vaccination, hygiene practices, quarantine, and lifestyle choices that reduce risk factors.<br>**Electrolysis**<br>Students investigate how electrolysis uses an electric current to break down ionic compounds into their elements, learning about the roles of electrodes, electrolytes, and the movement of ions.<br>**Forces and Motion**<br>Students investigate how forces influence the movement of objects, including concepts like acceleration, friction, and Newton's laws of motion, to understand and predict changes in motion. | **Treating Disease**<br>Students explore different methods used to treat diseases, including the use of medicines like antibiotics and antivirals, the development of vaccines, and the role of the immune system in fighting infections.<br>**Crude oil and Fuels**<br>Students learn that crude oil is a mixture of hydrocarbons that can be separated by fractional distillation into fuels and other useful products, and explore how these fuels are used and their impact on the environment.<br>**Waves**<br>Students learn about the properties and behaviour of waves, including transverse and longitudinal waves, wave speed, frequency, wavelength, and how waves transfer energy without transferring matter. | **Coordination and Control**<br>Students learn how organisms use the nervous and hormonal systems to detect and respond to changes in their environment, maintaining internal balance through coordinated actions.<br>**Energy Changes**<br>Students learn how chemical reactions can release energy (exothermic) or absorb energy (endothermic), and how to represent these changes using energy profiles.<br>**Properties of Waves**<br>Students explore key wave properties such as amplitude, wavelength, frequency, period, and speed, and learn how these relate to the energy and behaviour of different types of waves. |
| | Year 11 | **Reproduction and Inheritance**<br>Students learn about sexual and asexual reproduction, the structure and role of DNA, and how genetic information is inherited and expressed, including the principles of dominant and recessive alleles.<br>**Crude Oil and Fuels, Calculations in Chemistry Recap**<br>Students learn that crude oil is a finite resource made of hydrocarbons, which can be separated by fractional distillation into useful fuels, and explore how combustion of these fuels impacts the environment.<br>Students learn how to use chemical equations and calculations to determine the amounts of reactants and products, including concepts like moles, relative formula mass, and percentage composition.<br>**Electromagnetism**<br>Students explore how electric currents produce magnetic fields, how electromagnets work, and the principles behind devices like motors and generators. | **Variation and Evolution**<br>Students explore how genetic and environmental factors cause variation within a species, and how natural selection and mutation contribute to the evolution of new species over time.<br>**Earth's Atmosphere**<br>Students learn about the evolution of Earth's atmosphere, the composition of gases today, and how human activities contribute to climate change through increasing levels of greenhouse gases.<br>**Electromagnetism**<br>Students explore how electric currents produce magnetic fields, how electromagnets work, and the principles behind devices like motors and generators. | **Ecosystems**<br>Students study how organisms interact with each other and their environment, exploring concepts such as food chains, predator-prey relationships, competition, and the impact of human activity on biodiversity.<br>**Earths Resources and Chemical Analysis**<br>Students learn how natural resources are used to provide energy, materials, and clean water, and explore sustainable methods such as recycling, water purification, and life cycle assessments to reduce environmental impact.Students study techniques used to identify substances, such as chromatography.<br>**Radioactivity Revision**<br>Students learn about the spontaneous decay of unstable atomic nuclei, the types of radiation emitted (alpha, beta, gamma), and the properties, risks, and uses of radioactive materials. | **Human Impact on the Environment**<br>Students examine how human activities such as deforestation, pollution, and global warming affect ecosystems and biodiversity, and explore strategies for sustainable development and environmental protection.<br>**Chemical Equilibrium & Electrolysis Revision**<br>Students learn that reversible reactions can reach a state of dynamic equilibrium, where the forward and backward reactions occur at the same rate, and understand how changing conditions (temperature, pressure, concentration) can shift the equilibrium position according to Le Chatelier's Principle.<br>Students explore how electrolysis uses electrical energy to decompose ionic compounds into their elements, identifying the products formed at the electrodes and applying this process to real-world examples like metal extraction and electroplating.<br>**Energy and Electrical Circuits Revision**<br>Students explore how energy is transferred and conserved in physical systems, and learn how electrical circuits function through key concepts like current, potential | **Paper 1 Revision / Exams**<br>Students revise key topics including cell biology, organisation of organisms, infection and response, and bioenergetics, focusing on fundamental biological concepts and processes.<br><br>Students review foundational chemistry topics including atomic structure, the periodic table, bonding and structure, quantitative chemistry, chemical changes, and energy changes—focusing on understanding core principles, chemical reactions, and calculations.<br><br>Students review core topics including energy transfers and conservation, electricity and circuits, particle model of matter, and atomic structure and radioactivity—focusing on key principles, calculations, and practical applications required for Paper 1 | **Paper 2 Revision / Exams**<br>Students review topics such as homeostasis and response, inheritance, variation and evolution, and ecology, emphasizing systems, genetics, and environmental interactions.<br><br>Students revise more advanced and applied chemistry topics such as the rate and extent of chemical change, organic chemistry, chemical analysis, Earth's atmosphere and resources, and the impact of chemistry on the environment and sustainability.<br><br>Students review key topics including forces and motion, waves, magnetism and electromagnetism, and space physics, focusing on understanding physical principles, interpreting data, and applying concepts to real-world contexts. |
| Separate GCSE | Year 10 | **Cardiovascular and Respiratory Systems**<br>Students study how the cardiovascular system transports oxygen, nutrients, and waste products through the blood, while the respiratory system enables gas exchange, bringing oxygen into the body and removing carbon dioxide.<br>**Quantitative Chemistry,**<br>Students learn how to use chemical equations and calculations to determine the amounts of reactants and products, including concepts like gas volume, atom economy and percentage yield<br>**Structure and Bonding - Ionic**<br>Students study how ions form through the transfer of electrons between metals and non-metals, creating ionic bonds that hold compounds together, and how this type of bonding affects their properties<br>**Radioactivity**<br>Students learn about the spontaneous decay of unstable atomic nuclei, the types of radiation emitted (alpha, beta, gamma), and the properties, risks, and uses of radioactive | **Respiration**<br>Students learn how cells release energy from glucose through aerobic and anaerobic respiration, understanding the chemical reactions involved and the importance of respiration for all living organisms.<br>**Structure and Bonding - Covalent and Metallic**<br>Students explore how metal atoms bond by sharing a 'sea of electrons,' which explains properties like conductivity, malleability, and high melting points in metals.<br>**Forces in Balance**<br>Students explore how balanced and unbalanced forces affect the motion of objects, learning to calculate resultant forces and understand equilibrium in everyday situations. | **Communicable and Non-Communicable Diseases**<br>Students understand the differences between communicable diseases, which are caused by pathogens and can be spread between individuals, and non-communicable diseases, which are long-term conditions often linked to lifestyle or genetics.<br>**Transition Metals**<br>Students study the properties of transition metals, including their ability to form coloured compounds, and their uses as catalysts<br>**Motion**<br>Students study how objects move by analysing speed, velocity, acceleration, and the effects of forces, using graphs and calculations to describe motion. | **Preventing Disease**<br>Students learn about ways to prevent the spread of diseases, including vaccination, hygiene practices, quarantine, and lifestyle choices that reduce risk factors.<br>**Chemical Changes / Titrations**<br>Students learn how chemical changes involve the formation of new substances with different properties, and how to identify evidence of these changes such as color change, gas production, or temperature change. Students explore the reactions between acids and metals, acids and alkalis, and learn how to identify acids and alkalis using pH scale, as well as understand neutralization and salt formation.<br>**Forces and Motion**<br>Students investigate how forces influence the movement of objects, including concepts like acceleration, friction, and Newton's laws of motion, to understand and predict changes in motion. | **Treating Disease**<br>Students explore different methods used to treat diseases, including the use of medicines like antibiotics and antivirals, the development of vaccines, and the role of the immune system in fighting infections.<br>**Electrolysis**<br>Students investigate how electrolysis uses an electric current to break down ionic compounds into their elements, learning about the roles of electrodes, electrolytes, and the movement of ions.<br>**Waves**<br>Students learn about the properties and behaviour of waves, including transverse and longitudinal waves, wave speed, frequency, wavelength, and how waves transfer energy without transferring matter. | **Coordination and Control**<br>Students learn how organisms use the nervous and hormonal systems to detect and respond to changes in their environment, maintaining internal balance through coordinated actions.<br>**Fuel Cells**<br>Students study how fuel cells generate electricity through chemical reactions, typically using hydrogen and oxygen, as an efficient and clean energy source.<br>**Properties of Waves**<br>Students explore key wave properties such as amplitude, wavelength, frequency, period, and speed, and learn how these relate to the energy and behaviour of different types of waves. |
| | Year 11 | **Reproduction and Inheritance**<br>Students learn about sexual and asexual reproduction, the structure and role of DNA, and how genetic information is inherited and expressed, including the principles of dominant and recessive alleles.<br>**Crude Oil & Fuels**<br>Students learn that crude oil is a finite resource made of hydrocarbons, which can be separated by fractional distillation into useful fuels, and explore how combustion of these fuels impacts the environment.<br>**Electromagnetism**<br>Students explore how electric currents produce magnetic fields, how electromagnets work, and the principles behind devices like motors and generators. | **Variation and Evolution**<br>Students explore how genetic and environmental factors cause variation within a species, and how natural selection and mutation contribute to the evolution of new species over time.<br>**Organic Reactions and Polymers**<br>Students explore the reactions of hydrocarbons such as alkenes, alcohols, and carboxylic acids, and learn how polymers are formed from monomers through addition and condensation polymerisation.<br>**Electric Motors & Magnetism**<br>Students learn how electric motors use magnetic fields and electric currents to create rotational motion, applying the interaction between magnetic forces and current-carrying conductors. | **Ecosystems**<br>Students study how organisms interact with each other and their environment, exploring concepts such as food chains, predator-prey relationships, competition, and the impact of human activity on biodiversity.<br>**Earth's Resources**<br>Students learn how natural resources are used to provide energy, materials, and clean water, and explore sustainable methods such as recycling, water purification, and life cycle assessments to reduce environmental impact.<br>**Space Physics**<br>Students explore the solar system, including the properties and motion of planets, moons, and satellites, as well as concepts like gravity, orbits, and the life cycle of stars. | **Human Impact on the Environment**<br>Students examine how human activities such as deforestation, pollution, and global warming affect ecosystems and biodiversity, and explore strategies for sustainable development and environmental protection.<br>**Chemical Analysis and Chemical Equilibria**<br>Students study techniques used to identify substances, such as chromatography and spectroscopy, and learn how reversible reactions reach equilibrium, including factors that affect the position of equilibrium. | **Paper 1 Revision / Exams**<br>Students revise key topics including cell biology, organisation of organisms, infection and response, and bioenergetics, focusing on fundamental biological concepts and processes.<br><br>Students review foundational chemistry topics including atomic structure, the periodic table, bonding and structure, quantitative chemistry, chemical changes, and energy changes—focusing on understanding core principles, chemical reactions, and calculations.<br><br>Students review core topics including energy transfers and conservation, electricity and circuits, particle model of matter, and atomic structure and radioactivity—focusing on key principles, calculations, and practical applications | **Paper 2 Revision / Exams**<br>Students review topics such as homeostasis and response, inheritance, variation and evolution, and ecology, emphasizing systems, genetics, and environmental interactions.<br><br>Students revise more advanced and applied chemistry topics such as the rate and extent of chemical change, organic chemistry, chemical analysis, Earth's atmosphere and resources, and the impact of chemistry on the environment and sustainability.<br><br>Students review key topics including forces and motion, waves, magnetism and electromagnetism, and space physics, focusing on understanding physical principles, interpreting data, and applying concepts to real-world |
| A Level Biology | Year 12 | **Foundations in Biology (Cells / Biological Molecules)**<br>Students explore the fundamental principles of biology, including cell structure, biomolecules, and the scientific method underpinning biological research. | **Biological Membranes**<br>Students study the structure and function of cell membranes, focusing on membrane permeability, transport mechanisms like diffusion and active transport, and membrane proteins. | **Exchange and Transport**<br>Students investigate how substances move into and out of cells and across organisms, covering gas exchange, circulatory systems, and adaptations for efficient transport. | **Transport in Animals**<br>In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants<br>**Disease**<br>Communicable Disease, Disease prevention and the Immune System<br>Defence against pathogenic infections and the role of modern medicine | **Transport in Plants**<br>In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants<br>**Evolution -** Classifiaction and Evolution<br>Understand that all organisms share a common ancestor, as our understanding of organisms has developed so have the classification systems used. | **Transport in Plants**<br>In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants<br>**Biodiversity**<br>The study of the variety and complexity of life, maintaining biodiversity is important for many reasons.Actions to maintain biodiversity must be taken at local, national and global levels |
| | Year 13 | **Respiration**<br>Studnents learn that respiration is the process whereby energy stored in complex organic molecules is transferred to ATP.ATP provides the immediate source of energy for biological processes<br>**Communication and Homeostasis**<br>Students learn about cellular respiration as the process of energy release and examine homeostatic mechanisms that maintain internal stability in organisms. | **Photosynthesis**<br>Students study the light-dependent and light-independent reactions of photosynthesis, understanding how plants convert light energy into chemical energy.<br>**Endocrine System**<br>Students explore how hormones regulate physiological processes, focusing on the endocrine glands, hormone action, and feedback mechanisms in the body. | **Plant Hormones**<br>Students examine the role of plant hormones in growth, development, and responses to environmental stimuli, including auxins, gibberellins, and ethylene.<br>**Hormonal Communication**<br>Students explore how hormones regulate physiological processes, focusing on the endocrine glands, hormone action, and feedback mechanisms in the body. | **Cloning and Biotechnology, Ecosystems**<br>Students study techniques used to clone organisms and manipulate biological systems for applications in medicine, agriculture, and industry.<br>Students explore how living organisms interact with each other and their environment, including energy flow, nutrient cycles, and factors affecting biodiversity.<br>**Neuronal Communications, Cellular Control and Inheritance**<br>Students explore how nerve impulses are generated and transmitted, how cells regulate gene expression and respond to stimuli, and how genetic information is inherited, expressed, and leads to variation | **Exams and Revision** | **Exams and Revision** |
| A Level Chemistry | Year 12 | **Foundations in Chemistry**<br>Students review fundamental concepts including atomic theory, the mole concept, chemical calculations, and the basics of bonding and structure.<br>**Atomic Structure & Bonding**<br>Students explore the arrangement of electrons in atoms, different types of chemical bonding (ionic, covalent, metallic), and how bonding influences the properties of substances. | **Acids, Bases and Neutralisation**<br>Students explore the properties of acids and bases, the concept of proton transfer, and the principles of neutralisation reactions, including the use of titrations to determine concentrations.<br>**Periodicity**<br>Students explore the repeating trends in the physical and chemical properties of elements across periods and down groups in the periodic table, with a focus on atomic structure, ionisation energies, and bonding. | **Nomenclature**<br>Students study the systematic naming of organic and inorganic compounds, focusing on IUPAC conventions, functional groups, and the structure-property relationships of molecules.<br>**Redox Reactions**<br>Students study oxidation-reduction processes, including electron transfer, oxidation states, redox equations, and their applications in chemical reactions. | **Isomerism**<br>Students study different types of isomers—including structural and stereoisomers—and explore how molecular structure influences physical and chemical properties.<br>**Qualitative Analysis**<br>Students study techniques used to identify ions and compounds through test-tube reactions, including tests for anions, cations, gases, and functional groups. | **Rates of Reaction & Enthalpy**<br>Students investigate factors affecting reaction rates, such as temperature, concentration, surface area, and catalysts, and learn how to measure and interpret reaction kinetics.<br>**Reaction Mechanisms**<br>Students study reaction mechanisms to understand the step-by-step sequence of bond-making and bond-breaking processes in chemical reactions, including nucleophilic substitution, electrophilic addition, and elimination reactions | **Equilibrium**<br>Students study dynamic equilibrium in reversible reactions, Le Chatelier's principle, and how changes in conditions affect equilibrium position and yield, with applications in industrial processes<br>**Instrumental Analysis**<br>Students study advanced techniques such as mass spectrometry, infrared spectroscopy, and NMR spectroscopy to identify and analyse the structure of organic and inorganic compounds. |
| | Year 13 | **Rates of Reaction**<br>Students investigate factors affecting reaction rates, such as temperature, concentration, surface area, and catalysts, and learn how to measure and interpret reaction kinetics.<br>**Benzene**<br>Students study the structure, stability, and reactions of benzene, including electrophilic substitution mechanisms and the concept of aromaticity. | **Making Aspirin**<br>Students study the synthesis of aspirin through esterification, explore reaction conditions, purification techniques such as recrystallisation, and analytical methods including melting point determination and spectroscopy to assess purity<br>**Equilibria and pH**<br>Students study the principles of acid-base chemistry, including pH calculations, buffer solutions, and the dynamic nature of chemical equilibria, exploring how changes in conditions affect equilibrium positions | **Electrochemistry & Transition Metals**<br>Students study the principles of electrochemistry including redox reactions, electrode potentials, and electrochemical cells, alongside the properties, reactions, and applications of transition metals and their complexes.<br>**Organic Reactions (1)**<br>Students study the structure, properties, and reactions of organic compounds, including mechanisms, functional groups, and synthesis methods | **Oxidation Reactions (II) & Qualitative Analysis**<br>Students study the structure, properties, and reactions of organic compounds, including mechanisms, functional groups, and synthesis methods<br>Students study qualitative analysis techniques to identify functional groups such as aldehydes, including their chemical tests and characteristic reactions<br>**Lattice Enthalpy**<br>Students study how lattice enthalpy measures the energy change when one mole of an ionic solid is formed from its gaseous ions, exploring factors that affect lattice strength and its impact on properties like melting point and solubility | **Exams and Revision** | **Exams and Revision** |
| A Level Physics | Year 12 | **Physical Quantities & Motion**<br>Students study the fundamental physical quantities, how to measure and represent them, and analyze motion through concepts like displacement, velocity, acceleration, and the use of kinematic equations<br>**Charge**<br>Students study the concept of electric charge, including the properties of charge, conservation of charge, and how charged particles interact through forces and fields | **Electrical Circuits**<br>Students study the principles of electrical circuits, including current, voltage, resistance, and how components like resistors and power supplies affect circuit behavior and energy transfer<br>**Dynamics**<br>Students study the principles of motion, including forces, acceleration, and Newton's laws, to understand how and why objects move. | **Density**<br>Students study the concept of density as mass per unit volume, how to calculate it, and its applications in understanding the properties and behavior of different materials<br>**Fundamental Particles**<br>Students study the basic building blocks of matter, including quarks, leptons, and force carriers, and explore how these particles interact to form the universe | **Materials**<br>Students study the physical properties of materials, including stress, strain,Young's modulus, and the behavior of different materials under forces, to understand how materials deform and fail | **Waves**<br>Students study the properties and behavior of waves, including types of waves, wave characteristics, superposition, interference, and how waves transfer energy through different media. | **Quantum Physics**<br>Students study the particle nature of light and matter, exploring concepts like photons, energy quantization, wave-particle duality, and the principles underlying atomic and nuclear phenomena |
| | Year 13 | **Thermal Physics**<br>Students study the concepts of temperature, heat transfer, internal energy, and the behavior of gases, including how energy is stored and transferred in thermal systems<br>**Gravitational fields**<br>Students study the properties and effects of gravitational fields, including gravitational force, potential, field strength, and the motion of objects under gravity, both near Earth and in space<br>**Circular Motion**<br>Students study the dynamics of objects moving in circular paths, including centripetal force, acceleration, and the relationships between angular velocity, frequency, and period<br>**Oscillations**<br>Students study the principles of simple harmonic motion, including oscillation characteristics, energy transformations, damping, and resonance in physical systems | **Capacitors**<br>Students study how capacitors store and release electrical energy, exploring concepts like capacitance, charging and discharging circuits, and energy stored in electric fields<br>**Astrophysics and Cosmology**<br>Students study the structure and evolution of stars, galaxies, and the universe, including key concepts like stellar lifecycles, the Big Bang theory, dark matter, and cosmic expansion. | **Magnetic Fields**<br>Students study the properties and effects of magnetic fields, including the forces on moving charges, electromagnetic induction, and applications such as electric motors and generators<br>**Electric Fields**<br>Students study the properties and effects of electric fields, including field strength, electric potential, forces on charges, and the behavior of charges in uniform and radial fields | **Nuclear and Particle Physics**<br>Students study the structure of atomic nuclei, fundamental particles, radioactive decay, and the forces and interactions that govern nuclear processes<br>**Medical Imaging**<br>Students explore the principles and applications of medical imaging techniques, such as X-rays, MRI, and ultrasound, which use radiation and waves to visualise the human body | **Exams and Revision** | **Exams and Revision** |
| Applied Science BTEC | Year 12 | **Physics – Electricity and Circuits:**<br>Students study electrical concepts including current, voltage, resistance, circuit components, and how circuits function and are analysed<br>**Biology – Ecology and Microscopy:**<br>Students explore ecosystems, interactions between organisms and their environment, and the use of microscopes to study cells and microorganisms. | **Chemistry – Reacting Masses, Titrations, and Bonding:**<br>Students study how to calculate reacting masses, perform titrations to determine concentrations, and understand the types and properties of chemical bonds.<br>**Physics – Radioactivity:**<br>Students explore the nature of radioactivity, types of radioactive decay, and the effects and uses of radiation.<br>**Biology – Photosynthesis:**<br>Students investigate the process of photosynthesis, including how plants convert light energy into chemical | **Chemistry - Rates of Reaction & Enthalpy:**<br>Students study the factors affecting reaction rates and the energy changes involved in chemical reactions, focusing on enthalpy changes and reaction mechanisms.<br>**Biology - Biochemistry:**<br>Students explore the chemical processes within living organisms, including the structure and function of biomolecules like proteins, carbohydrates, lipids, and nucleic acids. | **Exam Revision and NEA** | **NEA** | **NEA** |
| | Year 13 | **Investigating Science - NEA**<br>Learners will be provided with an opportunity to undertake the role of a research scientist, following standard procedures<br>to complete a scientific investigation. The unit is designed to enable learners to demonstrate and extend their scientific knowledge and skills. Learners may choose one investigation from the list of titles or alternatively learners may choose their own investigation in consultation with their tutor. | | **Unit 4 - Human Body**<br>Students explore how understanding the structure and function of the human body helps in diagnosing and treating common health conditions<br>**Microbiology**<br>Learners will develop their knowledge and understanding of key microbiological concepts and techniques used when working in biotechnological industries. | | **Exams and Revision** | **Exams and Revision** |