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Curriculum Overview: Science

Principles and Purpose of the Science Curriculum

The purpose of the science curriculum is to create rational, analytical thinkers who can use scientific knowledge to make good decisions, particularly concerning their health (e.g. by understanding medical advice), their homes (e.g. appreciating how to improve energy efficiency) and wider society (e.g. how best to manage the environment). Knowledge of science, and the scientific method, enables them to be scientifically informed citizens, but it also serves as the foundation for a career in science, or for careers that require some scientific understanding. In addition, we learn science because knowledge is an intrinsic good, and it is only by knowing more science that we can fully appreciate, and make sense of our place, in the universe.

Why this, why now?

In the science curriculum, we have several vertical concepts that appear in different units over the course of both Key Stage 3 and 4. The tables at the end of this document show all these vertical concepts. The overview below explains the curriculum choices we have made, based on these concepts, and why the units have been placed in the order we have chosen.

In KS3, each unit has a code, which specifies the year in which it will be assessed in the United Learning end of year exams, the subject, and the unit title e.g., 7PF- Year 7 Physics Forces.

Biology topic

Chemistry topic

Physics topic



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| Term 1 | Autumn 1 | Why this, why now? | Autumn 2 | Why this, why now? |
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| Year 7 Autumn 1 and 2 | 7CP Particles 7BC Cells, Tissues, and Organs | <p>Students learn about the particle model, diffusion, changes of state, gas pressure and separation techniques. This is the first unit because an understanding of particle behaviour is fundamental to all three sciences.</p> <p>Students apply their knowledge of particles to explain how substances move in and out of cells. They learn about plant and animal cell structure through microscopy, and how cells work together to form more complex tissues and organ systems.</p> | 7PE Energy 7BR- Reproduction | <p>Students deepen their understanding of energy transfers through heating, as well as from one store to another. They begin to calculate power, electricity costs, and evaluate the pros and cons of energy.</p> <p>Students deepen their understanding of sexual reproduction, foetal development, birth, growth, puberty, variation, and reproduction in plants</p> |
| Year 8 Autumn 1 and 2 | 8CP The periodic table 8PL Light and space | <p>Students will learn about elements and their properties and relate this to the atomic model. They will learn how elements form compounds through chemical reactions.</p> <p>Students will consolidate their understanding of how light</p> | 8PL Light and space | <p>Students will consolidate their understanding of how light travels, and how the eye works to allow us to see images and color. The intensity of light is linked to seasons and the Earth's place in the solar system. The force of gravity is introduced.</p> |



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| | | <p>travels, and how the eye works to allow us to see images and color. The intensity of light is linked to seasons and the Earth's place in the solar system. The force of gravity is introduced.</p> <p>Students deepen their knowledge of series and parallel circuits, potential difference, resistance, insulators, static electricity, magnetic fields, and electromagnets.</p> | <p>8PE Electricity and magnetism</p> <p>8CM Materials and the earth</p> | <p>Students deepen their knowledge of series and parallel circuits, potential difference, resistance, insulators, static electricity, magnetic fields, and electromagnets.</p> <p>Students deepen their understanding of the Earth's structure, rock and fossil formation, fossil fuels, the greenhouse effect and global warming, and the recycling of resources.</p> |
| <p>Year 9</p> <p>Autumn 1 and 2</p> | <p>9CE Energetics and rates</p> <p>9PS Sound</p> | <p>Students consolidate their knowledge on measuring the rate of a reaction and which factors can affect this. They deepen their knowledge of energy changes during a reaction and investigate examples of these.</p> <p>Students deepen their knowledge of sound waves and how they propagate, how we hear, how microphones and speakers work to capture and produce waves, and the uses of ultrasound.</p> | <p>9BB Biological systems and processes</p> <p>B1- Cell biology</p> | <p>Students deepen their knowledge of the skeletal, muscular, and respiratory systems. They then look at the effects of smoking, alcohol and drugs on health. They finish by consolidating their knowledge of DNA and inheritance.</p> <p>Students deepen their understanding of cell structures, specialized cells and how substances move in and out of cells. They learn about cell division and stem cells. Triple science students learn about culturing micro-organisms.</p> |



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| | <p>9BB Biological systems and processes</p> <p>B1- Cell biology</p> | <p>Students deepen their knowledge of the skeletal, muscular, and respiratory systems. They then look at the effects of smoking, alcohol and drugs on health. They finish by consolidating their knowledge of DNA and inheritance.</p> <p>Students deepen their understanding of cell structures, specialized cells and how substances move in and out of cells. They learn about cell division and stem cells. Triple science students learn about culturing micro-organisms.</p> | <p>C1- Atomic structure and the periodic table</p> <p>P1- Energy</p> | <p>Students deepen their understanding of the structure of atoms, and how their electronic structures influence their reactions, and how scientific theory developed to give us the model of the atom today. Students will also investigate the development of the periodic table and focus on groups 1, 7 and 0, linking their structure to properties and tying back in with the organisation of elements in the periodic table.</p> <p>Students deepen their understanding of energy transfers, calculations involving energy, reducing wasted energy, and the pros and cons of energy resources. Triple science students will also cover thermal insulators.</p> |
| <p>Year 10</p> <p>Autumn 1 and 2</p> | <p>B2 Organisation</p> | <p>Students deepen their understanding of nutrients in foods, how to test for them and the role of enzymes in digestion. They deepen their understanding of the respiratory and circulatory</p> | <p>B2 Organisation</p> | <p>Students deepen their understanding of nutrients in foods, how to test for them and the role of enzymes in digestion. They deepen their understanding of the respiratory and circulatory</p> |



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| | <p>C2- Bonding</p> <p>P2- Electricity</p> | <p>systems, and noncommunicable diseases. Plant organs and systems are also covered.</p> <p>Students deepen their understanding of how atoms interact to form compounds, learning about ionic, covalent and metallic bonds. This then leads into how the properties of these different types of compounds are linked to their structures with focus on substances such as graphite and diamond.</p> <p>Students deepen their understanding of electric circuits, the relationship between potential difference, resistance and current and how these properties are utilised in the National Grid. Students will also learn how safety features of electric appliances work, and triple science students will cover static electricity and electric fields.</p> | <p>B3- Infection and response</p> <p>C3 Quantitative chemistry</p> <p>P2- Electricity</p> | <p>systems, and noncommunicable diseases. Plant organs and systems are also covered.</p> <p>Students learn how infectious diseases are spread by pathogens and examples of these, how our body's immune system responds, how vaccines work, and how new medicines are developed. Triple science students will also learn about monoclonal antibodies and plant diseases.</p> <p>Students consolidate their knowledge of elements and the periodic table to calculate atomic, formula mass and moles, balance equations, and calculate the concentration of solutions. Triple students will calculate atom economy, carry out titrations, and calculate the number of moles in a gas.</p> <p>Students deepen their understanding of electric circuits, the relationship between potential difference, resistance and current and how these properties are utilised in</p> |
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| | | | P3- Particle model | <p>the National Grid. Students will also learn how safety features of electric appliances work, and triple science students will cover static electricity and electric fields.</p> <p>Students deepen their understanding of the particle model of matter but considering the energy and arrangement of the particles. They investigate how to measure the density of regular and irregularly shaped objects, and liquids. They will explain changes of state in terms of latent heat.</p> |
| Year 11 Autumn 1 and 2 | B5- Homeostasis | Students will deepen their understanding of the nervous system, reflexes, hormonal responses, homeostasis, the menstrual cycle, methods of contraception, and fertility treatments. Triple science students will also study the | Paper 1 mocks (Triple) B5- Homeostasis | Students will deepen their understanding of the nervous system, reflexes, hormonal responses, homeostasis, the menstrual cycle, methods of contraception, and fertility |



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| | <p>C6- Rates</p> <p>C7- Organic chemistry</p> <p>(Combined)- P5- Forces</p> | <p>brain, the eye and vision, temperature regulation, water regulation and the kidneys, and plant hormones.</p> <p>Students will deepen their understanding of the factors that affect the rate of a reaction, how they can be changed and how to measure the rate. They will also learn about gas pressures, and reversible reactions. Triple science students learn about how the conditions in reversible reactions can be altered to improve their effectiveness.</p> <p>Students will learn about crude oil as a source of organic chemical building blocks, and the uses for its products. Triple science students will also learn about alkene reactions, alcohols, carboxylic acids, and polymers.</p> <p>Students will deepen their understanding of forces and their effects on the speed or shape of objects. They will apply ideas about forces,</p> | <p>B6- Inheritance, variation and evolution</p> <p>C7- Organic chemistry</p> <p>C8- Chemical analysis</p> | <p>treatments. Triple science students will also study the brain, the eye and vision, temperature regulation, water regulation and the kidneys, and plant hormones.</p> <p>Students cover sexual and asexual reproduction, inheritance of genes and characteristics, evolution, selective breeding, genetic engineering, and classification. Triple science students will cover protein synthesis, the work of Mendel, Darwin and Wallace, speciation, and cloning.</p> <p>Students will learn about crude oil as a source of organic chemical building blocks, and the uses for its products. Triple science students will also learn about alkene reactions, alcohols, carboxylic acids, and polymers.</p> <p>Students will consolidate their knowledge of pure substances, chromatography, and testing for various gases. Triple science</p> |
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| | <p>(Triple)- P7- Magnetism and electromagnetism</p> <p>P6- Waves</p> | <p>speed and acceleration to safe stopping and braking distances in cars. Triple science students will cover moments, gears, pressure, and car safety</p> <p>In this topic students learn that Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and that when current flows around a magnet it can produce movement.</p> <p>Students will learn about how waves transfer energy, how to describe wave properties, and the difference between electromagnetic and mechanical waves. They will investigate how to measure wave speed, and will discover the uses and dangers of the waves in the electromagnetic spectrum</p> | <p>C9- Atmosphere</p> <p>P6- Waves</p> | <p>students will also cover analysis of ions and spectroscopy.</p> <p>Students consolidate their knowledge about how the Earth's atmosphere started and how human activity has changed it.</p> <p>Students will learn about how waves transfer energy, how to describe wave properties, and the difference between electromagnetic and mechanical waves. They will investigate how to measure wave speed, and will discover the uses and dangers of the waves in the electromagnetic spectrum</p> |
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| Term 2 | Spring 1 | Why this, why now? | Spring 2 | Why this, why now? |
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| <p>Year 7</p> <p>Spring 1 and 2</p> | <p>7CC- Chemical reactions</p> <p>7PF- Forces and motion</p> <p><i>Revision and mid-year assessment</i></p> | <p>Students deepen their understanding of chemical changes, oxidation reactions, and reactions between acids and alkalis.</p> <p>Students will deepen their knowledge of balanced and unbalanced forced, gravity, calculate weight, pressure, speed, friction, and interpret distance-time graphs</p> | <p>7PF- Forces and motion</p> <p>7CC- Chemical reactions</p> <p>8BP- Plants and photosynthesis</p> <p>8PL Light and sound</p> | <p>Students will deepen their knowledge of balanced and unbalanced forced, gravity, calculate weight, pressure, speed, friction, and interpret distance-time graphs</p> <p>Students deepen their understanding of chemical changes, oxidation reactions, and reactions between acids and alkalis.</p> <p>Students consolidate their knowledge of plant organs, photosynthesis, transport in plants, and how plants affect the gases in the atmosphere.</p> <p>Students will consolidate their understanding of how light travels, and how the eye works to allow us to see images and color.</p> |
| <p>Year 8</p> <p>Spring 1 and 2</p> | <p>8PE- Electricity and magnetism</p> | <p>Students deepen their knowledge of series and parallel circuits, potential difference, resistance,</p> | <p>9PM- Matter</p> | <p>Students deepen their understanding of particle model, and apply this to</p> |



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| | <p>8CM Materials and the earth</p> <p><i>Revision and mid-year assessment</i></p> | <p>insulators, static electricity, magnetic fields, and electromagnets.</p> <p>Students deepen their understanding of the Earth's structure, rock and fossil formation, fossil fuels, the greenhouse effect and global warming, and the recycling of resources.</p> | <p>9BP- Plants and photosynthesis</p> <p>9PF- Forces in action</p> <p>9CR- Reactivity</p> | <p>density calculations, and investigating pressure</p> <p>Students consolidate their knowledge of plant organs, photosynthesis, transport in plants, and how plants affect the gases in the atmosphere.</p> <p>Students deepen their knowledge of forces and their effects and apply this to simple machines. They investigate how objects change shape when forces are applied to them</p> <p>Students consolidate their knowledge of atomic structure with reactivity, and then investigate the reactions of acids with metal compounds. They deepen their understanding of how metals are extracted from their raw materials.</p> |
| Year 9 | C1- Atomic structure and the periodic table | Students deepen their understanding of the structure of atoms, and how their | C1- Atomic structure and the periodic table | Students deepen their understanding of the structure of atoms, and how their |



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| <p>Spring 1 and 2</p> | <p>P1- Energy</p> <p><i>Revision and mid-year assessment</i></p> | <p>electronic structures influence their reactions, and how scientific theory developed to give us the model of the atom today. Students will also investigate the development of the periodic table and focus on groups 1, 7 and 0, linking their structure to properties and tying back in with the organisation of elements in the periodic table.</p> <p>Students deepen their understanding of energy transfers, calculations involving energy, reducing wasted energy, and the pros and cons of energy resources. Triple science students will also cover thermal insulators.</p> | <p>P1- Energy</p> <p>C2- Bonding</p> | <p>electronic structures influence their reactions, and how scientific theory developed to give us the model of the atom today. Students will also investigate the development of the periodic table and focus on groups 1, 7 and 0, linking their structure to properties and tying back in with the organisation of elements in the periodic table.</p> <p>Students deepen their understanding of energy transfers, calculations involving energy, reducing wasted energy, and the pros and cons of energy resources. Triple science students will also cover thermal insulators.</p> <p>Students deepen their understanding of how atoms interact to form compounds, learning about ionic, covalent and metallic bonds. This then leads into how the properties of these different types of compounds are linked to their structures with focus on substances such as graphite and diamond.</p> |
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| | | | B2 Organisation | Students deepen their understanding of nutrients in foods, how to test for them and the role of enzymes in digestion. They deepen their understanding of the respiratory and circulatory systems, and noncommunicable diseases. Plant organs and systems are also covered. |
| Year 10 Spring 1 and 2 | Revision and mid-year assessment B3- Infection and response B4- Bioenergetics | Students learn how infectious diseases are spread by pathogens and examples of these, how our body's immune system responds, how vaccines work, and how new medicines are developed. Triple science students will also learn about monoclonal antibodies and plant diseases. Students will consolidate their knowledge of photosynthesis and its limiting factors, respiration, exercise, and metabolism. | B4- Bioenergetics B5- Homeostasis C4- Chemical changes | Students will deepen their understanding of exothermic and endothermic reactions and apply this to different contexts Students will deepen their understanding of the nervous system, reflexes, hormonal responses, homeostasis, the menstrual cycle, methods of contraception, and fertility treatments. Triple science students will also study the brain, the eye and vision, temperature regulation, water regulation and the kidneys, and plant hormones. Students will deepen their understanding of how chemicals react, and link this |



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| | <p>C4- Chemical changes</p> <p>P3- Particle model</p> <p>P4- Atomic structure</p> | <p>Students will deepen their understanding of how chemicals react, and link this to predicting the products of reactions and linking this to their reactivity and the likelihood of atoms to form ions. This will also cover metal extraction techniques to include both reduction and electrolysis, and how this is useful in real-world applications.</p> <p>Students deepen their understanding of the particle model of matter but considering the energy and arrangement of the particles. They investigate how to measure the density or regular and irregularly shaped objects, and liquids. They will explain changes of state in terms of latent heat.</p> <p>Students will deepen their understanding of atoms and isotopes, the development of atomic models through experimentation, radiation and its uses, and half-life.</p> | <p>P4- Atomic structure</p> <p>P5- Forces</p> | <p>to predicting the products of reactions and linking this to their reactivity and the likelihood of atoms to form ions. This will also cover metal extraction techniques to include both reduction and electrolysis, and how this is useful in real-world applications.</p> <p>Students will deepen their understanding of atoms and isotopes, the development of atomic models through experimentation, radiation and its uses, and half-life.</p> <p>Students will deepen their understanding of forces and their effects on the speed or shape of objects. They will apply ideas about forces, speed and acceleration to safe stopping and braking distances in cars. Triple science students will cover moments, gears, pressure, and car safety.</p> |
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| <p>Year 11</p> <p>Spring 1 and 2</p> | <p>B6- Inheritance</p> <p>B7- Ecology</p> <p>C9- Atmosphere</p> <p>C11- Using resources</p> | <p>Students cover sexual and asexual reproduction, inheritance of genes and characteristics, evolution, selective breeding, genetic engineering, and classification. Triple science students will cover protein synthesis, the work of Mendel, Darwin and Wallace, speciation, and cloning.</p> <p>Students consolidate their knowledge of communities, adaptations of organisms, how to estimate population size, nutrient cycles, and the human impact on biodiversity and global warming.</p> <p>Students consolidate their knowledge about how the Earth's atmosphere started and how human activity has changed it.</p> <p>Students deepen their understanding of how we obtain drinking water and metals. Triple science students also learn about fertilizers, alloys, ceramics, polymers, and composite materials</p> | <p>Revision and paper 2 mock exams</p> | |
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| | <p>P6- Waves</p> <p>P8- Space (triple)</p> <p>(Triple) P5- Forces</p> <p>(Combined) P7- Magnetism and electromagnetism</p> | <p>Students will learn about how waves transfer energy, how to describe wave properties, and the difference between electromagnetic and mechanical waves. They will investigate how to measure wave speed, and will discover the uses and dangers of the waves in the electromagnetic spectrum</p> <p>Triple students will develop their knowledge of our solar system, and the lifecycle of stars. They will also explore the Big Bang Theory, as well as an understanding of 'Red Shift'.</p> <p>Students will deepen their understanding of forces and their effects on the speed or shape of objects. They will apply ideas about forces, speed and acceleration to safe stopping and braking distances in cars. Triple science students will cover moments, gears, pressure, and car safety.</p> <p>In this topic students learn that Electromagnetic effects are</p> | | |
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| | | <p>used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and that when current flows around a magnet it can produce movement.</p> | | |
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| Term 3 | Summer 1 | Why this, why now? | Summer 2 | Why this, why now? |
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| <p>Year 7</p> <p>Summer 1 and 2</p> | <p>8BP- Plants and photosynthesis</p> <p>8PL Light and sound</p> <p><i>Revision and end of year assessment</i></p> | <p>Students consolidate their knowledge of plant organs, photosynthesis, transport in plants, and how plants affect the gases in the atmosphere.</p> <p>Students will consolidate their understanding of how light travels, and how the eye works to allow us to see images and color.</p> | <p>8CP The periodic table</p> <p>8BD- Digestion and nutrition</p> | <p>Students will learn about elements and their properties and relate this to the atomic model. They will learn how elements form compounds through chemical reactions.</p> <p>Students consolidate their knowledge of organ systems and diffusion. It deepens their understanding of the components of food in a balanced diet and the use of each within the body. The role of enzymes is introduced as part of this.</p> |



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B2 Organisation

***Revision for end of year
assessment***

Students deepen their understanding of nutrients in foods, how to test for them and the role of enzymes in digestion. They deepen their understanding of the respiratory and circulatory systems, and noncommunicable diseases. Plant organs and systems are also covered.

Students will also learn how safety features of electric appliances work, and triple science students will cover static electricity and electric fields.



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| <p>Year 10</p> <p>Summer 1 and 2</p> | <p>B5- Homeostasis</p> <p>C5- Energy changes</p> <p>C6- Rates</p> | <p>Students will deepen their understanding of the nervous system, reflexes, hormonal responses, homeostasis, the menstrual cycle, methods of contraception, and fertility treatments. Triple science students will also study the brain, the eye and vision, temperature regulation, water regulation and the kidneys, and plant hormones.</p> <p>Students will deepen their understanding of exothermic and endothermic reactions and apply this to different contexts.</p> <p>Students will deepen their understanding of the factors that affect the rate of a reaction, how they can be changed and how to measure the rate. They will also learn about gas pressures, and reversible reactions. Triple science students learn about how the conditions in reversible reactions can be altered to improve their effectiveness.</p> <p>Students will deepen their understanding of forces and their effects on the speed or shape of objects. They will apply ideas about forces, speed and</p> | <p>End of year assessments (Paper 1 mocks)</p> <p>B7- Ecology</p> <p>C6- Rates</p> <p>P5- Forces</p> | <p>Students consolidate their knowledge of communities, adaptations of organisms, how to estimate population size, nutrient cycles, and the human impact on biodiversity and global warming.</p> <p>Students will deepen their understanding of the factors that affect the rate of a reaction, how they can be changed and how to measure the rate. They will also learn about gas pressures, and reversible reactions. Triple science students learn about how the conditions in reversible reactions can be altered to improve their effectiveness.</p> <p>Students will deepen their understanding of forces and their effects on the speed or shape of objects. They will apply ideas about forces, speed and acceleration to safe stopping and braking distances in cars. Triple science students</p> |
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P5- Forces

acceleration to safe stopping and braking distances in cars. Triple science students will cover moments, gears, pressure, and car safety.

will cover moments, gears, pressure, and car safety.



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| Year 11 | Revision | Preparation for GCSE exams through targeted revision | Revision and exams | Preparation for GCSE exams through targeted revision |
| Summer 1 and 2 | | | | |



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Vertical concepts in science

| KEY STAGE 3 | | | | | |
|---|---|---|--------------------------------|--------------------------------|--------------------------------|
| Vertical Concept | Unit 1 | Unit 2 | Unit 3 | Unit 4 | Unit 5 |
| Cells carry out life processes | Cells, tissues, and organs | Reproduction & Variation | Plants & photosynthesis | Biological Systems & Processes | |
| Multicellular organisms act as systems | Cells, tissues, and organs | Reproduction & Variation | Digestion & Nutrition | Plants & Photosynthesis | Biological Systems & Processes |
| Genes are inherited | Cells, tissues, and organs | Reproduction & Variation | Biological Systems & Processes | | |
| Species show variation | Reproduction & Variation | Ecological Relationships & Classification | | | |
| Organisms are interdependent | Ecological Relationships & Classification | Plants & Photosynthesis | | | |
| Matter and energy are cycled in ecosystems | Ecological Relationships & Classification | Plants & Photosynthesis | | | |
| Properties are determined by the structure | Particles | Atoms & the Periodic Table | Matter | | |
| Reactions rearrange particles | Chemical Reactions | Atoms & the Periodic Table | Reactivity | Energetics & Rates | |
| Reactions involve energy | Chemical Reactions | Atoms & the Periodic Table | Reactivity | Energetics & Rates | |
| Earth as a dynamic system & source of raw materials | Materials & the Earth | Plants & Photosynthesis | | | |
| Energy is transferred between stores | Energy | Light & Space | | | |
| Energy is transferred by different mechanisms | Energy | Light & Space | Electricity & Magnetism | Sound waves | |
| Forces act through fields | Light & Space | Electricity & Magnetism | | | |
| Forces affect motion | Forces & Motion | Light & Space | Forces in Action | Matter | |
| Mass and energy are conserved | | | | | |



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| KEY STAGE 4 | | | | | | | |
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| Vertical Concept | Unit 1 | Unit 2 | Unit 3 | Unit 4 | Unit 5 | Unit 6 | Unit 7 |
| Cells carry out life processes | Cell Biology | Organisation | Infection & Response | Bioenergetics | Homeostasis & Response | | |
| Multicellular organisms act as systems | Organisation | Infection & Response | Bioenergetics | Homeostasis & Response | | | |
| Genes are inherited | Cell Biology | Inheritance, Variation & evolution | | | | | |
| Species show variation | Ecology | Inheritance, Variation & evolution | | | | | |
| Organisms are interdependent | Ecology | Inheritance, Variation & evolution | | | | | |
| Matter and energy are cycled in ecosystems | Bioenergetics | Ecology | | | | | |
| Properties are determined by the structure | Atomic Structure & the Periodic Table | Bonding, Structure & Properties of Matter | Chemical Changes | Particle Model of Matter | | | |
| Reactions rearrange particles | Bonding, Structure & Properties of Matter | Chemical Changes | Quantitative Chemistry | Organic Chemistry | | | |
| Reactions involve energy | Chemical Changes | Energy Changes | Rates of Reaction | Organic Chemistry | | | |
| Earth as a dynamic system & source of raw materials | Chemical Changes | Organic Chemistry | Chemistry of the Atmosphere | Using Resources | | | |
| Energy is transferred between stores | Energy | Electricity | Atomic Structure | Forces | | | |
| Energy is transferred by different mechanisms | Energy | Electricity | Particle Model of Matter | Forces | Waves | | |
| Forces act through fields | Electricity | Forces | Magnetism & electromagnetism | | | | |
| Forces affect motion | Forces | Magnetism & electromagnetism | | | | | |
| Mass and energy are conserved | Energy | Quantitative Chemistry | Chemical Changes | Ecology | Rates of reaction | Particle Model of Matter | Magnetism & Electromagnetism |



Working scientifically and maths skills throughout the curriculum

| Curriculum topic | Working Scientifically and Maths Skills |
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| Cells, tissues and organs | <ul style="list-style-type: none">• Correctly use a microscope to view samples in greater detail• Calculating magnification using eyepiece lens x objective lens• Using magnification = image size ÷ actual size• Identify independent, dependent and control variables• Drawing a suitable results table• Carry out an investigation to test a hypothesis• Calculate means and rounding up numbers appropriately• Plot graphs with line of best fit• Use data to form conclusions <p>Required practical: Diffusion</p> <p>Required practical: Using microscopes</p> |
| Particles | <ul style="list-style-type: none">• Use and interpret negative numbers• Plot graphs of secondary data• Make and record accurate measurements• Check for reproducibility and recognise when results are reproducible• Evaluate separation methods and suggest improvements• Identify hazards and risks and suggest appropriate safety precaution• Identify anomalies and leave them out of lines of best fit <p>Required Practical – Distillation</p> |
| Energy | <ul style="list-style-type: none">• Identify variables to change, measure and control• Identify hazards and risks, and suggest appropriate and relevant safety precautions• Describing patterns in primary and secondary data• Drawing graphs |



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| | <ul style="list-style-type: none">Evaluate methods and data, making suggestions for improvements to procedures or equipment <p>Required practical: Cooling down</p> <p>Required practical: Energy in foods</p> |
| Reproduction and variation | <ul style="list-style-type: none">Analyse secondary data, describing patterns, suggesting reasons for patterns, spotting anomaliesCollect, process and display data appropriately, explaining the choice for bar charts or line graphs in terms of the type of dataIdentify variablesUsing a model to illustrate sexual reproduction |
| Forces and motion | <ul style="list-style-type: none">Formulate a hypothesis and make a prediction.Identify the variables in a given methodSelect appropriate apparatus for making measurementsCollect and process results, and choose to present the data as a suitable graphWrite conclusions based on results obtained or secondary data provided, and relate results to predictions/ hypothesisUse and rearrange equations to perform calculations, using SI units where appropriate. <p>Required practical: relationship between mass and weight on earth</p> |
| Chemical reactions | <ul style="list-style-type: none">Observations for evidence for a reactionRecognising hazard symbols, suggesting risks associated with them and appropriate safety precautionsIdentifying variables to change, measure and control to test a hypothesisRecognising repeatable data and processing it appropriatelyChoice of bar chart based on categoric dataCheck for and comment on reproducibility <p>Required practical: Titration</p> |



Ecological relationships and classification

- Select and use appropriate apparatus and sampling techniques for field work
- Describe a method to sample the number of organisms in a habitat
- Process data to estimate the population of organism in a habitat
- Identify the control variables in a given method
- Collect and process results
- Write conclusions based on results obtained or secondary data provided, and relate results to predictions/ hypothesis
- Explaining how scientific theories have developed, as new evidence and ideas are taken into account

Required practical: sampling

Digestion and nutrition

- Interpretation of secondary data in various formats
- Identify variables to change, measure and control to test a hypothesis
- Identifying hazards and risks and suggesting appropriate safety measures
- Design a table for results
- Drawing conclusions from data and observations and explaining them using scientific knowledge and understanding
- Evaluation of models

Required practical: chemical food tests for fat, protein, starch and sugar

Light and space

- Identification of IV, DV and CVs
- Repeatability, reproducibility, and resolution in readings.
- Writing conclusions, using data to support conclusions

The periodic table

- Processing primary data to calculate results
- Straight lines of best fit with anomalous points
- Reproducibility ideas
- Describing and explaining results from primary and secondary data and using data to back up these statements
- Making predictions and evaluating predictions after experimental work



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| | Required practical: reaction of magnesium and oxygen |
| Electricity and magnetism | <ul style="list-style-type: none">• Use equipment to make measurements of current, voltage and resistance and record it to an appropriate number of decimal places• Identify variables to change, measure and control to test a hypothesis• Plot a graph and describe the relationship shown• Recognise and describe proportional relationships• Use data to inform conclusions• Use and manipulate equations to calculate unknown values Required Practical: Resistance of a wire |
| Materials and the Earth | <ul style="list-style-type: none">• Read and interpret graphs and tables of secondary data• Explain observations from practical work using scientific knowledge and understanding and using data to back these up• Describe trends shown in graphs, using data to support and identifying when more than one trend is present• Comparison of data, including multipliers, e.g. 'double the rate' or '5x more' etc |
| Plants and photosynthesis | <ul style="list-style-type: none">• Writing comparisons• Drawing conclusions from observations• Identifying variables to change, measure and control• Drawing conclusions from observations and from secondary data• Describing trends in graphs and using data to illustrate points made Required practical 1: products of photosynthesis Required practical 2: adaptations of leaves |



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| <h2>Matter</h2> | <ul style="list-style-type: none">• How models allow us to understand phenomena• Calculating density and determining the correct unit• Sketching graphs and line of best fit• Explaining observations• Writing conclusions from data collected/secondary data• Explanations of observations, describing patterns in data, interpolating and extrapolating from tabular data <p>Required Practical: Density</p> |
| <h2>Forces in action</h2> | <ul style="list-style-type: none">• Design tables that include repeats and means• Calculate means, ignoring anomalies• Round means to the same resolution as their original readings• Scale and label axes and draw lines of best fit• Recognise and describe a proportional relationship• Describe patterns in primary and secondary data, using data to back up statements. <p>Required practical: Hooke's Law</p> |
| <h2>Reactivity</h2> | <ul style="list-style-type: none">• Forming a hypothesis• Method writing, including equipment names chemicals and processes• Identification of variables from a hypothesis• Calculating means• Identification of hazards and risks, and suggestions for reducing risk• Checking for reproducibility <p>Required practical: displacement reactions</p> |



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| <h2>Sound waves</h2> | <ul style="list-style-type: none">• Identifying sources of error• Calculating means and uncertainties• Suggesting how additional data can be used to reduce error• The term range in the examples of hearing range and range in results to calculate uncertainty• Using SI units for wavelength, frequency, speed, |
| <h2>Biological systems and processes</h2> | <ul style="list-style-type: none">• Calculating means, spotting anomalies• Identifying the range in a set of readings• Analysing and interpreting secondary data in multiple formats• Displaying secondary data appropriately <p>Required practical: structure of DNA (modelling)</p> |
| <h2>Energetics and rates</h2> | <ul style="list-style-type: none">• Scaling and plotting graphs• Drawing lines of best fit• Reading data from graphs and making conclusions from them• Describing patterns in data• Explaining patterns using scientific knowledge and understanding• Explaining choices for equipment to minimise heat loss and making suggestions on further improvements <p>Required practical: rate of reaction</p> |