Year 10 Combined

Overall Curriculum Intent

By the end of their 5-year journey students will know the fundamental principles from biology, chemistry and physics that will provide a foundation for understanding and navigating the world. Student knowledge is structured around the Big Ideas in science which range from the particulate nature of matter to the cellular basis of living organisms, to the structure of the universe.

Students will understand the process of scientific enquiry that leads to the creation and development of concepts and theories. Students will understand how science can be used to explain observation and make predictions about natural phenomena.

	Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Knowledge Introduced	**Atomic Structure (Chemistry)** Atoms, elements and compounds. Development of the structure of the atom. Electrical charges of subatomic particles. Size and Mass of atoms. Relative atomic mass. Electronic structure. Development of the periodic table, including metals and non-metals and groups 0,1,7. **Energy (Physics)** Energy stores Kinetic energy calculations Elastic Potential energy calculations Gravitational Potential energy calculations Specific Heat Capacity, including an investigation to determine the specific heat capacity of one or more materials. [RP 14] Power Efficiency National and Global Energy Resources **Cells (Biology)** Eukaryotic and Prokaryotic cells Plant and Animal Cells Microscopy, including sing a microscope to observe cells. [RP 1] Cell specialisation and differentiation. Chromosomes, mitosis and the cell cycle. Diffusion in cells Osmosis, including using apparatus and techniques to investigate osmosis in plant cells. Active transport in cells.	**Separating Techniques (Chemistry)** Formulations Mixtures Mixtures can be separated by physical processes such as filtration, crystallisation, chromatography simple distillation, fractional distillation. Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate R_f values. [RP12] **Electricity (Physics)** Standard circuit symbols Electrical charge and current Current, Potential difference and resistance (Ohm's Law) including using appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: the length of a wire at constant temperature combinations of resistors in series and parallel. [RP 15] Resistors including ohmic conductors, thermistors and diodes and the associated V-I graphs for these components. Construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature. [RP 16] Series and Parallel circuits, including Kirchoff's Laws. Domestic and mains electricity. Electrical Power Energy transfers in everyday appliances National Grid. **Organisation (Biology)** Principles of organisation Human digestive system Digestive enzymes Use of qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein. [RP 3] Use apparatus and techniques to investigate the effect of pH on the rate of reaction of amylase enzyme [RP 4] The heart and blood vessels Blood components Coronary Heart disease Health issues and the interaction of non-communicable diseases. Effect of lifestyle on non-communicable diseases Cancer Plant tissues and organ systems.	**Bonding (Chemistry)** Ionic bonds Ionic compounds Covalent bonding Metallic bonding States of matter and state symbols Properties of ionic compounds Properties of small molecules Polymers Giant covalent structures Properties of metals and alloys Metals as conductors Structure and properties of diamond, graphite, graphene, and fullerenes. **Particle Model (Physics)** Density of objects Use of appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. [RP 17] Changes of state Internal energy Specific heat capacity Specific Latent Heat Particle motion in a gas	**Infection and Response (Biology)** Communicable diseases Viral, bacterial, fungal and protist diseases Human defence systems Vaccines Antibiotics and painkillers, including antibiotic resistance. Discovery and development of drugs **Quantitative Chemistry (Chemistry)** Conservation of Mass and Balancing Equations Relative formula mass Mass changes when a reactant or product is a gas Chemical Measurements Moles and their use to balance equations Amount of substance in equations Limiting reactants Concentration of solutions	**Atomic Structure (Physics)** Structure of the atom. Isotopes Development of the model of the atom Radioactive decay and nuclear radiation Decay equations. Half-life and the random nature of decay Radioactive contamination **Chemical Changes (Chemistry)** **a) Acids and Alkalis** Neutralisation of acids and salt production Soluble salts including use of apparatus and techniques to prepare a sample of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution. [RP8] pH scale and neutralisation Strong and weak acids Reaction of acids with metals **b) Electrolysis** Reactivity of metals Metal oxides Reactivity Series of metals Extraction of metals and reduction Tests for oxygen, carbon dioxide, hydrogen and chlorine. Process of electrolysis Electrolysis of ionic compounds and aqueous solutions. Use of apparatus and techniques to investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis. [RP 9] Use of electrolysis for extracting metals. Representations of reactions at the electrodes as half equations.	**Bioenergetics** Photosynthesis Reaction Factors affecting the rate of photosynthesis. Use apparatus and techniques to investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. [RP5] Uses of glucose from photosynthesis Aerobic and Anaerobic respiration Response to exercise Metabolism **Forces (Physics) Part 1** Scalar and vector quantities. Contact and non-contact forces. Resultant force. Work done and energy transfer. Elastic forces including using apparatus and techniques to investigate the relationship between force and extension for a spring. [RP 18]

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Key vocabulary/ concepts/ideas students must master	**ATOMIC STRUCTURE** **Key Concepts** Apply knowledge of subatomic particles to describe to atoms, and calculate relative atomic masses. Identify and name elements, compounds and mixtures from symbols. Explain how the idea of the atomic structure developed and what evidence was used to support this development. Explain and use the periodic table to be able to predicts reactions in group 0,1,7 by including how electron configuration affects this. Describe how the periodic table developed form Mendeleev to modern periodic table. Represent the arrangement of electrons using energy levels/shells with correct configuration. **Mathematical Skills** Recognise and write expressions in standard form in regards to atoms and subatomic particles (1b) Relate the size and scale of atoms to objects in the physical world (1d) Represent the electronic structure using 2D and 3D models (5b) **Working Scientifically Skills** Use SI units and the prefix nano when describing atoms and subatomic particles (4.3, 4) Describe how scientific methods and theories develop over time specifically the atom and the periodic table (1.1, 1.6) Make predications on the reactivity of elements in group 0,1,7 (1.2) Use models to represent elements in the periodic table using energy levels/shells (1.2) **ENERGY** **Key Concepts** Apply conservation of energy to different scenarios, including identifying relevant stores and transfer pathways Evaluate the success of energy transfers in terms of power and efficiency Explain temperature rise as a result of a gain in thermal energy in terms of SHC of different materials Compare a range of renewable and non-renewable energy resources that contribute to UK and global electricity production **Mathematical Skills** Recall, apply and rearrange equations to calculate GPE, EPE and KE including converting prefixes. 1a, 1c, 3b, 3c Apply and rearrange the equation to calculate SHC including converting prefixes. 1a, 1c, 3b, 3c Recall, apply and rearrange equations to calculate power and efficiency including converting prefixes 1a, 1c, 3b, 3c Interpret data on the use of a range of energy resources 2c, 4a **Working Scientifically Skills** Use models of energy stores and pathways to develop explanations and understanding of how energy drives actions 1.2 Use the appropriate SI units, prefixes and powers of 10 (including correctly converting where necessary) to perform energy calculations 4.3, 4.4, 4.5, 4.6 Evaluate the social, economic and environmental implications of a range of energy resources 1.4 Use secondary data to explain trends and patterns in the use of energy resources 3.5	**SEPARATING TECHNIQUES** **Key Concepts** Define mixtures as two or more substances not chemically joined that can be physically separated using a number of different techniques. Explain the difference between simple distillation and fractional distillation. Describe how filtration and crystallisation are used to make salts. Describe how to perform, filtration; crystallisation; simple distillation to separate mixtures Describe how to perform paper chromatography to separate coloured substances. **Mathematical Skills** Calculate Rf using chromatograms (1a, 1c, 1d, 2a) Give answers to correct significant figures (1a, 2a) **Working Scientifically Skills** Use a range of equipment to accurately separate/purify mixtures (AT4) Record data accurately utilising suitable apparatus (AT1) Record observations and measurements when carrying out paper chromatography (2.6) [RP12] Use apparatus and techniques to separate coloured substances (2.4) [RP12] **ELECTRICITY** **Key Concepts** Draw and interpret diagrams of both series and parallel circuits, including making predictions about what will happen to potential difference and current. Apply Ohm's law to a range of different components. Explain the factors that would cause the resistance of a range of components to change. Describe how electricity is distributed and costed for domestic use. Use prior knowledge of energy transfers and knowledge of power calculations to evaluate the effectiveness of everyday appliances. **Mathematical Skills** Recall, apply and rearrange equations to calculate resistance, power, energy and efficiency, including converting prefixes. 1a, 1c, 3b, 3c, 3d Apply and rearrange the equation to calculate resistance, power energy, and efficiency, including converting prefixes. 1a, 1c, 3b, 3c, 3d Recall, apply and rearrange equations to calculate power and efficiency including converting prefixes 1a, 1c, 3b, 3c Use graphs to explore the resistive properties of components and whether they are linear or non-linear and relate the curves produced to their function and properties. 4c, 4d, 4e **[Tangents]** **Working Scientifically Skills** Use models of electricity to develop explanations and understanding of how energy is transferred in circuits 1.2 Use the appropriate SI units, prefixes and powers of 10 (including correctly converting where necessary) to perform calculations 4.3, 4.4, 4.5, 4.6 Explain everyday applications of resistors e.g. use of LDRs in circuits 1.4	**BONDING** **Key Concepts** Explain the three types chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons. Apply knowledge of ionic bonding and atomic structure to work out the charges of ions formed when a metal and non-metal bond. Apply knowledge of covalent bonding and electronic structure to recognise small molecules, polymers, metallic bonds and giant covalent structures from diagrams. Explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding Interpret and use state symbols in a variety of chemical equations. Use knowledge of intermolecular forces to explain to bulk properties of molecular substances. Use and apply knowledge of bonding and intermolecular forces to explain the properties of Small molecules, polymers, giant covalent structures, metals and alloys. Explain the properties of diamond and graphite in terms of its structure and bonding. Recognise graphene and fullerenes from diagrams and descriptions of their bonding and structure. Give examples of the uses of fullerenes, including carbon nanotubes. **Mathematical Skills** Visualise and represent bonds and substances in 2D and 3D forms including two-dimensional representations of 3D objects. 5b Translate information between graphical and numerical forms to work out the empirical formula of ionic compounds. 4a Recognise and use expressions in decimal form 1a Use ratios, fractions and percentages to calculate empirical formula. 1c **Working Scientifically Skills** Recognise, draw and interpret diagrams and models of the three types of bonding and of a range of substances. (1.2) Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent structures and bonding. (1.2) **PARTICLE MODEL (PHYSICS)** **Key Concepts** Use and apply the equation for density to explain differences in densities of a variety of materials. Use prior knowledge of energy and chemical and physical reactions to explain changes of state, including the conservation of mass and changes in energy stores. Explain why temperature does not change when a substance changes state. Use prior knowledge of energy stores and transfers to explain how and why the energy of a system changes when the system is heated. Use the specific heat capacity equation to explain how changing factors affects the change in thermal energy of a system. Explain how and why various factors affect the particle motion in gases. **Mathematical Skills**	**INFECTION AND RESPONSE** **Key Concepts** Describe communicable diseases and link to the pathogens contributing towards the development of these in animals and plants. Describe the specific and non-specific defence systems of the human body against pathogens. Explain methods of prevention and treatment of communicable diseases. Describe the process of discovery and development of potential new medicines, including preclinical and clinical testing. **Mathematical Skills** (MS 2c, 2g, 4a, 4c) Translate information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. (MS 2d) Understand the principles of sampling as applied to scientific data, including clinical trial data. **Working Scientifically Skills** Understand that the results of testing and trials are published only after scrutiny by peer review. (1.6) **QUANTITATIVE CHEMISTRY** **Key Concepts** Apply the law of conservation of mass to interpret a range of chemical formula and calculate percentage by mass. Explain observed changes in mass in non-enclosed systems during chemical reactions. Calculate the number of moles in a mass and vice-versa. Calculate amount of substance in a range of chemical reactions. Use and apply knowledge of mass and moles to balance a chemical equation. Explain the effect of limiting a quantity of reactant on the amount of product it is possible to form. Calculate the mass of solute in a solution. Explain how mass of solute and volume are related to concentration. **Mathematical Skills** Recognise and use expressions in decimal and standard form 1a, 1b Use ratios, fractions and percentages when calculating masses and amounts of substance in chemical reactions. 1c Use an appropriate number of significant figures 2a Understand and use the symbols: =, <, <<, >>, >, ∝ , ~ 3a Change the subject of an equation to calculate a range of chemical quantities including mass, moles, concentration and volume. 3b Substitute numerical values into algebraic equations using appropriate units for physical quantities 3c **Working Scientifically Skills** Use a range of descriptive, graphical and chemical models to calculate chemical quantities and interpret data from chemical reactions. 1.2 Calculate the uncertainty in given or obtained data from chemical reactions 3.4	**ATOMIC STRUCTURE (PHYSICS)** **Key Concepts** Use knowledge of atomic structure to describe the differences between isotopes. Explain how scientific discoveries led to the development of the model of the atom and how and why this changed over time. Explain the ionising properties of radiation and evaluate which type of radiation is most suitable for a particular use. Use decay equations to represent the decay of a range of nuclei. Determine the half-life if nuclei and use this to evaluate which type of radiation is most suitable for a particular use. **Mathematical Skills** Recall, apply and rearrange equations to calculate density, specific latent heat and specific heat capacity, including converting prefixes. 1b, 1c, 3c, 3d Recall, apply and rearrange the equation to calculate density, specific latent heat and specific heat capacity, including converting prefixes. 1a, 1c, 3b, 3c, 3d Use data and given graphs to explore changes of state, including identifying melting and freezing points and rate of cooling. 4a, 4c, 4d, 4e Use experimental data to plot a cooling/heating curve for a substance 4a, 4b, 4c, 4d, 4e **Working Scientifically Skills** Interpret models of the atom 1.2 Model the decay of a radioactive substance to determine its half-life 1.2 Evaluate the risks associated with radioactive contamination and irradiation 1.5 Analyse and evaluate examples of media reporting of the risks associated with the use of radioactive substances 1.6 **CHEMICAL CHANGES** **a) Acids and Alkalis** **Key Concepts** Describe and explain a range of reactions between acids and metals, in terms of loss/gain of electrons. Describe and interpret a range of neutralisation reactions. Describe how to make a pure, dry sample of a soluble salt. Apply knowledge of the pH scale to identify acidic/alkaline solutions and investigate pH changes during neutralisation. Explain dilute/concentrated and strong/weak acids. Describe neutrality and relative acidity. **Mathematical Skills.** Make order of magnitude calculations 2h **Working Scientifically Skills** Safe use of a Bunsen burner AT2 [RP8] safely use of a range of equipment to purify and/or separate a chemical mixture including evaporation, filtration and crystallisation AT4 [RP8] Safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products AT6 [RP8]	**BIOENERGETICS** **Key Concepts** Describe photosynthesis and explain the effect of factors on the rate pf photosynthesis. Compare and contrast aerobic and anaerobic respiration. Describe how the human body reacts to the increased demand for energy during exercise. Describe the use of molecules in photosynthesis and metabolism. **Mathematical Skills** Measure and calculate rates of photosynthesis AT5, MS1a, 1c **RP5** Understand and use the inverse square law MS3a, 3d **RP5** Plot, draw, extract and interpret appropriate graphs selecting appropriate scale for axes of photosynthesis MS4a, 4c **RP5** Translate information between graphical and numeric form. WS 3.2 **Working Scientifically Skills** Use appropriate apparatus and techniques to observe and measure the process of oxygen gas production and control the temperature of water AT1, AT2, AT3. **RP5** Measure responses of pondweed to light. AT4 **RP5** Translate information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. (WS 3.1, 3.2) Understand the principles of sampling as applied to scientific data. (WS 2.5) **RP5** **FORCES (PART 1)** **Key Concepts** Use and apply knowledge of contact forces, non-contact forces and vectors to describe interactions between pairs of objects. Use prior and new knowledge of weight to explain why the weight of an object varies. Use knowledge of forces and vectors to calculate resultant forces and resolve forces into components. Apply knowledge of forces and vectors to produce vector diagrams. Apply knowledge of forces and energy transfer to work done in a variety of everyday situations. Apply knowledge of forces, energy transfer and work done to a stretched spring. **Mathematical Skills** Recall, apply and rearrange equations to calculate weight. 3b, 3c Use data and given diagrams to resolve vector problems. 4a, 5a, 5b Produce accurate vector diagrams to resolve vector problems. 4a, 5a, 5b Recall, apply and rearrange equations to calculate work done on an object. 3b, 3c Convert between different physics units e.g. Joules and Newton-meters, understanding the equivalence of each. 1c Recall, apply and rearrange the equations to calculate force, extension and elastic potential energy. 3b, 3c Use an appropriate number of significant figures.2a Find arithmetic means. 2b

	Use appropriate apparatus to make and record measurements of mass, time and temperature accurately. [RP14] (AT1) Use, in a safe manner, appropriate apparatus to measure energy changes/transfers and associated values such as work done. [RP14] (AT5) **CELLS** **Key Concepts** Apply knowledge of cell structures to identify a variety of plant, animal and prokaryotic cells based on their structure. Explain the structural adaptations of a wide variety of cells, linking to their specific function. Apply knowledge of cell structure to describe the stages of the cell cycle. Compare and contrast the methods of transport in cells. **Mathematical Skills** Recall, apply and rearrange the equation for magnification, including converting prefixes (centi, milli, micro, nano) (1a, 1b, 3b) Make order of magnitude calculations using powers of 10 and standard form (1d, 2h) Plot, draw and interpret appropriate graphs for the process of osmosis (RP2) (4a-d) Use estimations to judge the relative size or area of sub-cellular structures (RP1) (1d, 3a) Use percentiles and calculate percentage gain and loss of mass of plant tissue during the process of osmosis (RP2) (1c) **Working Scientifically Skills** Evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. (1.3, 1.5) Use models and analogies to develop explanations of how cells divide. (1.2) Recognise, draw and interpret diagrams that represent the processes of diffusion and osmosis (1.2) Use apparatus and techniques to record the length and area of cells (RP1) (AT1) Use a microscope to make observations of biological specimens and produce labelled scientific drawings. (RP1) (AT7) Use appropriate apparatus and techniques to observe and measure the process of osmosis (RP2) (AT3) Experimentally measure the rate of osmosis by water uptake. (RP2) (AT5) Make order of magnitude calculations using powers of 10 and standard form (4.4) Determine whether data, both experimental and given supports the theory of osmosis. (RP2) (1.1)	Explain the use of transformers in distributing electricity efficiently 1.4 Evaluate the risks of current electricity in the home 1.5 Use appropriate apparatus to measure and record length accurately. AT 1 [RP15] [RP16] Use appropriate apparatus to measure current, potential difference and resistance. AT 6 [RP15] [RP16] Use circuit diagrams to construct and check series and parallel circuits. AT 7 [RP15] [RP16] **ORGANISATION** **Key Concepts** Apply knowledge of organisation in known and unknown organisms. Apply knowledge of necessary dissolved substances and how they are transported around organ systems. Explain the role of enzymes within the digestive system. Describe non-communicable diseases and link to factors contributing towards the development of these. **Mathematical Skills** (MS 1c) Understand of size and scale in relation to cells, tissues, organs and systems. (MS 1a, 1c) Carry out rate calculations for chemical reactions, blood flow and transpiration. **RP4** (MS 2c, 2g, 4a, 4c) Translate information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. **RP 3&4** (MS 2d) Understand the principles of sampling as applied to scientific data, including epidemiological data and risk factors. **Working Scientifically Skills** Use models to explain enzyme action (1.2) Safely use of a Bunsen burner, electric heater and a boiling water bath (AT2) **RP 3&4** Correct and safe manipulation of apparatus (2.4) **RP 3&4** Use appropriate apparatus to record the volumes of liquids, time and pH. (2.4, AT1) **RP 3&4** Measure the rate of reaction by the colour change of iodine indicator. (AT5) **RP4** Use scientific theories and explanations and hypothesis on how pH affects amylase activity. (2.1) **RP4** Describe the appropriate sampling technique to ensure samples are representative. (2.5) Make and record observations and measurements of time. (2.6) **RP4** Present a graph of amylase activity against pH. (3.1) **RP4** Translate numeric data into graphical form. (3.2) **RP4**	Recall, apply and rearrange equations to calculate density, specific latent heat and specific heat capacity, including converting prefixes. 1a, 1b, 1c, 3b, 3c, 3d Recall, apply and rearrange the equation to calculate density, specific latent heat and specific heat capacity, including converting prefixes. 1a, 1c, 3b, 3c, 3d Use data and given graphs to explore changes of state, including identifying melting and freezing points and rate of cooling. 4a, 4c, 4d, 4e Use experimental data to plot a cooling/heating curve for a substance 4a, 4b, 4c, 4d, 4e **[Tangents]** **Working Scientifically Skills** Use models of particles to develop explanations and understanding of how density differs between materials 1.2 Use models of particles to develop explanations and understanding of how and why gas pressure changes 1.2 Use the appropriate SI units, prefixes and powers of 10 (including correctly converting where necessary) to perform calculations 4.3, 4.4, 4.5, 4.6 Use appropriate apparatus to make and record measurements of length, area, mass and volume accurately. Use such measurements to determine the density of solid objects and liquids. (AT1) [RP17]	Use scientific vocabulary, terminology and definitions. 4.1 Recognise the importance of scientific quantities and understand how they are determined.4.2 Use SI units and IUPAC chemical nomenclature unless inappropriate. 4.3 Use prefixes and powers of (including correctly converting where necessary) to perform chemical calculations 4.4, 4.5 Use an appropriate number of significant figures in calculation 4.6	Use of appropriate apparatus and techniques for conducting and monitoring chemical reactions, including appropriate reagents and/or techniques for the measurement of pH in different situations AT3 Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations (2.4) [RP8] **b) Electrolysis** **Key Concepts** Explain oxidation in terms of loss/gain of electrons. Apply knowledge of the reactivity series to describe and explain a range of chemical reactions. Explain how metals can be extracted using carbon. Interpret and evaluate metal extraction processes. Apply knowledge of oxidation and reduction to displacement equations to identify the species that are oxidised or reduced. Write ionic equations for a range of displacement reactions. Describe the process of electrolysis for ionic compounds dissolved in water and molten ionic compounds, identifying products formed. Represent electrolysis using half equations. Explain how electrolysis can be used to extract metals from molten compounds. Describe and explain the process of electrolysis of aqueous solutions, including identifying products formed. Investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis. [RP9] **Mathematical Skills** Understand and use the symbols: =, <, <<, >>, >, ∝ , ~ 3a **Working Scientifically Skills** Use appropriate apparatus and techniques for conducting and monitoring chemical reaction (AT3) [RP9] Use appropriate apparatus and techniques to draw, set up and use electrochemical cells for separation and production of elements and compounds. (AT7) [RP9] Use scientific theories and explanations to develop a hypothesis about what happens when aqueous solutions are electrolysed. (2.1) [RP9] Plan experiments to test a hypothesis developed about what happens when aqueous solutions are electrolysed (2.2) [RP9] Apply a knowledge of a range of techniques, instruments, apparatus and materials to select those appropriate to the experiment planned. (2.3) [RP9] Carry out electrolysis experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. (2.4) [RP9] Make and record observations of products formed from electrolysis using a range of apparatus and methods. (2.6) [RP9]	Translate information between graphical and numeric form to calculate spring constants and work done on a stretched spring. 4a and WS 3.2 Understand that $y = mx + c$ represents a linear relationship, and this holds true up to the elastic limit for springs that obey Hooke's law 4b Plot a graph of force and extension from experimental data. 4c **Working Scientifically Skills** Use vector diagrams to resolve a force into components 1.2 Interpret vector diagrams 1.2 Use the appropriate SI units, prefixes and powers of 10 (including correctly converting where necessary) to perform calculations 4.3, 4.4, 4.5, 4.6 Convert between different physics units e.g. Joules and Newton-meters, understanding the equivalence of each. 4.5 Use appropriate apparatus to make and record length of a spring accurately. AT1 [RP18] Use appropriate apparatus to measure and observe the effect of force on the extension of springs and collect the data required to plot a force-extension graph. AT2 [RP18] Use scientific theories and explanations to develop a hypothesis about what happens when force is applied to springs. (2.1) [RP18] Plan experiments to test a hypothesis developed about what happens when force is applied to springs. (2.2) [RP18] Apply a knowledge of a range of techniques, instruments, apparatus and materials to select those appropriate to the experiment planned. (2.3) [RP18] Carry out extension experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. (2.4) [RP18] Make and record measurements of force and extension using a range of apparatus and methods. (2.6) [RP18]
Knowledge revisited	**Atomic Structure (Chemistry)** In KS3, students have learned the basic Dalton model of the atom and the basic structure of the	**Separating Techniques (Chemistry)** In KS3, students have learnt what a mixture is and covered the basic ideas of separation using	**Bonding (Chemistry)** Students will retrieve knowledge from the study of atoms and elements, the periodic table and	**Infection and Response (Biology)** Students have previously gained understanding of the human body and have learnt about some	**Atomic Structure (Physics)** Students will revisit and build upon their knowledge of atomic structure studied in	**Bioenergetics (Biology)** Students will build on their knowledge of photosynthesis and respiration from KS3,

	periodic table. The properties of metals and non-metals have also been studied. Pupils will now use this knowledge to develop a more complex and in-depth understanding of atomic and electronic structure, the periodic table and how elements are grouped. The knowledge students gain in this topic will support them to develop understanding of more complex ideas in Chemistry. **Energy (Physics)** Students have learnt the main energy stores and pathways at KS3, as well as the concept of conservation of energy. Here they will use their knowledge from KS3 to support them to learn about energy stores and transfers in more detail, including calculating energy stores and explaining more complex energy transfers. The knowledge gained in this topic will support learning throughout KS4 and beyond, as energy is a fundamental principle of science. **Cells (Biology)** In KS3, pupils learnt the basic structure of plant and animal cells. They also learnt how to use a microscope to view cells. Here, students will further develop their knowledge of cells to include eukaryotic and prokaryotic cells, cell specialisation, mitosis and the cell cycle. Students will deepen their knowledge of apparatus and techniques, to learn how to prepare slides to view using a microscope and how to calculate magnification. Students will also retrieve their particle model knowledge from KS3, to understand the different methods of transport in cells. Students will use their knowledge of cells to support their learning of complex ideas in Biology.	filtration, chromatography and simple distillation. Here, students develop their knowledge of separating mixtures to include identification of substances from chromatography and fractional distillation. This supports students with learning in future topics such as chemical changes, where a knowledge of separation techniques is required. **Electricity (Physics)** Students have developed knowledge of series and parallel circuits, including the rules for current and potential difference, Resistance and static electricity in KS3. In addition, earlier in Y10, pupils have developed a deeper understanding of energy transfers. In this topic, students build on this prior learning and extend their knowledge to Ohms' law, the relationship between R, V and I for non-ohmic conductors, domestic electricity, power and the national grid, including associated energy transfers. **Organisation (Biology)** Students have developed an understanding of the basic structure of living organisms and major organs of humans and plants in KS2 and KS3 and an in-depth knowledge of cells in term 1 of Y10. In addition, during KS3, pupils developed an understanding of a balanced diet and deficiency diseases. Throughout KS2 and KS3, pupils have developed an understanding of some common illnesses. This knowledge will be retrieved here to build a deeper understanding of the human digestive system and food testing. In addition, pupils will develop their learning to understand the structure of the heart and associated health problems that can develop. Students will also learn about cancer and how lifestyle factors can affect the risk of getting certain cancers. The knowledge developed here will not only support their learning of future Biology topics but will also support their personal development for the future.	atomic structure, which they learnt earlier in Y10 and in KS3. They will also use their knowledge of metals from KS3 and electricity from KS3 and earlier in Y10. This knowledge will support students to understand how different atoms bond, the properties of different structures and metals as conductors. This forms part of the fundamental principles of Chemistry and students will revisit this knowledge when studying future topics such as acids and alkalis and electrolysis. **Particle Model (Physics)** In KS3, students learnt about states of matter and changes of state, alongside density of solids. Students will also now have a thorough grasp of energy stores and transfers. Retrieving this knowledge, students will be able to deepen their learning of density to include density of liquids. They will also use their knowledge of energy stores and transfers to learn about specific heat capacity and specific latent heat. Finally, particle motion in gases will be explored in more depth The particle model of matter is a fundamental principle in Physics which will support students throughout their study of science and to understand the world around them.	diseases that affect humans in KS3. This topic provides students with a detailed understanding of different types of diseases and the body's defence system as well as vaccines, antibiotics, painkillers and drug development. This unit provides a detailed overview of infection and response in humans, not only supporting students' biological knowledge but also providing them with important information for their lives beyond school. **Quantitative Chemistry (Chemistry)** Students will retrieve and utilise many aspects of prior learning from KS3 and earlier in KS4, including particle model, atomic structure and bonding and chemical reactions, alongside their now more advanced mathematical knowledge to deepen their knowledge and understanding of chemical calculations. This provides students with the ability to analyse chemical reactions and equations with more rigour as they progress through the GCSE course.	Chemistry earlier in Y10, to learn about nuclear radiation, its uses, including medical uses, dangers and radioactive contamination. This topic, as well as providing a grounding in a key area of Physics, also supports students' personal development, ensuring they understand the uses of radiation in everyday life, the risks associated with uses and how these can be minimised/assessed. **Chemical Changes (Chemistry)** Students will retrieve and utilise many aspects of prior learning including particle model, atomic structure and bonding from earlier in Y10, alongside knowledge of acids and alkalis and metals and the reactivity series from KS3. Students will use this knowledge to successfully understand acids and alkalis in much greater depth, while also learning about the complex process of electrolysis for the first time.	alongside their knowledge of energy stores and transfers, to develop a deeper understanding of photosynthesis and respiration. Students will use the knowledge from this topic later in the course to explore aspects of ecology. **Forces (Physics)** Students have learnt about forces and motion at KS3 and will build upon this knowledge and their knowledge of energy transfers and work to gain a deeper knowledge and understanding of forces, including a more formal approach to Newton's laws of motion and the new knowledge of stopping and braking distances and momentum. Force is a fundamental concept in Physics so the knowledge gained from this unit will support students as they learn other aspects of science and will also support their wider knowledge of the world.
CEIAG Links/ Opportunities						