Science

Science Long Term Plan – September 2025

The Orme Academy
EMPOWERING LEARNERS FOR LIFE

LONG TERM CURRICULUM PLANNING OVERVIEW:					
	YEAR 7	**YEAR 8**	**YEAR 9**	**YEAR 10**	**YEAR 11**
Autumn A Topic	B1.1 - Cells C1.1 - Particles	B2.1 – Tissues and Organs C2.1 – Acids and Alkalis P2.1 – Movement and Pressure	B3.1 – Growth and Differentiation C3.1 – The periodic Table	B4.1 – The Digestive System C4.1 – Structure and Bonding P4.1 - Matter	B5.1 – Feedback and control C5.1 – Carbon chemistry
Autumn A Knowledge	B1.1 - Pupils will learn to appreciate how all living things are made of cells which, in some instances, build to form more complex organisms. Pupils will learn more about the processes that occur within all cells, such as respiration and photosynthesis, and within specialised cells. C1.1 - Pupils will start this unit looking at the three states of matter and using the particle model to describe and explain the properties of each. They will then start to consider how substances change state, learning	B2.1 - Pupils will begin this unit looking at the skeletal and muscular system. Pupils will then learn the important relationship between breathing and respiration, exploring how the lungs are adapted for efficient gas exchange before investigating how the composition of air changes as it passes in and out of the lungs. Pupils will use their new learning about the breathing system to explain the effect of asthma, smoking and exercise on breathing. The unit finishes with pupils looking into a	B3.1 - In this unit, pupils will develop their understanding of cell structure and specialisation. Pupils will learn to classify cells as eukaryotic or prokaryotic according to some basic features and revisit the function of the main subcellular structures. Pupils will have another opportunity to use microscopes to investigate cells and learn how scientists now use electron microscopes to study cells in more detail. Pupils will also have the opportunity to investigate bacterial growth using agar and develop their	B4.1 - Pupils will build on their knowledge of organ systems when they study the circulatory system in the following unit. They will revisit the role of the small intestine in the absorption of glucose and learn how this glucose is required by every cell for use in respiration. Pupils will learn how homeostasis ensures conditions for enzyme action remain at an optimum in B5.1 (Feedback and Control). C4.1 - This unit provides the foundational knowledge for many chemistry concepts going	B5.1 - The unit begins with a prior knowledge review, where students should revisit some of the critical prior knowledge for this unit, including the process and importance of respiration, the different organ systems within the body and the levels of organisation, and the link between the structure of a cell/tissue/organ and its function. Students are then introduced to the idea of homeostasis as a whole and why it is important, including the role of the nervous system and the endocrine system.

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	how to explain this in terms of energy and forces of attraction between particles. Pupils will then apply this learning to two situations: diffusion and gas pressure. Finally, pupils are introduced to density.	range of different drugs and how these affect organ systems. C2.1 - This unit introduces pupils to acids and alkalis. They will learn about common acids and alkalis around the home and the use of indicators to assess the pH of a substance. Pupils will also learn about the most important reactions of acids, including neutralisation, reaction of acids, with metals and metal carbonates. A key focus throughout this unit will be the nature of a chemical reaction and how we can represent reactions using word equations. This unit falls under the big idea 'Reactions Rearrange Matter'. It presents an opportunity to develop pupils understanding of chemical reactions in general, as well as applying previous	skills in using aseptic techniques. This unit also introduces pupils to the three main methods of cell transport: diffusion, osmosis and active transport. Pupils will consider how different cells are adapted for efficient exchange and apply their learning about methods of cell transport to different contexts. Pupils will also study cell specialisation and learn how cells divide by mitosis to allow for growth and repair. Pupils will be introduced to cancers as a group of diseases that can arise from uncontrolled cell growth. They will also learn how scientists use stem cells to study and treat different diseases. C3.1 - Pupils will develop their knowledge of atomic structure. They will learn about the nuclear model of the	forward. In C4.1 (Extraction of Metals), students will be introduced to ionic and half equations. The foundational understanding of ionic bonding will help them to understanding how these ions are formed and the proper notation for these. The movement of ions that will be discussed in electrolysis lessons will make more sense following students' learning about the delocalised electrons and them carrying charge throughout a structure. The qualitative chemistry unit later in year 10 will discuss acids and alkalis and the ions that these solutions contain, so this unit will provide foundational understanding to be able to access these ideas too. In year 11, students will learn more about carbon chemistry and hydrocarbons. This unit is	Students will then look at the structure of the nervous system and the reflex arc before looking in more detail at synapses. Students will then carry out the required practical to investigate human reaction time. All students will move from the nervous system to the endocrine system, where they will look at the difference between hormone and nervous responses. C5.1 - Students are introduced to crude oil and hydrocarbons. This lesson forms the basis of the rest of this unit as students will be exploring different types of hydrocarbon compounds, each of which can be traced back to crude oil. In this lesson, students will learn what a hydrocarbon is, and are are introduced to their first homologous series,

		learning about particles, atoms, elements and compounds and word equations for chemical reactions. P2.1 - In this unit pupils will be introduced to speed as a measure of how much distance is covered in a given time and be able to calculate speed using these values. They will also be introduced to changing speeds, including relative motion and acceleration as the rate of change of speed. Pupils will also cover how to draw and interpret distance-time graphs and calculate speed from these. This unit also covers the fundamental ideas of pressure, including applications of pressure where high pressure and low pressure are required, and the equation used to calculate it.	atom, as well as the development of our understanding of the atom, with an overview of some of the key discoveries and scientists that have paved the way so far. Important here also is that pupils understanding that our knowledge of the atom is still evolving now. As part of the learning about the atomic structure, pupils will be introduced to isotopes and the term 'relative atomic mass'. Pupils will study the structure of the periodic table, and the distinct properties of some of the groups within it, as well as the link between those properties and the electronic configurations of the elements. Finally pupils will look at the history of the periodic table and the contribution of Mendeleev.	especially important to understand in order to access these ideas. Knowledge such as the formation of covalent compounds, how structure and bonding relate to properties, how the size of a molecule relates to its melting and boiling point, displayed formulae and polymers are all explored more deeply, and there will be frequent opportunities to link back to this structure and bonding unit. In C5.3 (our Atmosphere) many of the covalent compounds we have studied in this unit will be encountered again, for example as examples of greenhouse gases. Ions will again become important as we look at identifying ions in a laboratory. At A-level, students will develop these ideas even further by exploring organic and inorganic substances, and the formation and	alkanes. As crude oil appears early on, the next lesson delves into the process of fractional distillation, as this is the process that allows us to obtain all the various fractions that are the basis of much of the carbon chemistry that students learn about. From here, students are introduced to alkenes and cracking. Students here build on their new knowledge of alkanes to understand their next homologous series: alkenes. Finally the unit ends by learning about polymers, polymerisation and natually occuring polymers.

				formulation of these in more detail. A knowledge of structure and bonding can be linked to any chemistry topic in future study, and will allow students to make sense of any observations and chemical processes. P4.1 - This topic has links to chemistry, where students will go on to look at the properties of different materials that influence their melting and boiling points, as well as how different materials are suitable for different purposes because of their properties.	
Autumn A Skills	B1.1 Know the difference between a scientific question and a non-scientific question. Define and understand the term 'hypothesis'. Assess risk. Identify names and uses of basic lab equipment. Use models to represent data and other scientific phenomena. Obtain a	B2.1 Measure and observe the effects of forces including the extension of springs. Identify and assess risks to health. Describe representative sampling techniques. Apply representative sampling techniques.	B3.1 Application of aseptic technique. Suggest a hypothesis to explain given observations or data. Obtain a clear image using a light microscope. Prepare a slide with cells for viewing under the light microscope. Use an appropriate number of	Make order of magnitude calculations. Use of appropriate techniques and qualitative reagents to identify biological molecules and processes in more complex and problem-solving contexts including continuous	Observing and measuring biological changes and/or processes, including safe and ethical use of living organisms (humans) Produce clear, labelled scientific drawings Observing and measuring biological changes and/or processes, including safe

	clear image using a light microscope. Recognise and use expressions in decimal form. Read a scale accurately. Use SI units and IUPAC chemical nomenclature. Recognise the importance of scientific quantities. Produce labelled scientific drawings. Describe a practical procedure for a specified purpose. Understand and use mathematical symbols C1.1 Use models to represent data and other scientific phenomena. Safe use of heating devices. Identify in a given context the variable in an investigation. Measure volumes of liquids accurately. Suggest a hypothesis to explain given observations or data. Substitute values into equations using appropriate units. Solve simple algebraic	C2.1 Measure pH, Identify hazard symbols, Assess risk, prepare a salt, write a method, measure volumes of liquids, measure mass P2.1 Calculate mean, median and mode, determine speed, interpret graphs, draw conclusions, plot variables on a graph, calculate area	significant figures. Change the subject of an equation. Calculate areas of triangles and rectangles, surface areas and volumes of cubes. Use percentages. Identify in a given context the variable in an investigation. Measure mass accurately. Identify and assess risks to health. Outline a simple ethical argument. Explain the hazards associated with science based technologies. C3.1 Recognise and use expressions in standard form. Use prefixes and powers of ten for orders of magnitude. Make order of magnitude calculations. Critique and evaluate models. Recognise that scientific methods and theories change over time. Measure pH. Interpret a line (scatter) graph. Understand and use mathematical symbols.	sampling in an investigation. Interpret pie charts Determine the resolution of an instrument Interpret graphs Understand the terms mean, mode and median Calculate percentage increase or decrease. Calculating density Measuring density	and ethical use of living organisms (plants) Visualise and represent 2D and 3D forms including 2 dimensional representations of 3D objects Safe use of equipment to separate mixtures using distillation Recognise, draw and interpret diagrams Use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including gas tests, flame tests, precipitation reactions, and the determination of concentrations of strong acids and strong alkalis.

	equations. Determine densities of solid and liquid objects. Measure mass accurately. Calculate areas of triangles and rectangles, surface areas and volumes of cubes.				
Autumn A Assessment opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.
Autumn B Topic	P1.1 - Forces B1.2 - Reproduction	B2.2 – Respiration and Photosynthesis	P3.1 - Acceleration B3.2 – Human interaction	B4.2 – Circulation and respiration C4.2 – Extraction of metals P4.2 – Energy conservation	P5.1 – Electromagnetic radiation B5.2 – Controlling reproduction C5.2 – Controlling reactions
Autumn B Knowledge	P1.1 - The unit starts with an introduction of the different types of forces (contact and non-contact) and the common examples of each of these. Pupils then learn about balanced and unbalanced forces and practice interpreting force diagrams, before using these ideas to calculate resultant forces.	B2.2 - This unit introduces pupils to biochemistry, beginning with respiration. Pupils will learn the basic processes of aerobic and anaerobic respiration and the role they play in releasing energy for organisms to use. Pupils will be supported to understand the important relationship between	P3.1 - In this unit pupils will learn how the effect of forces on the motion of objects, looking at Newton's First Law and the effects of balanced and unbalanced forces. They will also look at Newton's Third Law and describe forces in terms of actionreaction pairs. Pupils will learn about the differences between	B4.2 - From this unit, students will go on to look at other organ systems in the body, including the nervous system, endocrine system and exrectory system. In this unit students cover coronary heart disease, which will be revisited in B4.4 Health and Disease, where students will look at the differences	P5.1 - This unit covers the topic of electromagnetic radiation and the uses of different waves. It includes the infrared radiation required practical and a review of the observing waves required practical. It contains several pieces of Physics only content, including lenses, ray

	Pupils then build on their knowledge of force diagrams to cover interaction pairs. Pupils are then introduced to Hooke's Law, followed by drag forces and friction, including practical activities for each. B1.2 – In this unit pupils will learn about the different types of reproduction in both plants and animals. They will learn about different processes connected to reproduction including the menstrual cycle and the development of an embryo.	respiration and breathing. Pupils will also consider how humans have utilised the process of fermentation in the production of bread and alcoholic drinks. This unit also introduces pupils to photosynthesis. Pupils will review the organs of the plant and consider how they aid the process of photosynthesis. Pupils will also study nonphotosynthetic plants and consider how plants recycle resources within biomes. Pupils will complete an investigation into the effect of light intensity on photosynthesis, and also carry out their first biochemical test to identify the presence of starch in leaves.	scalar and vector quantities and examples of each, particularly comparing speed and velocity and distance and displacement. They will also learn how to calculate resultant vectors from vectors acting at right angles and how to resolve single diagonal vectors into their horizontal and vertical components. Pupils will also learn about acceleration as the rate of change of velocity and how to calculate it using the change of velocity over time. They will also investigate acceleration themselves including measuring initial and final velocity. They will also learn how to describe motion using velocity-time graphs and interpret these qualitatively and quantitatively. They will also learn how to describe the forces acting	between communicable and non-communicable diseases, correlation and causation and risk factors. C4.2 - This unit begins with prior knowledge review of the reactions of metals, and ions, ionic formulae and ionic bonding. From here, students will learn about the extraction of less reactive metals using displacement reactions. This will also include reference to prior learning, as students have already studied displacement reactions. Here, students will revisit the definitions of oxidation and reduction in terms of reaction with oxygen. At this point, students studying higher tier material will be introduced to ionic and half equations and redox equations, where we will define reduction and oxidation in terms of electrons for this first	diagrams and colour, as well as red-shift and black body radiation. B5.2 - The unit begins with a review of the differences between sexual and asexual reproduction, including for separate science students the advantages and disadvantages of each. This leads into a review of the different types of cell division, mitosis and meiosis, and how they are involved in reproduction. Students will then move from the formation of gametes by the sex organs to the structures and development of the reproductive organs and the changes that occur during puberty. Students will then apply their knowledge of hormones to a specific example, in the control of the menstrual cycle. After looking at the phases of the menstrual cycle,

			on an object based on its motion. B3.2 – In this unit student will learn about the importance of biodiversity and the impact that we have on it. They will consider the causes and effects of pollutants and the problems associated with global warming.	time. This will be aided by the recent review of ions and ionic formulae. Ionic and half equations are first taught outside the context of electrolysis and extraction of metals, so that students are confident in the notation and in interpreting these equations. From here, students will meet the process of electrolysis, building their knowledge of this process over a number of lessons, and completing the required practical in electrolysis. This topic gives students their first opportunity to apply ionic and half equations and to see how they are useful. Students will first encounter electrolysis in principle, then the electrolysis of simple molten ionic compounds, and then the electrolysis of ionic solutions where there are competing ions at each electrode. The end of the unit deals with metals	students will then look at how different methods of contraception can involve hormonal control, as well as other methods, then evaluate the advantages and disadvantages of different methods. Finally, students will look at problems with fertility and possible treatments, again practising the skill of evaluating a treatment based on its advantages and disadvantages. C5.2 - Students have already met the term activation energy and can now put that into the context of a collision being successful. Students then cover the different factors that affect the rate of reaction, each explained in the context of collision theory. From here students look at rate of reaction graphs, using their knowledge of collision theory and the factors that affect rate of

				more generally, lookin at corrosion and its prevention, alternative methods of extraction and recycling metals. Each of these topics links back to previous learning at KS3, especially 'Using resources' topic in year 9 and rusting/reactions of metals. Having learned about the extraction of metals at this point, students can appreciate the energy required to do this, and the scarcity of some ores, and so realise the value of preventing corrosion of extracted metals, and recycyling these where possible to preserve valuable resources. P4.2 - Energy is one of the biggest areas of physics so feeds into almost every other unit that students will encounter during GCSE physics. They will go on to look more at how energy is transferred by waves and by	reaction to draw conclusions from graphs. After rate of reaction graphs, students will go on to understand how they can actually measure rate of reaction themselves, from quantities of reactants used or products made in a given time, preparing them for the two methods used in the required practical. The unit then moves on to reversible reactions and dynamic equilibrium, linking back to knowledge of yield from C4.3. Higher tier students will then look at dynamic equilibrium and Le Chatelier's principle and the effects of changing conditions.

				radiation. At A-Level, students will also go on to look in more depth about how energy is transferred when work is done.	
Autumn B Skills	P1.1 Use SI units and IUPAC chemical nomenclature. Define the terms precise, accurate and valid, and be able to use these terms. Understand and use mathematical symbols. Decide on a suitable scale for the x and y-axis when drawing a graph. Measure and observe the effects of forces including the extension of springs. Identify in a given context the variable in an investigation. Read a scale accurately. B1.2 Produce labelled scientific drawings. Construct and interpret frequency tables and results tables.	B2.2 Identify and assess risk, measure changes, measure time, decide an suitable scales for graphs, identify anomalies	P3.1 Recognise the importance of scientific quantities. Change the subject of an equation. Measure motion, including speed and rate of change. Any anomalous values should be examined. Measure time accurately. Understand that y = mx + c represents a linear relationship. Determine the slope and intercept of a linear graph. Plot two variables from experimental or other data. Understand the significance of area between a curve and the x-axis and measure it by counting squares. B3.2 Use percentages. Understand that whenever a measurement is made,	Assess risk Prepare a slide with cells for viewing under the light microscope Explain why data is needed to answer scientific questions, and why it may be uncertain, incomplete or not available. Reading a scale	Assess whether sufficient, precise measurements have been taken in an experiment. b. Evaluate methods with a view to determining whether or not they are valid. Observing and measuring biological changes and/or processes, including safe and ethical use of living organisms (humans) Produce clear, labelled scientific drawings Interpret the reliability of sources of information Report findings with appropriate tone, format and content for a particular audience Understand simple probability Draw and use the slope of a tangent to a curve as a measure of rate of change

			there is always uncertainty about the result. Use the range about the mean as a measure of uncertainty. Find the mean, mode, and range. Interconvert units. Use an appropriate number of significant figures. Describe a practical procedure for a specified purpose. Identify names and uses of basic lab equipment. Safe use of equipment to separate mixtures using evaporation. Safe use of equipment to separate mixtures using filtration. Safe use of equipment to separate mixtures using crystallisation. Measure volumes of liquids accurately. Measure mass accurately.		calculate percentage increase and decrease.
Autumn B Assessment opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 1 Format: 1 paper Section A - 30 MCQs Section B -	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 1 Format: 1 paper Section A - 30 MCQs Section B -	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 1 Format: 1 paper Section A - 30 MCQs Section B -	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 1	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Mock exam – full GCSE paper 1

	standard and extended response	standard and extended response	standard and extended response		
Spring A Topic	C1.2 – Atoms, Elements and Compounds P1.2 - Space	C2.2 Changing Substances P2.2 - Magnetism B2.3 – Life Diversity	C3.2 – Introduction to Quantitative Chemistry P3.2 - Heating	B4.3 – Plant and material cycling C4.3 – Quantitative Chemistry	P5.2 – Force fields B5.3 – Controlling nature C5.3 – Our atmosphere
Spring A Knowledge	C1.2 - This unit begins by defining some of the most fundamental terminology in chemistry: atoms and elements. Learning this first gives pupils the language and conceptual understanding (along with their prior learning of the particulate nature of matter) to be able to access topics later in this unit. From here, pupils are introduced to the periodic table which houses all of these different types of atoms (elements). Pupils will further explore different types of atoms here by looking at metals and nonmetals and their differing properties. From here, pupils will be introduced to compounds	C2.2 - In this unit, pupils will learn about the nature of chemical reactions. They will learn to interpret a chemical equation which uses symbols, numbers and chemical formulae. Pupils will learn about the Law of Conservation of Mass and to balance an existing chemical equation. Finally, pupils will revisit some chemical reactions from the previous chemistry unit (Acids and Alkalis) to apply their learning about balancing equations to those reactions. This unit sits under the big idea 'Reactions Rearrange Matter'. Throughout this unit, pupils will examine the nature of chemical	C3.2 - At the beginning of this unit, students will be introduced to state symbols in reactions which will then be used throughout the rest of this unit in varying contexts. Following on from the introduction to concentration, students will carry out some basic concentration calculations, using the last lesson's learning to convert between units of volume where required. Students will use the learning of rearranging equations to rearrange the equation where required. P3.2 - In this unit pupil will learn about internal energy of substances and how these are affected by heating. They will learn	B4.3 - The unit starts with a recap of KS3 knowledge about microscopes and leaf structure and function. Then we will learning more detail about the processes of transpiration and tranlocation, learning about the structure and function and function of xylem and phloem. Then the units progresses into greater depth about photosynthesis and the various ways that plants use glucose. This is the applied by looking at limiting factors of photosynthesis and how these can be interpreted using graphs. The maths in science lessons allow recap of how to draw and use graphs and for HT only, inverse square law,	P5.2 - Students begin with a review of the differences between contact and non-contact forces, particularly using magnetism as an example of a non-contact force. They then move on to look at the differences between permanent and induced magnetism, leading into Earth's magnetic field. The unit then moves on to electromagnets and electromagnetism, before moving into applications of electromagnetism, starting with the motor effect and Fleming's left hand rule. All students will then look at the other non-contact force: gravity, starting with a prior knowledge review of the differences

	– the result of two or more elements chemically combining – and will learn about the vast range of compounds that are possible, to create the variety of substances and materials we see (and don't see) around us. P1.2 - This unit begins with developing pupil understanding of the force of gravity, including a review of contact and non-contact forces and the relationship between the force and distance of objects. Pupils then go on to cover the difference between mass and weight using their understanding of gravitational field strength. They then move on to learn about how gravity keeps objects in orbit as well as more detail about our solar system, including using a number of models to represent different phenomena. Pupils then	reactions and the equations we use to represent these, with an emerging understanding that in any chemical reaction the reactant atoms rearrange to form one or more new products. P2.2 - In this unit pupils will learn about the fundamentals of magnetism as a noncontact force. They will cover the different magnetic materials and the rules of attraction and repulsion. They will also learn about magnetic fields and their properties, including how to interpret and draw them. They will also learn the differences between permanent magnets and electromagnets, and how electromagnets can be turned on and off using simple circuits. They will also learn about the factors that affect the strength of an	about the different methods of energy transfer: conduction, convection and radiation and the similarities and differences between each process. They will learn about specific heat capacity and investigate the specific heat capacity of different materials, use the specific heat capacity equation and explain what these different values can tell us about materials. They will also learn about specific latent of heat, both of fusion and vaporisation, and calculate these for a number of different materials. They will also compare the ideas of specific heat capacity and specific latent heat in terms of energy changes.	which support the photosynthesis RP. After students apply the learning so far in the practical investigating photosynthesis rate, they will learn about different types of cycling of materials. Understanding how decay, carbon cycle and water cycle function in ecosystems allows a real life application of the knowledge of photosynthesis and respiration. For TIF lessons, students will learn about plant infections and the implications this has for photosynthesis. Also, TIF lessons include the RP of investigating the rate of decay and biogas generators C4.3 - This unit contains the bulk of quantitative chemistry content, but not all. Quantitative chemistry will be revisited in C4.4 Energy Changes, with key calculations	between mass and weight. B5.3 – Students will then also review genes and alleles in the context of inheritance and inherited disorders, so they can link these disorders with possible medical applications. This understanding of different characteristics and how they are inherited then leads into how humans have used selective breeding for different purposes. Following on from one method of humans controlling genetics, the unit then moves on to look at another method: genetic engineering. Students then revisit stem cells and how scientists can use them in different ways, as well as potential future uses. C5.3 – They will look at the current composition of the atmosphere before

	learn about natural and artificial satellites, applying their knowledge of how objects stay in orbit. Finally, they cover the movement of the Earth itself and the effect of its tilt on seasons, before looking at how the movement of the Earth and the Moon results in eclipses.	electromagnet and investigate these factors for themselves. Pupils will also learn the very basics about how the Earth's magnetic field functions because of the structure of the core and the difference between a geographic north pole and a magnetic north pole. B1.3 - Pupils will begin this unit by learning about the levels of organisation within an ecosystem, before considering how we can use different sampling techniques to study a place in more detail. Pupils will then build upon their knowledge of ecosystems by learning how organisms within an ecosystem rely on each other and their environment for survival. Pupils will finish the unit considering how different organisms compete for survival.		interleaved and percentage yield and atom economy introduced. Quantitative chemistry makes up a large part of A-Level chemistry. The ideas that underpin quantitative chemistry are essential to many different manufacturing processes. These will be reviewed when students meet controlling reactions and carbon chemistry in Y11.	learning about the Earth's early atmosphere and how it has changed over time, and the importance of photosynthesis and evolution in this process. From here students will look at the greenhouse effect and the effect of human activities on the atmosphere, as well as linking to the biological consequences of global warming from prior units. Students will go on to look at the idea of carbon footprint, Finally students will revisit the process of combustion of hydrocarbon fuels and how this is linked to atmospheric pollutants, and the impact of these pollutants. The unit concludes with a lesson where students will look at how humans can reduce their impact, by reducing pollution and increasing the use of renewable energy resources.

		B2.3 This unit introduces pupils to the types of variation and how this leads to diversity under the big idea 'species show variation'. Pupils will learn that variation is caused by inherited characteristics and interaction with the environment. This unit will be the first time pupils learn how different environments exert different selection pressures that result in diversity. Pupils will consider how organisms are adapted to suit the environment in which they live in order that they are able to survive and reproduce. Pupils will also be introduced to human practices that control the selection process in order to produce organisms with desirable characteristics. This unit also introduces pupils to the concept of evolution, allowing pupils to develop an			

		appreciation of how different species change over time. Pupils will also look at examples of when extinction has occurred, before reflecting on how human activity is accelerating the rate of extinction.			
Spring A Skills	C1.2 Find the mean, mode, and range. Recognise and use expressions in decimal form. Draw conclusions from given observations. Measurement of rates of reaction. Assess risk. P1.2 Measure and observe the effects of forces including the extension of springs. Construct and interpret frequency tables and results tables. Substitute values into equations using appropriate units. Solve simple algebraic equations. Construct and interpret bar charts, pie charts and histograms. Decide on a suitable scale	C2.2 Measure mass, measure pH, use reagents to analyse chemicals P2.2 Visualise and represent 2D and 3D forms, including 2 dimensional representations of 3D objects. Select the best procedure from given options. Identify in a given context the variable in an investigation. B2.3 present data, use fractions, use percentage, calculate percentage increase and decrease	C3.2 Use percentages. Understand that whenever a measurement is made, there is always uncertainty about the result. Use the range about the mean as a measure of uncertainty. Find the mean, mode, and range. Interconvert units. Use an appropriate number of significant figures. Describe a practical procedure for a specified purpose. Identify names and uses of basic lab equipment. Safe use of equipment to separate mixtures using evaporation. Safe use of equipment to separate mixtures using filtration.	Change the subject of an equation Safe use of appropriate apparatus to measure energy changes/ transfers and associated values such as work done Construct and interpret bar charts, pie charts and histograms Use percentages Calculate percentage increase and decrease. Prepare a slide with cells for viewing under the light microscope Measurement of rates of reaction by a variety of methods including production of gas, uptake of water and colour change of indicator. Draw a line of best fit	Recognise and use expressions in standard form Understand the importance of control experiments. Explain why data is needed to answer scientific questions, and why it may be uncertain, incomplete or not available. Decide whether or not data supports a particular theory Comment on the extent to which data is consistent with a given hypothesis. Interpret a line (scatter) graph Describe mathematical relationships in terms of proportionality

	for the x and y-axis when drawing a graph.		Safe use of equipment to separate mixtures using crystallisation. Measure volumes of liquids accurately. Measure mass accurately. P3.2 Change the subject of an equation. Any anomalous values should be examined. Measure temperature accurately.	Determine the slope and intercept of a linear graph	
Spring A Assessment Opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit.
Spring B Topic	B1.3 - Interdependence	B2.3 – Life Diversity	B3.3 - Genetics	P4.3 - Movement	B5.4 - Evolution C5.4 – Chemical analysis
Spring B Knowledge	B1.3 - Pupils will begin this unit by learning about the levels of organisation within an ecosystem, before considering how we can use different sampling techniques to study a place in more detail. Pupils will then build upon their knowledge of ecosystems by learning how organisms within an ecosystem rely on each	B2.3 - Pupils will begin this unit learning about variation. They will consider how variation is affected by both the environment and heredity, how DNA controls inherited characteristics, and how variation can be either continuous or discontinuous. Pupils will have the opportunity to investigate variation	B3.3 - Students will take their knowledge of sexual and asexual reproduction further by considering the advantages and disadvantages of each method. They will be introduced to the process of meiosis and how this gives rise to the gametes of different organisms. Students will develop their understanding of the natural polymer,	P4.3 - Following on from this unit, students will continue to make links between forces and work done in the P4.2 unit on energy conservation. At A-Level, students will look at more complex mechanics, including vectors and projectile motion.	B5.4 – All students will then use their understanding of variation and adaptations to learn about the process of natural selection and how it results in evolution over time. Students will look at evidence for evolution, and fossils, before looking at fossils and their formation in more detail. This is closely linked with

	other and their environment for survival. Pupils will finish the unit considering how different organisms compete for survival.	amongst their peers. Pupils will then learn about artificial selection as a way of controlling variation, before studying natural selection. Pupils will finish this unit learning about how natural selection gives rise to evolution	DNA, and its structure. Students will have the opportunity to explore the basics of protein synthesis, and how mutations alter the shape of proteins (separate science students will study these concepts in more detail at the end of the unit). Students will be introduced to Mendelian Inheritance and develop an understanding of how different combinations of alleles result in different characteristics. Students will learn about particular genetic disorders, and use Punnett squares and family trees to describe inheritance in terms of probability.		extinction. Combined science students will finish with classification, looking at how understanding of species and their formation has changed over time. C5.4 – Students will then move on to pure substances and formulations as useful mixtures, linking back to how useful materials can be created in chemistry for different purposes. From looking at specific mixtures, students will then go on to look at methods of separation in more detail, specifically distillation and chromatography. When looking at distillation, students will review the process of fractional distillation from carbon chemistry, and the importance of different boiling points of substance, which links with the difference between pure and

					impure substances. Students will carry out the chromatography required practical, focusing on the analysis elements, which is the basis of this unit on chemical analysis. After students have looked at chromatography as a method of analysis, they will move on to chemical analysis tests, with testing for gases, of which testing for carbon dioxide and hydrogen should be a review. Separate science students will then move on to look at testing for different ions, starting with the different methods for identifying cations through flame tests and reactions with sodium hydroxide solution. They will then look at tests for anions, before finishing with a summary of chemical analysis and the use of instrumental methods of analysis.

Spring B Skill	B1.3 Construct and interpret bar charts, pie charts and histograms. Describe representative sampling techniques. Apply representative sampling techniques. Interpret a line (scatter) graph. Plot two variables from experimental or other data. Draw a line or curve of best fit. Find the mean, mode, and range.	B2.3 Construct and interpret frequency tables and results tables. Use fractions. Use percentages	B3.3 Use prefixes and powers of ten for orders of magnitude. Recognise that scientific methods and theories change over time. Use fractions. Use ratios. Understand simple probability. Explain the hazards associated with sciencebased technologies.	Use ratios Use SI units Preparation of a pure dry sample of a soluble salt Measure volumes of liquids accurately Change the subject of an equation Measure motion, including determination of speed and rate of change of speed Measure and observe the effects of forces including the extension of springs	Understand the principles of sampling as applied to scientific data Application of aseptic technique Explain why data is needed to answer scientific questions, and why it may be uncertain, incomplete or not available. Identify which of two or more hypotheses provides a better explanation of observations. correlation vs causation Interpret the reliability of sources of information Safe use of equipment to separate mixtures using evaporation Safe use of equipment to separate mixtures using chromatography Define and undertand the term hypothesis. Know the difference between a scientific question and a non-scientific question (a

					question that science can answer). Describe, suggest or select the technique, instrument, apparatus or material that should be used for a particular purpose, and explain why Select the best procedure from given options
Spring B Assessment opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 2 Format: 1 paper Section A - 30 MCQs Section B - standard and extended response	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 2 Format: 1 paper Section A - 30 MCQs Section B - standard and extended response	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 2 Format: 1 paper Section A - 30 MCQs Section B - standard and extended response	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Formative assessment 2	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Mock exam – full GCSE paper 2
Summer A Topic	C1.3 - Mixtures P1.3 – Energy Transfers	C2.3 – Earth Systems P2.3 – Electric Circuits - Resistance B2.4 - Nutrition	C3.3 – Using Resources P3.3 – Sound and Waves	B4.4 – Health and disease C4.4 – Energy changes P4.4 – Electric circuits	
Summer A Knowledge	C1.3 - This unit begins by defining and describing mixtures and solutions. This forms the foundation for the rest of the unit, which focuses on the separation of mixtures and solutions. The	C2.3 - This unit introduces two of Earth's main systems; the water cycle and the rock cycle. Pupils will learn about the different types of rock and how they are cycled. They will also learn about	C3.3 - This unit covers how humans use different resources from the Earth, including metals, different materials and water, including the importance of water as a resource,	B4.4 - The unit starts with a prior knowledge review, before an introductory lesson on staying healthy and what makes a healthy lifestyle, which should also mostly be revision from KS3.	

	separation techniques increase in complexity, starting with decanting and evaporation, and concluding with chromatography which also has a quantitative element to it. P1.3 - This unit begins with an introduction to energy. Students will then learn how energy can be stored and carried. A lesson here on energy in food, brings a familiar context in for students to apply their learning to. Now that students have a basic understanding of the nature of energy, the second part of this unit focuses on the efficiency of transfer of energy between stores, with a quantitative aspect. The 'wasted' energy often dissipates as heat into the surroundings, and this fact leads nicely into the final portion of the unit where students explore	the processes involved in the water cycle, and build on their knowledge of respiration and photosynthesis, as well as other life processes to explain why water is such an important molecule. Pupils will also be introduced to the idea of pollution, which will be a recurring topic throughout chemistry, biology and physics. P2.3 - This unit brings together previous learning from P1.4 electrical circuits, focusing on the relationships and calculations of Ohm's Law. In later units pupils will look at applications of electricity in real life, such as mains electricity and different energy resources. They will also revisit circuits in more detail in P4.2, including current, resistance and potential difference and calculating these from	how potable water is obtained, and how water can be tested. The second half of the unit introduces different resources that can be obtained from the Earth, with a particular focus on our responsibility to source these in a sustainable way. Pupils will be expected to be able to use life cycle assessments to determine the environmental impact of a material or product, and also to consider the advantages and disadvantages of various methods of disposal for waste. P3.3 - This unit starts with the different types of wave, comparing longitudinal and transverse waves with examples of each. From here pupils will go on to study the properties of waves, including amplitude, wavelength and frequency. Students	Students will then look in more detail at specific risk factors and the diseases associated with them, as well as the difference between correlation and causation. From looking at disease and health in general, students will then move on to looking at the difference between communicable and non-communicable diseases, different types of communicable diseases and different methods of transmission. Students will then look at methods used to reduce transmission, as well as the general defence responses of the body and the more specific immune response. Students will then look at the function of vaccinations, followed by antibiotics as methods of preventing the spread of communicable diseases. Separate science students will also look at how to culture bacterial colonies,	

	heat, thermal energy and temperature.	different circuit diagrams. They will also build on their understanding of current and voltage to learn about power, energy transferred and charge, including equations P=IV and E=VQ. B2.4 - This unit underpins future learning about enzymes at KS4, where pupils will consider how their action is affected by temperature and pH. They will use their knowledge of biochemical tests again when they study the effect of temperature or pH on amylase activity. The understanding they gain about plant nutrition here will be built upon when they consider the use of fertilisers to support plant growth as part of B4.2.	will then use wave properties and the wave equation to calculate the velocity or frequency of different waves, which helps them to understand the physics of refraction in more detail.	as well as how to measure the effectiveness of antibiotics, before all students move on to antibiotic resistance and the danger it poses. Finally, students will look at the stages involved in drug development. Separate science students will also look at the functions of monoclonal antibodies and evaluate their therapeutic use. C4.4 - This unit begins with the prior knowledge review of chemical reactions and the ideas of conservation of energy and conservation of mass. Students are already familiar with the Law of Conservation of Energy, and have discussed energy transfers in physics. Chemistry only students begin with interleaved lessons from the quantitative chemistry unit, to spread the	

				practice particularly of calculating reacting masses, which is reviewed in the percentage yield lesson. Chemistry students also look at atom economy and how scientists decide which reaction to use. Combined students begin with an introduction to exothermic and endothermic reactions, linking to prior knowledge of energy conservation. In these lessons, we will apply that learning to a chemical context, and ensure that students are thinking about energy in reactions in the correct way, and using the correct language - which can be tricky to navigate. From here, students studying higher tier material will look at the chemical ideas more closely, with a focus on bond energies and why these energy changes occur, zooming in on the molecular scale, again	

				linking to the quantitative elements. The required practical lessons measure temperature changes and apply student observations to the science learned so far in this unit. By sequencing the unit in this way, students should now have the language required to hypothesise, analyse and draw conclusions and evaluations of a higher quality, and link these to scientific ideas. The unit concludes with two chemistry only lessons on batteries and fuel cells. These offer an opportunity to apply the learning from earlier in the unit to a different context. They also give an opportunity to link back to prior learning that is often tricky for students: half equations/ionic equations. P4.4 - This unit starts with a prior knowledge review	

				lesson, focusing on complete and incomplete circuits and the basics of series vs parallel circuits, as well as the concepts of current and potential difference. From here, students continue to review prior learning with a revisit to resistance, including Ohm's Law and resistance in series and parallel circuits. Students then complete the practical activity on resistance in a wire, developing their skills in using circuit equipment and ensuring they are secure on how to take measurements using an ammeter and voltmeter. From here, they start to look at different circuit components, including Ohmic and non-Ohmic conductors. They will complete the practical activity looking at different circuit components and the characteristics these produce on IV graphs.	

				Students will then move on to calculating power from current, voltage and resistance, which is partly a review from P3.4 and partly new content (with the introduction of the P=I2R equation). They then have more opportunities to practice using multiple equations, both from scenario-based written questions and pulling information from circuit diagrams, as well as revisiting some ideas behind energy transfers in appliances and the function of different appliances. Finally, students finish the unit with a lesson that is an opportunity to review using all the electricity equations and apply them to previous learning of the National Grid.	
Summer A Skill	C1.3 Measure temperature accurately. Plot two variables from experimental or other data. Assess risk. Identify	C2.3 Use a microscope, use models to present data, calculate density, evaluate models	C3.3 Safe use of equipment to separate mixtures using filtration. Safe use of equipment to separate mixtures using	Identify and assess risks Explain that the process of peer review helps to detect false claims	

	names and uses of basic lab equipment. Safe use of equipment to separate mixtures using evaporation. Produce labelled scientific drawings. Describe the technique or apparatus that should be used for a particular purpose. Safe use of equipment to separate mixtures using filtration. Safe use of heating devices. Safe use of equipment to separate mixtures using distillation. Measure volumes of liquids accurately. Safe use of equipment to separate mixtures using chromatography. Select the best procedure from given options. P1.3 Interconvert units. Construct and interpret bar charts, pie charts and histograms. Safe use of appropriate apparatus to measure energy transfers.	P2.3 Use significant figures, describe mathematical relationships, measure current, potential difference in a circuit, draw circuit diagrams, use fractions B2.4 Identify and assess risk, identify lab equipment, use heating devices safely, describe sampling techniques, evaluate models, evaluate strengths and weaknesses, draw a line of best fit, suggest a hypothesis.	distillation. Understand that whenever a measurement is made, there is always uncertainty about the result. Use the range about the mean as a measure of uncertainty. Use technology such as MS Excel and data loggers to generate a graph of results digitally. Measure pH. Understand the terms mean, mode and median. Cite sources of information. Interpret the reliability of sources of information. P3.3 Visualise and represent 2D and 3D forms, including 2 dimensional representations of 3D objects. Relate derived quantities with the formulae to calculate those quantities. Making observations of waves in fluids and solids. Measure motion, including speed and rate of change.	Application of aseptic technique Understand the importance of control experiments. Use models to represent data, events, processes, behaviours and other scientific phenomena, Evaluate methods with a view to determining whether or not they are valid. Measure temperature accurately. Use an appropriate number of significant figures.	

	Substitute values into equations using appropriate units. Recognise and use expressions in decimal form. Solve simple algebraic equations. Plot two variables from experimental or other data. Use SI units and IUPAC chemical nomenclature. Measure temperature accurately. Define the terms precise, accurate and valid, and be able to use these terms.				
Summer A Assessment opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit
Summer B Topic	P1.4 – Electric Circuits – Current and Potential Difference	P2.4 - Light	P3.4 – Home Electricity	P4.5 - Radioactivity B4.5 - Ecology	
Summer AB Knowledge	P1.4 - This unit starts with a bigger picture view of models of electricity, looking at electrical circuits as a whole, as a pathway by which energy is transferred. Pupils are then introduced to the	P2.4 - In this unit pupils will be introduced in more detail to how light travels, including covering the basics of the processes of refraction and reflection and pupils will learn to draw and	P3.4 - In this unit, students will study mains electricity and its transfer to where we need it. This includes learning about alternating and direct current, the different wires within circuits in the	P4.5 - This unit starts with a review of content from C3.1, which is the shared phsyics and chemistry content on the structure of the atom. This recap of the structure of the atom and the development of	

	two different types of circuit, drawing on their understanding of models of electricity. Then pupils are introduced to current as the rate of flow of charge, using the current, charge and time equation. Following on from this pupils then learn to represent electrical circuits using the correct diagrams and circuit symbols, before finally applying this to working with practical circuits.	interpret simple ray diagrams. The unit also covers the fundamentals of how light reaches the retina, including comparing the shape of the lens and cornea in human eyes, to understand examples of refraction in real life. Pupils will also look at the similarities and differences between the eye and a camera. Fianlly pupils will cover the relationship between primary colours of light and white light, and how we are able to see light.	home, and the wiring and design of plugs. They will learn about how the cost of electricity is calculated, and how this links to the power of and energy transferred by, appliances. From here, students will look at the generation of electricity and the various energy resources available to us. They will learn about the transport of that electricity to our homes via the National Grid, including the importance of step up and step down transformers. Finally students are introduced to static electricity.	atomic theory is covered first so that students have been refamiliarised with the idea of isotopes. This will feed directly into the first lesson of new content, where students will look at what radioactivity is, and the different types of radiation that can be emiited. They will then use their knowledge of the types of radiation to write nuclear equations, consolidating their understanding of the properties of each type. From here they will look at half-life, before finally looking at the different uses of radioactivity, as well as hazards and precautions of using radioactivity. The final lesson is a taking it further lesson on nuclear fission, where students can have further practice of writing nuclear equations from stages in the reaction. This lesson also introduces nuclear	

				fusion, but this will be revisited in the Y11 units of space and the formation of stars. B4.5 - The first lesson in this unit is the prior knowledge review unit which focuses on biodiversity from B3.2. Students then move onto the levels of orgaisation in an ecosystem before looking at the different biotic and abiotic factors that can affect a community. From there they will look at adaptations and how different organisms are suited to deal with the biotic and abiotic factors in their environment. Building on understanding of adaptations leads into food chains and food webs, where students look at the interactions between plants and animals in more detail, leading into predator-prey relationships, where	

				students will look at how these relationships run in cycles and the adaptations that different predators and prey have. From here, students will carry out the sampling required practical, with a dedicated lesson afterwards that focuses on the maths skill of estimating a population size. Biology only students will then look at how sampling can be used to measure the impact of environmental change. Finally biology only students will review some content from B3.2 that can now be applied to their deeper understanding of relationships within an ecosystem.	
Summer B Skills	P1.4 Use models to represent data and other scientific phenomena. Visualise and represent 2D and 3D forms, including 2 dimensional representations of 3D objects. Use of circuit	P2.4 Make observations, measure and calculate angles, draw ray diagrams, draw a line of best fit.	P3.4 Change the subject of an equation. Interconvert units. Safe use of appropriate apparatus to measure energy transfers.	Use of appropriate apparatus to measure current, potential difference (voltage) and resistance Use of circuit diagrams to construct and check series and parallel circuits	

	diagrams to construct and check series and parallel circuits. Use of appropriate apparatus to measure current, potential difference and resistance. Select the best procedure from given options.			including a variety of common circuit elements Decide whether or not data supports a particular theory Use fractions Understand simple probability Critique and evaluate models. Calculating percentage increase Describe representative sampling techniques	
Summer B Assessment Opportunity	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Summative assessment Format: 2 papers 2 x 45 mark paper, standard and extended response	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Summative assessment Format: 2 papers 2 x 45 mark paper, standard and extended response	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit papers 3 x 45 mark paper, standard and extended response (Bio. Chem and Physics)	AfL throughout each lesson. Exit ticket at the end of each lesson. Mastery quiz at end of unit. Full GCSE exam – paper 1	