Long term plan: Big Questions / Core Concepts

Oasis Sholing Science – Legacy Curriculum.

Big Questions

We have structured our curriculum around the most significant concepts in science and mapped students' development of these concepts through lesson sequences and topics. To give our curriculum a deeper structure when designing it we have thought about how students knowledge of those concepts enables them to answer our "big questions" in greater depth. This enables our teachers to think about both deepening students knowledge of concepts and developing meaningful connections between those key concepts. Our big questions have been developed from the ASE and Royal Societies project and are closely linked to the idea of the "big ideas" of science.

Biology	Chemistry (& Earth Science)	Physics
What are living things made of? Core concept: Cellular basis of life **How do organisms grow and reproduce?** Core concept: Inheritance. *secondary concepts: growth and reproduction* **Why do organisms depend on each other and their environment?** Core concept: interdependence **Why are living things so diverse?** Core concept: evolution **What keeps organisms healthy?** Core concept: health	**What are substances?** Core concept: substances **What gives substances their properties?** Core concept: bonding **What is chemical change?** Core concept: chemical change **How does chemistry affect our world?** Core concept: chemical earth **What is the Earth made of and how is it changing?** Core concept: dynamic earth	**What is matter?** Core concept: matter **Why do things move and change?** Core concepts: force and energy **How does information and energy spread?** Core concepts: waves (and energy) **What is electricity and magnetism?** Core concept: electromagnetism **Where are we in space?** Core concept: space

The national curriculum, and AQA exam specifications, for science set out a body of target knowledge which is very broad. Our curriculum aims to help students scaffold this breadth of knowledge by structuring KS4 content around a firm foundational understanding of how our core concepts provide meaningful answers to our big questions. Our KS3 (Y7-Y9) establishes a deep understanding of each question and our KS4 enriches these answers using the breadth and detail of the AQA exam specification. We aim for students to leave school having retained the ability to explain and expand the following answers to our questions long after their GCSE exams have been passed. We have written end point answers to each big question, this is what we want all our students to be able to know and answer about that big question when they leave Oasis Sholing. For each unit end points are identified, this is what we want our students to have learnt about that big question by the end of that specific unit building upon their prior knowledge. End points and further information can be found in our departments statement of intent document.

Long term plan: Principles of Progression

Principles of Progression:

Our curriculum is designed to ensure that our students are knowledgeable. Our curriculum is well-sequenced around a series of big questions starting from students' own experience of the world and moving towards a more developed scientific understanding. Over their science education, students will build up their knowledge of the most significant concepts in biology, chemistry, and physics.

- **Secure Substantive Knowledge**: we believe that if they have secure substantive knowledge, they will feel confident in explaining the key scientific principles that govern everything that occurs within our universe. Concepts are revisited throughout their curriculum to ensure that students engage with the most important concepts in a range of applications and contexts.
- **Experience of phenomena**: we feel it is important that students experience many of the phenomena they are studying. The tacit knowledge they gain strengthens and reinforces their declarative knowledge as they move through the curriculum. Experiencing phenomena also provides opportunities for students to challenge the existing models by making and justifying predictions.
- **Develop Disciplinary Knowledge**: we also want to ensure that students have mastered the disciplinary knowledge – they understand and have some experience of what it means to be 'a scientist'. We feel it is important that this is taught alongside the substantive knowledge so that students understand how substantive scientific knowledge has been developed over time.
- **Investigative and practical skills**: structured into our units are opportunities for students to carry out investigative work into the concepts they are studying. Students complete work accurately and precisely in order to develop their procedural knowledge of the scientific method, giving deeper meaning to their understanding and providing students with the foundations to study science at a higher level.
- **Secure subject specific literacy**: We want to ensure that students are equipped with a wide range of scientific vocabulary, an understanding of how scientific ideas are presented and communicated and an opportunity to engage in discussions within the curriculum and at home so that they are able to communicate their ideas effectively.
- **Link the 'Big Questions' in science**: over their science education, students will build on this knowledge in order to gain a deeper understanding of the big, overarching ideas in biology, chemistry and physics. From understanding that all material in the universe is made of very small particles, to the concept that energy cannot be created or destroyed to the key ethical arguments governing science; knowledge is constructed and deepened from the foundations up.
- **Concrete examples and real life contexts**: students have the opportunity to practise application of knowledge to meaningful real life contexts so that we ensure it is flexible and that they can apply it to a range of different situations & scenarios both within the classroom and more importantly, their real lives.

Long term plan: Disciplinary Knowledge

Disciplinary Knowledge

Embedded into our curriculum plans are explicit opportunities for students to develop their disciplinary knowledge of science. We have sequenced how students develop their sense of how the three disciplines of science work around discipline specific concepts. These concepts and end points are based upon those suggested by the royal society of chemistry, royal society of biology and IOP's work on developing curriculum frameworks. We have also referenced relevant procedures and techniques in our sequencing as set out in the national curriculum and GCSE specifications. Disciplinary knowledge end points for each of the three sciences and 'how science works' can be found in our statement of intent.

Our curriculum is designed to ensure students have the disciplinary knowledge to be 'good scientists'. This includes:

- **Knowledge of methods for answering scientific questions**: a secure knowledge of the different ways that scientists investigate scientific questions so that students will be able to decide on appropriate methods of investigation that will enable them to test predictions and evaluate scientific theories for themselves.
- **Knowledge of apparatus and techniques**: students will have experience of using a range of different pieces of apparatus and techniques so that they can decide on the most appropriate and evaluate their use in different scenarios in terms of safety, accuracy, precision, and errors.
- **Analyse data**: students should be able to analyse data gathered or shared with them using a range of mathematical techniques, tables, and graphs. They should be able to discuss repeatability and reproducibility of findings and potential sources of error and bias so that they are able to discern between fact and error and justify and communicate their conclusions effectively.
- **Apply mathematical concepts**: students will be able to apply mathematical concepts, conventions, and skills to identify patterns and describe phenomenon quantitatively.
- **Use standardised units**: students will be able to use standardised units effectively and perform appropriate calculations.
- **Respectful conversation**: the curriculum will create a space for students to engage in respectful conversation around challenging topics which enables them to develop their understanding of the complexity of decisions made within the field of science and how scientific advances have had an impact on the future of our planet.
- **Continuously evolving**: students will understand that scientific theories, laws, models and methods change over time to take into account new evidence.
- **Impact of science on us, our local and global communities**: students should be able to explain the contribution of science to our past and it's role in our future. They should be able to use their knowledge of science to make well-informed decisions that impact themselves and their local and global community and be able to communicate and justify these to those around them.

Long term plan: Topic overview

This sequence is being taught to years nine, ten and eleven in 2023-24. The Year seven and eight part of this sequence is no longer delivered as our current year seven and eight are on our new curriculum sequence (please see our other the long term plan document for these year groups). A more detailed breakdown on learning in year 7 and 8 is available if requested. Unit numbering starts from the beginning of Y9 with previous content shown in a summary document

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year nine					
C1	C2	P1	P2	B1	B2
Year ten					
B3	B4	P3	P4	C3	C4
Year eleven					
C5	B4	B5	P5	REVISION	

Legacy Year 7 Long term plan

Chemistry	*Our legacy year seven sequence started with a skills unit before covering the basics of separation techniques and looking at atoms, elements and compounds.* • Describe the three states of matter & link these to the properties of substances (inc. changes of state, melting and boiling points, Brownian motion & types of transport) • Describe atoms, elements, compounds and mixtures and know the symbols and formula for these. • Describe the structure of an atom (electrons, protons & neutrons) • Describe the difference between physical and chemical reactions • Describe the four separation techniques (filtration, crystallisation, simple distillation & chromatography) • Describe the structure of the periodic table (inc. the properties of metals and non-metals)
Biology	*Our legacy year seven biology sequence started by looking at the classification of organisms before moving on to food webs. The second term of biology work looked at microscopes and cells before studying specialist cells and levels of organisation* • Describe the 5 kingdoms and the classes of vertebrates and classify organisms using classification keys • Link organisms using food chains & food webs and use this to describe the impact of one organism on another (including increases and decreases in numbers & competition) • Describe the environment and habitats of different organisms • Describe the key parts of a microscope • Compare and contrast animal and plant cells and prokaryotic and eukaryotic cells • Describe the features of key specialised cells in the body (and stem cells) • Link cells, tissues, organs and systems in terms of size.
Physics	*Our legacy year seven physics sequence started with force and energy before looking at motion using distance-time and velocity-time graphs* • Identify the different types of forces • Explain the impact of balanced and unbalanced forces on an object • Calculate speed and interpret distance time graphs and velocity time graphs. • Describe the different energy stores and how energy can be transferred from one store to another • Describe efficiency and how energy can be lost during different energy transfers

Disciplinary knoweldge developed:

Students learnt how to: Define the three types of variable and identify them in a range of scenarios. They talked about accuracy and explained how this can be achieved in an experiment. They learnt how to use a microscope to examine plant and animal cells. Students studied classification in biology and chemistry (e.g. organisms into kingdoms/classes & substances into solids, liquids and gases or elements, compounds or mixtures).

Students also completed some simple investigations and learnt how to follow a simple method and select appropriate equipment for different separation technique

Analysis of data: Students learnt how to draw simple graphs to represent data (bar charts, line graphs with scales provided) and how to describe the relationship shown on a graph (distance-time or velocity time as examples)

Legacy Year 8 Long term plan

Chemistry	*Our legacy year eight sequence started by looking a the periodic table before studying chemical reactions. It finished with Earth science – covering the Earths structure and the formation of different rock types.* • Describe how elements are organised in the periodic table and common properties • Describe exothermic and endothermic reactions • Describe how to test for oxygen, carbon dioxide and hydrogen • Describe common reactions (metal & oxygen, metal & acid, combustion, acid & hydroxide and acid & carbonates) and write simple word & symbol equations for these • Rank metals in terms of reactivity • Describe the composition of the earth & some properties of each rock type.
Biology	*Our legacy year eight biology sequence started with food groups and digestion before looking at plant adaptions for photosynthesis. Our second term of biology looked at other human organ systems, building up to look at respiration. It finished by looking at different pathogens and how vaccinations and antibiotics could prevent or cure diseases.* • Describe the key food groups and the impact of balanced and unbalanced diets • Describe the key organs in the digestive food & explain the digestion of food. • Describe photosynthesis and explain how a plant is adapted for this process. • Describe the lungs & the processes of breathing & gas exchange • Compare aerobic and anaerobic respiration • Compare communicable and non-communicable diseases and how our body, life choices and immune system can protect us from these.
Physics	*Our legacy year eight physics sequence started with sound and light, including both reflection and refraction. The second term of physics focused on circuits before concluding with a series of lessons on magnets and electromagnets* • Describe how sounds are produced, travel and are heard. • Describe how light can be reflected and refracted giving examples in everyday life & drawing ray diagrams. • Classify items as conductors and insulators • Draw simple circuits identifying components • Describe how current & potential difference can be measured & predicted in a series and parallel circuit. • Describe the properties of magnets and draw magnetic fields.

Disciplinary knoweldge developed:

Students learnt how to: use standardised units for different measurements, write and test predictions, draw conclusions from data. They also learnt how to draw ray diagrams to represent investigations and how to draw circuit diagrams and diagrams of magnetic fields.

Students also completed some simple investigations and learnt how to follow a simple method and select appropriate equipment for different separation technique

Analysis of data: Students learnt how to identify anomalies, rank things in order by measurements of a property, draw simple graphs and analyse a line graph

Year 9 Long term plan: Chemistry

Narrative
Year 9 begins by exploring the arrangement of particles in a solid, liquid and gas and relate use this knowledge of their arrangement to explain properties such as boiling point and density. They will then learn about the differences between pure substances and mixtures and investigate how substances can be separated based on properties such as boiling point. Students zoom in on these particles and begin to learn about the structure of atoms and the properties of the proton, neutron and electron. Students will revisit the idea of changing theories by exploring the timeline of how our current model of the atom was developed where they look in more depth at the work of Rutherford and the alpha particle scattering experiment. Students will then learn about the different isotopes that exist and use this knowledge as a foundation for understanding what relative atomic mass is, building on their knowledge of atomic structure to calculate things such as relative atomic mass. Students learn how the periodic table has changed over time due to the work of Mendeleev. This will lead students to begin to explore different groups in the periodic table and learn about the patterns of chemical and physical properties that exist within groups. Students will build on their earlier knowledge of atomic structure to explain these patterns. In Autumn 2, students start learning about ionic, covalent and metallic bonds. How each is formed and represented using different models.. Students will be introduced to the mole as a unit of measurement. We explore reactions of metals in detail and how to use knowledge of word and symbol equations to represent these reactions. Students will be introduced to the definitions of acids, alkalis and bases and apply their earlier knowledge of equations to represent neutralisation. Finally, students will learn about the reactivity series of metals and apply this to large scale industrial processes used to extract meals such as electrolysis.

Unit	C1	C2
Unit title	Chemistry Fundamentals	Investigative Chemistry
Big question/ core concept	What are substances? Core concept: Substance	What gives substances their properties? Core concept: Bonding
Relevant end points	✓ Most materials are mixtures of substances. ✓ Materials made of single substances have distinct properties. ✓ Substances can be classified into different groups by their properties and structure ✓ Substances are made of atoms, which have a structure made up of subatomic particles. ✓ The periodic table arranges elements in increasing atomic number and so elements with similar properties are in groups.	✓ All matter is made of atoms. The arrangement and bonding between atoms explains a substances properties. Bonding is the result of electrostatic attractions. ✓ Mass is conserved in a reaction and can be shown by a balanced symbol equation. ✓ Acids can react with bases, such as metal oxides and metal hydroxides, to form salts and water. ✓ The reactivity of a metal is due to how easily it forms positive ions. ✓ Passing an electric current through a molten or dissolved ionic compound decomposes it. This is called electrolysis.
Core substantive knowledge	➢ Representing the structure of matter and how substances change state ➢ Difference between pure and impure substances ➢ Difference between an element, mixture, and a compound ➢ Separating mixtures to produce useful substances including crystallisation, distillation, filtration, and chromatography. ➢ The development of the model of the atom over time ➢ The nuclear model of an atom ➢ That atoms can exist as different isotopes ➢ The structure of the periodic table ➢ The trends in properties of group 1, 7 and 0 ➢ How Scientists can determine the identify of various gases.	➢ The bonding between atoms. Including ionic, covalent, and metallic bonds ➢ Properties of ionic compounds ➢ Properties of simple covalent molecules ➢ Properties of giant covalent structures ➢ Properties of metallic substances ➢ Representing chemical change in word and chemical form. ➢ Common metal reactions with oxygen, common acids, water, hydroxide, and carbonates ➢ That neutralisation produces a salt and water. ➢ Method scientists can use to produce pure, dry soluble salts. ➢ That elements can be placed into a reactivity series and knowledge of this is used to displace other elements from their compounds. ➢ Writing ionic half equations for displacement reactions. ➢ Electrolysis can be used to split ionic compounds.
Core disciplinary knowledge	• Chemists use models of the sub microscopic domain of substances to explain the properties and behaviour of substances. • Chemists use a range of unique symbols, formula, nomenclature, diagrams and equations. • Substances can be classified into groups. This enables chemists to identify patterns and trends. • Data from chemical measurements can be used to identify trends. • Provides evidence to test ideas. There are a range of qualitative and quantitative investigative techniques. • Chemistry requires skilled use of specialised equipment. This includes chemical measurement.	

Year 9 Long term plan: Physics

Narrative
In Year 9, students build on ideas of conservation introduced in chemistry and begin to explore the idea of conservation of energy. Students will learn about different stores of energy and how these stores change in open and closed systems. Students will begin to use calculations to represent these changes quantitatively and will use this knowledge to understand the relationship between different variables in an equation. Students will then look more broadly at the Earth's energy resources and evaluate the advantages and implications of using these resources. Next, students will learn how energy is transferred in the form of waves and learn the differences between transverse and longitudinal waves and investigate the reflection and refraction of these waves through different mediums. Students will then learn about the electromagnetic in terms of the differing properties, uses and potential dangers of each wave. In Spring 2, students will start to explore how objects move and how this motion may be changed because of forces. Students will begin by looking at different types of forces and the effects they can have on objects before looking in more detail at weight and gravitational force. Students will learn what a resultant force is, and the role it plays in the motion of objects. Students will apply this knowledge to a range of systems and learn how to represent these forces in free body a vector diagrams. Students will then focus on how the speed and velocity of objects may change over a period of time and analyse graphs representing this motion. Students will then explore each of Newton's laws of motion, applying these to different systems and carrying our calculations to represent the numerical relationships between different quantities. Students will carry out investigations into Newton's third law of motion and Hooke's law and represent their results graphically. Finally, students will learn about momentum and how this impacts our knowledge of safety features.

Unit	P1	P2
Unit title	Energy and Waves	Forces
Big question/ core concept	How does information and energy spread? Core concept: Waves and Energy	Why do things move and change? Core concept: Force and Energy
Relevant end points	✓ Waves, including sound, water and electromagnetic waves transfer energy and information. ✓ Energy stores can be used to predict how much a system can change. ✓ All electromagnetic waves travel at the same speed but their properties and uses depend on the frequency of the wave.	✓ Changing the motion of an object requires a net force to be acting on it. ✓ Calculating the "energy" stored in a system allows us to make predictions about how much change is possible. ✓ Energy is always conserved but some energy is always dissipated into smaller and less useful stores. ✓ Distance time and velocity-time graphs can be used to represent the motion of an object
Core substantive knowledge	➢ Identify energy stores and transfers ➢ Energy cannot be created or destroyed, only transferred. ➢ That energy is transferred when work is done. ➢ Resources humans use to produce energy for consumption including their advantages and disadvantages. ➢ The types of wave motion ➢ Calculating the properties of waves. ➢ The features of the electromagnetic spectrum.	➢ How forces are classified. ➢ How forces work together and against each other including calculating the resultant force acting on an object. ➢ The effect of forces on the motion of objects. ➢ Objects falling reach terminal velocity ➢ Calculating and representing motion. ➢ Newton's Laws of Motion ➢ Factors that affect the stopping distance of a vehicle ➢ Momentum
Core disciplinary knowledge	• Aims for the most fundamental explanations that apply in widest range of situations • Explanations include tests which support or disprove the idea. • Explanations are based on observations and experimental measurements • Arguments are developed from data, discussed and debated • Many explanations use models to think with and use to make predictions • Many models can be expressed as mathematical formulas	

Year 9 Long term plan: Biology

Narrative
In Year 9 students look in depth at different types of cells. Students build the foundation of knowledge to learn how tissues, organs and organ systems are specially adapted to carry out important processes inside living things in year 10. Students will learn the role of mitosis and meiosis in producing new cells and importance of producing cells with the correct number of chromosomes. They are then introduced to stem cells and the important role they can play in research and treatment of disease as well as exploring some of the implications of using them. We learn how the development of the microscope has allowed us to see cells at higher resolution and this has led to a better understanding of how living things function. One example of this is through our knowledge of DNA and the role it plays in inheritance. Students will learn the structure of DNA and explore how DNA is arranged and its role in passing on genetic information to offspring. Students explore the debates about how cloning techniques can be used in research, medicine and in agriculture. We then look at how living things interact through communicable diseases. Students explore how we prevent these pathogens from entering before looking at the role of white blood cells in destroying pathogens that enter. They will also learn about what vaccines are and how they provide us with immunity against diseases. Students will then learn how medicines are discovered and developed through exploring pre-clinical and clinical trials.

Unit	B1	B2
Unit title	Cell Biology	Communicable Disease
Big question/ core concept	What are living things made of? Core concept: Cellular basis of life How do organisms grow and reproduce? Core concept: Inheritance	What keeps organisms healthy? Core concept: Health
Relevant end points	✓ The cell is the basic unit of life from which organisms emerge. Organisms are adapted to survive in their environment. Multicellular organisms have different levels of organisation to maintain the conditions for life ✓ Microscopes can be used to view microscopic samples of organisms ✓ Organisms reproduce by passing their genetic information from one generation to the next. How an organism develops depends on its genome and its environment. ✓ The cell cycle and mitosis produces genetically identical cells for growth and repair. ✓ Meiosis produces genetically different gametes for sexual reproduction.	✓ Health results from interactions between an organism's body, behaviour, its environment and other organisms. ✓ Only diseases caused by pathogens can be infectious ✓ White blood cells fight infections through engulfing and digesting, producing antibodies and antitoxins. ✓ Organisms remember how to produce specific antibodies and can rapidly mass produce them again in the future.
Core substantive knowledge	➢ Differences and similarities between animal, plant and bacterial cells including categorising them as eukaryotic or prokaryotic ➢ How cells can be specialised for a function including examples in plants and animals ➢ Organisation of an organism ➢ Using microscopes to study microscopic organisms including light and electron microscopes ➢ The role of DNA in organisms ➢ How organisms produce new cells for growth and repair through the process of mitosis ➢ Role of stem cells and process of specialisation ➢ Use of stem cells in medical treatment ➢ Process of asexual and sexual reproduction and the advantages and disadvantages of each.	➢ Types and examples of communicable diseases ➢ How bacterial and viral infections make animals feel ill ➢ How our bodies respond to communicable diseases including barrier and immune responses ➢ How vaccinations work and prevent illness ➢ The source and use of different medical drugs including examples ➢ Process of antibiotic resistance and how humans can slow the spread of resistance
Core disciplinary knowledge	• Biologists collect data in a variety of settings including field work. Variables in biology can be difficult to control. • Different biologists study life at different levels. From biological models to population of organisms • Biologists have to carefully consider how specimens are sourced and treated during research • Observations and data can be analysed and interpreted quantitatively and qualitatively • A cycle of collecting and analysing data provides evidence that biologists use to develop and improve explanations, classification systems and models • Biologists communicate about their work with a range of audiences within and beyond the scientific community, to facilitate evidence-informed debate and decision-making.	

Year 9 Long term plan by lesson

Year 9						
Learning Period	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Discipline	**Chemistry**	**Chemistry**	**Physics**	**Physics**	**Biology**	**Biology**
Topic	Chemistry Fundamentals	Investigative Chemistry	Energy & Waves	Forces	Cell Biology	Communicable Diseases
Lesson Sequence	1. States of matter and melting and freezing 2. Changing states of matter 3. Pure substances and mixtures 4. Separation techniques 1 (filtration and evaporation) 5. Separation techniques 2 (Distillation) 6. RP: Chromatography 7. Atoms and elements 8. Compounds and formulae 9. Changing Atomic Theories 10. Protons, Neutrons and Electrons 11. Electron configuration 12. Isotopes and relative atomic mass 13. The periodic table 14. Noble Gases 1 15. Noble gases 2 (bar charts) 16. Alkali metals 17. Halogens 18. Gas Tests 1. Metals and Non Metals 2. Forming Ions 3. Metallic Bonding 4. Properties and Uses of Metals 5. Alloys and Their Uses 6. Ionic bonding - dot and cross 7. Ionic bonding - describing 8. Ionic bonding - Properties of ionic substances	1. Simple covalent molecules 1 (their properties) 2. Simple covalent molecules 2 (contrast molecules to metals or ionic crystals) 3. Covalent bonding (dot and cross) 4. Giant covalent structures (Diamond, graphite, graphene, and silicon dioxide) 5. Fullerenes and nanotubes 6. Comparing bonding (summary) 1. Ions and Compound formula (HT only) 2. Word and Symbol equations 3. Conservation of mass 4. Balancing equations 5. Metals and oxygen 6. Metals and acid 7. Metals and water 8. Redox reactions (HT only) 9. Acids and bases 10. Strong and Weak acids (HT only) 11. Neutralisation 12. RP: Soluble Salts 13. Reactivity series 14. Displacement reactions 15. Reactivity series and extraction methods 16. Phytomining and bioleaching (HT only) 17. REDOX - Ionic equations (HT only) 18. REDOX - Half equations (HT only) 19. Electrolysis of molten compounds 20. Electrolysis of aqueous compounds 21. RP - Electrolysis – part 1 22. RP - Electrolysis - part 2	1. Energy Stores 2. Energy Transfers (including open and closed systems) 3. Conservation of Energy 4. Conduction, Convection and Radiation 5. Reducing unwanted energy transfers 6. Efficiency calculations 7. Work done 8. Power 9. Gravitational potential energy 10. Kinetic energy 11. Elastic potential energy 12. Multistep Energy Calculations (HT only) 13. Non-renewable resources 14. Renewable resources 1 15. Renewable resources 2 16. Evaluating Resources (analysis) 1. Transverse Waves 2. Longitudinal Waves 3. Wave speed equation 4. Calculating period of a Wave 5. RP: Measuring speed of a wave using a ripple tank (Part 1) 6. RP: Measuring speed of a wave using a ripple tank (Part 2) 7. Measuring the speed of wave using a piece of string 8. Types of Electromagnetic Waves 9. Properties and Uses of EM waves	1. Scalar and vector quantities 2. Types of forces 3. Weight 4. RP – Relationship between force and extension (1) 5. RP – Relationship between force and extension (2) 6. Resultant forces 7. Vector diagrams (HT only) 8. Newton's First Law 9. Speed and velocity 10. Distance time graphs 11. Acceleration and deceleration 12. Velocity time graphs 13. Terminal Velocity 14. Newton's Second law 15. RP - Investigate Newton's Second Law of motion (1) 16. RP - Investigate Newton's Second Law of motion (2) 17. Inertia (HT only) 18. Newton's third law 19. Stopping distances 20. Energy transferred in stopping 21. Momentum (HT only) 22. Conservation of Momentum (HT only)	1. Types of cells – Eukaryotic & Prokaryotic 2. Types of cells – Subcellular structures and functions 3. Specialised cells 4. Tissues, organs, and systems 5. Types of microscopes 6. Magnification 7. RP: Using Microscopes – preparing a slide 8. RP: Using a Microscope 9. RP: Using a Microscope – viewing a specimen and microscope drawings 10. DNA 11. The Cell Cycle 12. Mitosis 13. Incredible stem cells 14. Therapeutic cloning 15. Asexual reproduction 16. Sexual Reproduction 17. Meiosis 18. Comparing mitosis and meiosis	1. Communicable Diseases (including transmission) 2. Viral diseases 3. Bacterial diseases 4. Fungal and protists 5. Analysing communicable disease data (tables) 6. Analysing communicable disease data (graphs) 7. Our barriers to diseases 8. The immune system 9. Vaccinations 10. Medicines 11. Antibiotic resistance 12. Developing new drugs (part 1) 13. Developing new drugs (part 2)
Assessment			Mid-Point Assessment			End of Year 9 Assessment

Year 10 Long term plan: Biology

Narrative
In Year 10 students learn that all living things need to respire and explore the substances they need for this reaction (oxygen and glucose) as well as the harmful waste products (such as carbon dioxide). Students also begin to learn the role that plants play in transferring energy from the Sun through photosynthesis. Students will explore the substances required by plants for this process (light energy, carbon dioxide and water) as well as the products (oxygen and glucose). We are introduced to the idea of surface area to volume ratio and the role this plays in an organism's ability to exchange substances efficiently. We then look at specially adapted exchange and transport systems in both plants and animals and within these systems, we explore the transport mechanisms through which substances move in and out of cells, namely diffusion, active transport, and osmosis. Students are introduced to the factors that affect the rate of these types of transport and begin to apply this understanding to the adaptations that exchange, and transport systems have in order to maximise this rate and meet its respiratory and photosynthetic needs. Students will learn the role that enzymes play as biological catalysts in helping organisms to break down larger molecules so that they can be transported, exchanged, and then used by cells. We will explore the factors that affect the rate of these enzyme-controlled reactions and lay the foundations for understanding why conditions inside cells must be controlled, which is explored further in year 11. We then look at how energy is transferred through living things through feeding relationships and the interactions between organisms within an ecosystem, including through the water and carbon cycles. We will also learn about human activities that are impacting on ecosystems as well as on these cycles. Students will also explore the methods ecologists use to measure living things within ecosystems.

Unit	B3	B4
Unit title	Human Biology	Plant Biology
Big question/ core concept	What are living things made of? Core concept: Cellular basis	Why do organisms depend on each other and their environment? Core concept: Interdependence
Relevant end points	✓ All organisms require oxygen and glucose for respiration which releases energy. ✓ Multicellular organisms have adapted exchange surfaces to absorb oxygen and glucose for respiration. ✓ Enzymes speed up reactions in the body and have optimum conditions. ✓ Anaerobic respiration occurs when oxygen is not present in cells, it is less efficient.	✓ Plants make their own glucose for respiration through the process of photosynthesis. ✓ The rate of photosynthesis is affected by multiple factors. ✓ Osmosis is the net movement of water. ✓ Plants have specialised tissues to transport water and glucose. ✓ Organisms compete with and depend on other organisms for the materials and energy that cycle through ecosystems. A change to one population, or environmental condition can have a huge impact on biodiversity.
Core substantive knowledge	➢ How animal, plant, and bacterial cells release energy for life processes. ➢ Respiration without oxygen in animals and plants/yeast. ➢ How the lungs, heart and blood are designed for efficient respiration. ➢ How food is digested including the role of enzymes. ➢ Metabolism and examples of reactions that both build and break down molecules. . ➢ Substances are transported across cell membranes by diffusion, osmosis, and active transport.	➢ The interaction between organisms, and the environment. ➢ Energy transfers between organisms within an ecosystem. ➢ The relationship between predator and prey in a stable community. ➢ Techniques used to sample the distribution and abundance of species within an ecosystem. ➢ The structure of a plant and how it is adapted to carry out specific functions. ➢ How plants make their own food through photosynthesis ➢ The processes that move water, mineral ions and glucose through a plant. ➢ Abiotic and biotic factors that affect a plants ability to photosynthesise. ➢ How carbon and water is cycled through the environment
Core disciplinary knowledge	• Biologists collect data in a variety of settings including field work. Variables in biology can be difficult to control. • Different biologists study life at different levels. From biological models to population of organisms • Biologists have to carefully consider how specimens are sourced and treated during research • Observations and data can be analysed and interpreted quantitatively and qualitatively • A cycle of collecting and analysing data provides evidence that biologists use to develop and improve explanations, classification systems and models	

Year 10 Long term plan: Physics

Narrative		
In year 10 students will learn how energy and information can be transferred in the form of waves. They will explore a range of both transverse and longitudinal waves and observe and measure how they behave during reflection and refraction. Students will gain an understanding of how the properties of these waves make them both useful and harmful to humans. Students will then explore the particles that make up substances and make links between the arrangement of these particles and properties such as density and pressure. Students will explore how our understanding of the atom has changed over time and will appreciate how observations and measurements by scientists have changed our theories over time. We will then look at how to measure the energy changes that take place when substances are heated up and change state and carry out calculations to determine this energy change. Students will then explore the behaviour of radioactive isotopes and learn about the properties of alpha, beta and gamma and how these relate to their hazards and uses. Students will model the behaviour of this radioactive decay and use data from graphs and tables to calculate properties such as the half-life of radioactive decay. In Spring 2, students will explore how energy is transferred in electrical circuits through learning about current, potential difference and resistance. They will observe and measure these factors in both series and parallel circuits and investigate the relationship between them in different Ohmic and non-Ohmic conductors.. Students will then learn how this energy is transferred to homes using the national grid.		
Unit	**P3**	**P4**
Unit title	Waves, Particles and Radioactivity	Electricity
Big question/ core concept	How does information and energy spread? Core concept: Waves and Energy What is matter? Core concept: Matter	What is electricity and magnetism? Core concept: Electromagnetism
Relevant end points	✓ Waves, including sound, water and electromagnetic transfer energy and information. ✓ Radioactive decay is where unstable nuclei emit neutrons, alpha particles, beta particles or gamma rays from their nuclei. ✓ Radioactive decay is a random process and unpredictable. ✓ The world is made of matter and all matter is made of particles. The particle model can be used to explain how matter behaves. All matter is made of atoms which are made of smaller, sub atomic, particles. ✓ Heating a system increases the energy of its particles resulting in an increase in temperature or a change of state.	✓ The movement of charge forms electric current and causes magnetic fields. We use electrical currents to power our society. ✓ The resistance of and the potential difference across a component determine the current flowing through it. ✓ Series and parallel circuits are ways of connecting electrical components. ✓ The national grid is a network of cables and transformers that transfers electrical power to the consumer.
Core substantive knowledge	➢ Energy can transferred by waves without the presence of particles. ➢ The features of the electromagnetic spectrum. ➢ The properties and uses of waves that constitute the electromagnetic spectrum. ➢ That different surfaces emit different levels of IR radiation ➢ How light is refracted through different mediums ➢ The structure of the current model of an atom and how the theories relating to the model of the atom have developed over time. ➢ Types of radioactive decay and their properties. ➢ The difference between irradiation and contamination. ➢ Using the particle model to understand density, changes of state and pressure. ➢ Energy changes during changes of state, heating, and cooling. ➢ The role of temperature and volume in gas pressure	➢ Knowledge of appropriate symbols to illustrate circuit components. ➢ Understanding of current, charge, potential difference, and resistance in relation to electricity. ➢ The rule for current in series and parallel circuits. ➢ The rule for potential difference in series and parallel circuits. ➢ Ohms law and the components that it is applicable to. ➢ The rule for resistance in series and parallel circuits. ➢ Difference between alternating and direct current. ➢ How electricity is transported across the national grid efficiently and how it safely enters our homes. ➢ The components within a plug and how this allows for their safe operation. ➢ That the total energy transferred to an appliance depends on how long the appliance is on for and its power.
Core disciplinary knowledge	• Aims for the most fundamental explanations that apply in widest range of situations • Explanations include tests which support or disprove the idea. • Explanations are based on observations and experimental measurements • Arguments are developed from data, discussed and debated • Many explanations use models to think with and use to make predictions • Many models can be expressed as mathematical formulas	

Year 10 Long term plan: Chemistry

Narrative
In Year 10 students learn that chemical reactions involve a transfer of energy that is either endothermic or exothermic. They will understand that scientists can observe and measure this change. Students will revisit the idea of rate by learning how different factors affect the rate of chemical reactions. They will observe changes in rate both qualitatively and through taking quantitative measurements, which will then allow them to analyse rates of reactions graphically and make predictions about how the rate will be affected when different factors are changed. Students will then be introduced to the idea of reversible reactions by making observations and through exploring theoretical reactions. They will apply Le Chatelier's principle to a range of reversible reactions and use this to predict the outcome on the yield of different substances. Students will also learn the law of conservation of mass and use this to balance symbol equations. They will also learn the importance of the mole as a unit of measurement to chemists and use this to calculate the mass of different substances. Separate students will also carry out tests and make observations in order to identify the presence of different ions during reactions. Throughout the first unit, students will move from looking at isolated reactions to applying their knowledge to reactions carried out on a mass scale in industry. In the second unit, students start to look more broadly at the relationship between chemistry and our Earth. They will start by learning how the composition of the atmosphere has changed over time and draw on their knowledge from B2 to understand the important role that plants and algae play in this.

Unit	C3	C4
Unit title	Reacting Substances	Humans and The Earth
Big question/ core concept	What is chemical change? Core concept: Chemical change	How does chemistry affect our world? Core concept: Chemical Earth What is the Earth made of and how is it changing? Core concept: Dynamic Earth
Relevant end points	✓ In chemical reactions atoms are rearranged to form new substances. The new substances produced will have different properties from the substances they are formed from. Mass and energy are always conserved in chemical changes. ✓ Energy is transferred to or from the surroundings in a chemical reaction ✓ Activation energy is the minimum energy that particles must have when they collide in order to react. Factors affect the rate of reaction. ✓ Amounts of substances are measured in moles, and one mole of any substance contains the same number of particles. (Higher Only) ✓ Concentration of a solution is measured by the mass of solute in a given volume. ✓ In reversible reactions the products can react to form the original reactants. Reversible reactions reach equilibrium when the rate of forward and backward reaction are equal. ✓ If conditions in a reversible reaction are changed the position of equilibrium will alter to counteract those changes (Higher only).	✓ Substances can move within and between Earth's atmosphere, hydrosphere, geosphere and biosphere as part of large-scale Earth systems. Chemical substances produced by human activity are changing our planet. ✓ The structure of the earth is slowly changing. The Earth provides us with a rich source of resources
Core substantive knowledge	➢ The difference between exothermic and endothermic reactions and how this can be illustrated with a reaction profile diagram. ➢ That bond breaking and bond forming occur in all reactions. ➢ The mole as a measure of concentration and using this value to determine the limiting reactants in a chemical reaction. ➢ Writing word equations to illustrate the reactants and products ➢ The law of conservation of mass and the relationship with balanced equations. ➢ Determining the relative formula mass of a compound. ➢ Calculating the mass produced in a reaction from knowledge of reactants and vice versa. ➢ That concentration is a measure of the mass of a substance in a certain volume of a solution. ➢ Factors that determine the rate at which reactions progress. ➢ Certain reactions are reversible and will reach a point of equilibrium. ➢ Knowledge of Le Chatelier's principles.	➢ The composition of earth's atmosphere compared to its early atmosphere. ➢ How the earth's atmosphere has changed over time. ➢ The greenhouse effect and its association with global warming. ➢ Methods of reducing our carbon footprint. ➢ Utilisation of global resources by humans and their impact on the environment. ➢ The harmful effects of combustion. ➢ Reusing, reducing and recycling resources helps to prevent finite natural resources running out.
Core disciplinary knowledge	• Chemists use models of the sub microscopic domain of substances to explain the properties and behaviour of substances. • Chemists use a range of unique symbols, formula, nomenclature, diagrams and equations. • Substances can be classified into groups. This enables chemists to identify patterns and trends. • Data from chemical measurements can be used to identify trends. • Provides evidence to test ideas. There are a range of qualitative and quantitative investigative techniques. • Chemistry requires skilled use of specialised equipment. This includes chemical measurement.	

Year 10 Long term plan by lesson

Year 10						
Learning Period	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Discipline	**Biology**	**Biology**	**Physics**	**Physics**	**Chemistry**	**Chemistry**
Topic	Human Biology	Plant Biology	Nuclear & Thermal Physics	Electricity	Reacting Substances	Humans & The Earth
Lesson Sequence	1. Types of Cells (Recap) 2. Diffusion 3. Aerobic respiration 4. The lungs & Ventilation 5. Gas Exchange 6. Exchange Surfaces 7. Adaptions for diffusion 8. Enzymes 9. Optimum conditions for enzymes 10. The Digestive System 11. RP – Testing for Food Groups (1) 12. RP – Testing for Food Groups (2) 13. Enzymes in Digestion 14. RP – pH & Enzymes (1) 15. RP – pH & Enzymes (2) 16. The Heart – Theory 17. The Heart – Dissection 18. Blood Vessels & Blood Flow 19. Composition of blood 20. Coronary Heart Disease 21. Anaerobic respiration 22. Fermentation 23. Effects of exercise 24. Metabolism 25. Non Communicable Diseases 26. Cancer	1. Photosynthesis 2. Limiting Factors 3. Inverse Square Law (HT only) 4. RP – Factors Affecting Photosynthesis (1) 5. RP – Factors Affecting Photosynthesis (2) 6. Plant Cells, Tissues, and Organs 7. Structure of a Leaf 8. Osmosis 9. Osmosis in Action 10. RP – Osmosis (1) 11. RP – Osmosis (2) 12. Active Transport 13. Transpiration 14. Transpiration Experiments 15. Translocation 16. Using Glucose & Nitrogen in Plants 17. Ecosystems 18. Food webs 19. Predator Prey Interactions 20. Sampling Techniques 21. RP - Quadrats 22. Carbon Cycle 23. Water Cycle 24. Biodiversity & Human Impact 25. Biodiversity & Pollution 26. Maintaining Biodiversity	1. Types of Electromagnetic Waves 2. Properties & Uses of EM waves 3. Microwaves and Radio Waves (HT only) 4. RP – Investigating IR Radiation 5. Dangers of EM waves 6. Refraction of Light 1. Atoms recap 2. Changing Atomic Theories 3. Physics of Atoms 4. Introducing Radioactive Decay 5. Types of Radioactive Decay 6. Decay Equations 7. Half Life 8. Modelling Radioactive Decay 9. Irradiation & Contamination 10. Particle Model – Density & States 11. RP – Calculating Density 12. Changing state 13. Heating & Cooling Graphs 14. Latent Heat 15. Specific Heat Capacity 16. RP – Specific heat capacity 17. Pressure in Gases	1. Circuit Symbols & Drawing Circuits 2. Calculating Current & Charge Flow 3. Current in Series & Parallel 4. Potential difference in Series & Parallel 5. Resistance in Series and Parallel 6. Ohms Law 7. RP – Resistance in lengths of wire (1) 8. RP – Resistance in lengths of wire (2) 9. LDRs & Thermistors 10. IV Characteristics (theory) 11. RP – IV Characteristics (1) 12. RP – IV Characteristics (1) 13. Mains Electricity 14. Plugs 15. Calculating Power (P=IV & P=I2R) 16. Calculating Energy Transferred 17. Electromagnets (Recap) 18. National Grid & Transformers	1. Exothermic & Endothermic Reactions 2. RP – Temperature Changes (1) 3. RP – Temperature Changes (2) 4. Reaction Profiles 5. Bond Energy (HT only) 1. Relative formula mass 2. Percentage mass 3. Balancing equations 4. Introducing Moles (HT only) 5. Reacting Masses (HT only) 6. Balancing using moles (HT only) 7. Limiting Reactants (HT only) 8. Concentration 1. Measuring the Rate of Reaction 2. Factors Affecting Rates of Reaction 1 3. Factors Affecting Rates of Reaction 2 (include details around catalysts) 4. Drawing Rates of Reaction Graphs	1. RP – Investigating Effect of Concentration on the ROR (1) 2. RP – Investigating Effect of Concentration on the ROR (2) 3. Reversible Reactions 4. Chatelier Principles 1 (HT only) 5. Chatelier Principles 2 (HT only) 1. The Early Earth's Atmosphere 2. Theories of the atmosphere 3. The Greenhouse Effect 4. Effects of global warming 5. Reducing our carbon footprint 6. The Harmful Effects of Combustion 7. Sustainable development
Assessment			Mid-Point Assessment			Summer Paper 1 Mocks

Year 11 Long term plan: Biology

Narrative
In Year 11, students explore how we can classify organisms based on their characteristics and how these classification groups have changed as our understanding of cells and DNA has developed. Students then sue their knowledge of DNA and inheritance from year 9 to look more broadly at how organisms have evolved through natural selection. Students then explore how s=humans have used their knowledge of inheritance and DNA to create organisms with desirable characteristics through both selective breeding and genetic modification. They will look at the benefits and implications of these methods and evaluate the impact on individual organisms and whole ecosystems. Students will then look at ways in which organisms are specially adapted to their environment with a focus on the ways in which organisms carry out homeostasis. Students will first explore the nervous system in more depth and focus on reflexes as a way of responding rapidly to harmful stimuli and will carry out an investigation into how our reaction time can be affected by different factors such as caffeine. Students then explore our endocrine system as a mechanism for carrying our homeostasis and draw comparisons between the two. Students will build a more in-depth knowledge of glands, the hormones they produce and the affect they have on organs. Students will then look at both the control of blood glucose and control of the menstrual cycle in more depth. Separate students will also look at the role of hormones and kidneys in control of water. Finally, students will build on their knowledge of the menstrual cycle to explain how fertility can be controlled using contraceptive methods and fertility treatment. Students will explore implications of fertility treatment and embryo screening.

Unit	B5	B6
Unit title	Reproduction and Genetics	Evolving Organisms
Big question/ core concept	How do organisms grow and reproduce? Core concept: Inheritance	How do organisms grow and reproduce? Core concept: Inheritance Why are living things so diverse? Core concept: Evolution What are living things made of? Core concept: Cellular basis
Relevant end points	✓ DNA makes up all genetic information in cells, and it is found in the nucleus. ✓ Organisms reproduce by passing their genetic information from one generation to the next. How an organism develops depends on its genome and its environment. ✓ An organisms genotype controls its phenotype and is inherited from alleles passed on from its parents. ✓ In sexual reproduction genetic information from the mother and father is mixed, which leads to variation in the offspring.	✓ Internal conditions must be carefully controlled so that cells and enzymes can function properly. Hormones are chemical molecules that are secreted by glands, travel in the blood and act on target organs to maintain homeostasis. ✓ Hormones can be used to control and increase fertility. ✓ Organisms compete with and depend on other organisms for the materials and energy that cycle through ecosystems. A change to one population, or environmental condition can have a huge impact on biodiversity. ✓ The diversity of organisms, living and extinct, is the result of evolution by natural selection.
Core substantive knowledge	➢ The role of DNA in biological organisms. ➢ How cells replicate and the stages of the cell cycle. ➢ How organisms reproduce by asexual and/or sexual reproduction. ➢ New gametes are formed through the process of meiosis. ➢ The difference between genotype and phenotype and its application when drawing genetic cross diagrams. ➢ Causes and inheritance probability of genetic diseases. ➢ Determining the sex of the offspring from sexual reproduction. ➢ Using family tree diagrams to determine links between parents and offspring. ➢ The process of genetically engineering organisms ➢ The process of selectively breeding organisms for advantageous genotypic and phenotypic traits.	➢ Organisms are grouped into different classifications. ➢ The theory of evolution by natural selection and how it relies upon variation and random mutations. ➢ How fossils are formed and used as evidence for evolution. ➢ The structure and function of the human nervous system. ➢ The structure and function of the human endocrine system. ➢ The role of adrenaline and thyroxine inside the human body. ➢ How the body maintains blood glucose levels. ➢ Causes and treatments of diabetes. ➢ The role of the menstrual cycle and the hormones that control it. ➢ Both hormonal and non-hormonal types of contraception. ➢ The process of IVF and embryonic screening.
Core disciplinary knowledge	• Biologists collect data in a variety of settings including field work. Variables in biology can be difficult to control. • Different biologists study life at different levels. From biological models to population of organisms • Biologists have to carefully consider how specimens are sourced and treated during research • Observations and data can be analysed and interpreted quantitatively and qualitatively • A cycle of collecting and analysing data provides evidence that biologists use to develop and improve explanations, classification systems and models • Biologists communicate about their work with a range of audiences within and beyond the scientific community, to facilitate evidence-informed debate and decision-making	

Year 11 Long term plan: Chemistry

Narrative
Students start by exploring ways that Human activity has impacted on the Earth through combustion of fossil fuels, processing water and through removal of raw materials. Students will learn about the ways in which we can reduce this impact and evaluate different processes and products through the lens of environmental, economic, social and ethical perspectives. In Year 11 students will bring together knowledge from previous chemistry units and start to explore the way in which we release energy rom fossil fuels and the impact this has on the Earth. They will start by learning how crude is formed before drawing on earlier knowledge of mixtures to learn that crude oil is made of different hydrocarbons. Students will be introduced to alkanes and alkenes and will draw on their earlier knowledge of structure and bonding to explain their properties. They will also apply their earlier knowledge of drawing molecular structures in order to represent alkanes and alkenes. Students will then explore the increased demand for shorter hydrocarbons and use knowledge of boiling points to explain the process of fractional distillation. Students will be introduced to a new reaction called cracking and gain more practice representing substances using molecular structures and formulae. They will learn about combustion reactions and make links to earlier learning in both chemistry and biology to explain the impact of both complete and incomplete combustion on the Earth. Students are then introduced to polymers, having explored this in a biological context in year 9, and learn how to represent these from different monomers.

Unit	C5
Unit title	Organic Chemistry
Big question/ core concept	How does chemistry affect our world? Core concept: Chemical Earth What is the Earth made of and how is it changing? Core concept: Dynamic Earth
Relevant end points	✓ Substances can move within and between Earth's atmosphere, hydrosphere, geosphere and biosphere as part of large-scale Earth systems. Chemical substances produced by human activity are changing our planet. ✓ Potable water is safe to drink and can be produced from freshwater and seawater. ✓ Wastewater needs to be treated to make it safe to release back into the environment. ✓ Hydrocarbons have different properties depending on the size of molecule. ✓ Hydrocarbons can be separated into fractions using fractional distillation.
Core substantive knowledge	➢ Generating potable water from both fresh and saline water sources. ➢ Treatment of waste water and sewage. ➢ The impact of resources can be assessed using a life cycle assessment. ➢ The composition and uses of crude oil. ➢ Testing for the presence of alkenes. ➢ How crude oil can be separated into different useful fractions. ➢ The composition and function of polymers.
Core disciplinary knowledge	• Chemists use models of the sub microscopic domain of substances to explain the properties and behaviour of substances. • Chemists use a range of unique symbols, formula, nomenclature, diagrams and equations. • Substances can be classified into groups. This enables chemists to identify patterns and trends. • Data from chemical measurements can be used to identify trends. • Provides evidence to test ideas. There are a range of qualitative and quantitative investigative techniques. • Chemistry requires skilled use of specialised equipment. This includes chemical measurement.

Year 11 Long term plan: Physics

Narrative
In year 11, students bring together knowledge of magnets, electrical current and forces to understand how electromagnets work. They will begin by learning about permanent and induced magnets. Next, what an electromagnet is before looking at ways that the strength of an electromagnet can increased. Higher tier students will also build on this further by exploring the motor effect and using Fleming's left-hand rule to make predictions about the direction of the force produced. Students will also develop their mathematical understanding of this relationship through use of the F = BIL equation.

Unit	**P5**
Unit title	Electricity and Magnetism
Big question/ core concept	What is electricity and magnetism?
Relevant end points	✓ The movement of charge forms electric current and causes magnetic fields. We use electrical currents to power our society. ✓ Magnets have a magnetic field which is the region where other magnets or magnetic materials experience a non-contact force. ✓ The motor effect is when a current carrying wire and a magnet exert a force on each other while the conductor is inside the magnets magnetic field (H tier only)
Core substantive knowledge	➢ The properties of magnets and the magnetic fields they generate. ➢ Creating and using electromagnets. ➢ Using electromagnets to generate the motor effect. ➢ Using Fleming's left hand rule. ➢ How do DC motors work. ➢ Calculating force using magnetic flux density.
Core disciplinary knowledge	• Aims for the most fundamental explanations that apply in widest range of situations • Explanations include tests which support or disprove the idea. • Explanations are based on observations and experimental measurements • Arguments are developed from data, discussed and debated • Many explanations use models to think with and use to make predictions • Many models can be expressed as mathematical formulas

Year 11 Long term plan

Year 11						
Learning Period	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Discipline	**Chemistry & Biology**	**Biology**	**Physics**	**Physics**	**Chemistry**	**Chemistry**
Topic	Organic Chemistry & Genetics	Evolving Organisms	Electricity & Magnetism & Energy & Waves			
Lesson Sequence	1. Potable Water 2. Waste Water 3. RP - Analysing water samples 4. Life Cycle Assessment 5. Reduce, Reuse, Recycle 1. Covalent Bonding (recap) 2. Crude Oil & Alkanes 3. Properties of Hydrocarbons 4. Combustion 5. Fractional Distillation 6. Cracking & Alkenes 7. Polymers 1. DNA 2. The Cell Cycle 3. Mitosis 4. Asexual & Sexual Reproduction 5. Meiosis 6. Genetics Key Terms 7. Genetic Cross Diagrams 8. Genetic diseases & Family Trees 9. Sex determination	1. Classification 2. Variation & Mutation 3. Natural Selection & Evolution 4. Evidence for Evolution 5. Fossils 6. Selective Breeding 7. Genetic Modification & Engineering 1. Homeostasis & Response 2. The Nervous System 3. Synapses 4. RP – Reaction time (1) 5. RP – Reaction time (2) 6. The Endocrine System 7. Adrenaline & Thyroxine (HT only) 8. Controlling Blood Glucose 9. Diabetes 10. Puberty and The Menstrual Cycle 11. Hormones of The Menstrual Cycle 12. Contraception 13. IVF (HT only) 14. Embryo Screening	1. Magnets 2. Magnetic Fields 3. Permanent and induced magnets 4. Electromagnets 5. The Motor Effect (HT only) 6. Fleming's Left Hand Rule (HT only) 7. Calculating Force (Magnetic Flux Density) (HT only) 8. DC Motors (HT only)	**Interleaved practice and application to different contexts** Address gaps in knowledge and build on links between different topics when applied to a range of scenarios Biology Paper 2 Chemistry Paper 2 Physics Paper 2 Paper 2 Mock Exams	**Interleaved practice and application to different contexts** Address gaps in knowledge and build on links between different topics when applied to a range of scenarios Biology Paper 1 Chemistry Paper 1 Physics Paper 1	
Assessment		Autumn Mock Exams – Paper 1 only	Spring Mock Exams – Paper 2 only		Final GCSE Exams	Final GCSE Exams