Walthamstow Academy – Science Curriculum Journey

Our Curriculum Intent

At Walthamstow Academy, we passionately believe that studying science is a fundamental part of a broad and full education. We believe this because:

1. Every one of our students has the right and the responsibility to become a scientifically informed citizen. Scientifically informed citizens are critical thinkers, they understand how to interpret data and where to seek evidence for scientific statements; this means they are equipped to be successful in the modern world.
2. Every one of our students has the right to understand how the natural world works, from their own bodies to the life cycle of stars. All of our students should understand the basic principles that underpin biology, chemistry and physics so that they can place their own experiences in the context of scientific knowledge. Knowing why you have your father's nose shape, or what you are seeing when you stare at the night's sky, makes for a fuller and richer experience of life.
3. The modern world cannot be fully understood without an appreciation of the special place of the scientific method in our history. To trace the path of scientific knowledge, and to understand how it was gained, is to understand much of the world we live in today. Our students learn to understand the value of doubt, as opposed to the value of faith, when seeking new knowledge.
4. The challenges faced by humanity have been caused to some extent by science, and can only be solved with its help. The jobs of the future will increasingly require scientific knowledge. Our curriculum ensures our students will be the scientists and engineers of tomorrow.

Curriculum Principles:

- Fundamental ideas taught across SoW – students are taught the 'big ideas' in biology, chemistry and physics.
- Spiral structure – students revisit the 'big ideas' through vertical concepts that increase in depth and complexity.
- Links between – students make links between the 3 science disciplines and constantly review and recall prior knowledge.
- Skills interleaved knowledge - skills are always taught in the context of the science being taught.

Our Curriculum Progression Model

Sequencing:

When sequencing material we aim to strike a thoughtful balance between introducing new content, emphasising links between scientific topics and pupils' need to spend time revisiting material so that they are successful. We sequence our units to introduce knowledge and new ideas in a way that begins with the simplest and builds to the more complex, including a range of vertical concepts developed over time in a variety of contexts. For example, students in year 7 starts with 7CP Particles, in which we introduce the concept of diffusion. We have placed this unit here as an understanding of particle behaviour is fundamental to all three sciences, and that movement in and out of cells requires an understanding of diffusion, which is taught in the next topic, 7BC Cells, Tissues and Organs. The idea is developed later in 9 PM Matter and will be revisited in a range of topics at Key Stage 4, including Organisation.

KS3

- At KS3 students are taught the big ideas in science, which sets the foundation for their future science education.
- As well as new content, working scientifically skills and mathematical skills are interleaved and embedded into units. For instance, the first unit in Y7 – 7CP Particles introduces graph drawing skills.

KS4

- Pre-requisite knowledge continues to be sequenced methodically at KS4. Electricity and waves is taught before electromagnetism ensuring greater understanding and providing opportunity for interleaving.
- At KS4 pupils build on knowledge and skills developed at KS3. Working scientifically skills are further developed through sequenced required practical activities in each unit.

KS5

- At KS5 students build on their foundation of scientific knowledge attained from KS3 and KS4.
- The curriculum is sequenced to allow students to deepen their understanding as topics become broader and more complex. For example, in physics Y12 students learn about Newtonian mechanics before learning about rotational mechanics in Y13.
- Where staffing allows, the KS5 curriculum is divided into sections to allow students to simultaneously learn aspects of the curriculum from subject specialists. For example, in chemistry students learn both Physics and organic chemistry.
- The scientific method is embedded throughout the KS5 curriculum. Students work towards attaining their CPAC endorsement by successfully completing 12 core practical activities. All core practicals and development of the scientific method is taught in the context of the curriculum, not as a standalone unit.

Our Curriculum Progression Model

Progression:

Progression between Key Stages

• The Science Key Stage 3 curriculum is planned on the basis that students will arrive in Year 7

having been taught the National Curriculum in their primary school.

• The Science Key Stage 3 curriculum is an essential foundation to Key Stage 4, and GCSE exams

assume knowledge of the Key Stage 3 curriculum. Therefore, all Key Stage 3 content should be taught

before starting any Key Stage 4 units.

• Throughout Key Stage 3 to we promote separate science (see below) to

higher attaining students, both as a pathway to Key Stage 5 study of science but also as an essential

aspect of a rounded intelligence for higher attaining students.

Key Stage 4 to Key Stage 5:

- As shown above in the vertical concepts grid, the KS5 curriculum builds upon the foundation of scientific knowledge students build during their studies at KS4.
- Separate science is at KS4 is promoted as the preferred route into A-level science as this course offers greater depth, breadth and complexity at KS4, bridging the gap between GCSE and A-level.
- Over the summer term and summer break between KS4 and KS5, students receive transition lessons and a transition booklet that aims to bridge the gap between GCSE and A-level sciences.

Progression beyond Walthamstow - University and Careers

The majority of our KS5 students progress into STEM related degrees, from aerospace engineering to zoology. Career opportunities open to graduates of science are vast.

Walthamstow Academy – Science Curriculum Journey

Half Term	Curriculum Content	Assessment(s) *(assessment title, duration and approx date)*	Extra-Curricular Options *(Places to visit; wider reading; clubs to join)*
Year 7 Curriculum Overview: *In Y7, students start their KS3 curriculum journey by studying the big ideas of science. The focus of KS3 science is to develop a deeper understanding of a range of scientific ideas in biology, chemistry and physics. Year 7 begins by understanding the key blocks of knowledge and concepts in order to progress to the next stages in Y8 + Y9, and eventually building upon these concepts at KS4. There is also a large focus on working scientifically and objectively and developing their scientific vocabulary. The topics studied in Year 7 are:* • *Particles* • *Cells* • *Energy* • *Chemical reactions* • *Reproduction and Variation* • *Forces*			**Science Museum** **Natural History Museum** **London Transport Museum**
Year 7 HT1	**7CP Particles** Students will be introduced to working scientifically and how to work safely in a secondary science lab. They will study the first chapter of the KS3 curriculum – 7CP Particles. They study this first because important terms such as diffusion is covered, which will be needed for subsequent chapters e.g. 7BC Cells. • How to use basic science equipment. • 7CP – Particle model of matter. • How to identify variables in science.	**7CP TOPIC TEST – 45 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 7 HT2	**7BC Cells + 7PE Energy** Students will continue to develop working scientifically skills. They will study the first chapter of biology in the KS3 curriculum – 7BC Cells. In which they will learn how to prepare slides, use microscopes and more about the systems within our body. In addition, they will move on to 7PE – Energy, in which they cover important concepts about energy transfer and conservation to using equations and developing maths skills. • 7BC – Cells • 7PE – Energy • How to identify variables in science + develop hypothesis	**7BC TOPIC TEST – 45 MINS** **7PE TOPIC TEST – 45 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 7	**7BR Reproduction + Variation**	**MID-YEAR PPE – 60 MINS**	**STEM Club**

HT3	Students will complete their mid year assessments consolidating the first term's topics. Students will then move onto learning 7BR – Reproduction + Variation, which builds upon key concepts and knowledge learnt from 7BC Cells. They will understand the changes that our bodies undergo and how the system works. Working scientifically skills will still be developed throughout the term. This topic sets students up for Y9 topics (Biological Systems) • 7BR – Reproduction + Variation • How to analyse data and spot anomalies	**7BR TOPIC TEST – 30 MINS** **KPIs**	**The Day** **New Scientist**
Year 7 HT4	**7CC Chemical Reactions** Students will move on to 7CC Chemical Reactions and learn the importance of chemical reactions, how these are used in industry and everyday life to benefit us, in addition to being introduced to the pH scale and where everyday substances fall within that. Students will also be involved in planning their own investigation on the reactions between acids and alkalis and how this can benefit humans. • 7CC – Chemical Reactions • How to use graphs to describe trends • How to plan an investigation	**7CC TOPIC TEST – 35 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 7 HT5	**7PF Forces** Students will be introduced to 7PF Forces. In this topic they are introduced to the three types of forces and the effect of forces. They will again be introduced to mathematical equations which they will have to manipulate as well as using and plotting their own distance-time graphs. Students will revisit forces in Y9 with Forces in Motion. • 7PF – Forces • How to plot graphs, analyse data and spot trends • How to use mathematical equations	**7PF TOPIC TEST – 35 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 7 HT6	**8BE Ecological Relationships + Classification** Students will use the start of this term to prepare for their End of Year PPE's. They will experience revision lessons in which they will develop the skills for effective revision in addition to going over content (which is something they have been doing throughout the year). Post EoY exams, students will begin the Y8 curriculum, starting with 8BE – Ecological relationships. This introduces key ideas which will later be revisited at KS4 and introduces students to Darwin's Theory of Evolution and how to debate within science. • Revision for End of Year exams • How to debate theories in science • How to accurately measure and record using equipment	**END OF YEAR PPE 1 – 6O MINS** **END OF YEAR PPE 2 – 60 MINS** **8BE TOPIC TEST – 35 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Term	**Curriculum Content**	**Assessment(s)** *(assessment title, duration and approx date)*	**Extra-Curricular Options** *(Places to visit; wider reading; clubs to join)*

<table>
<tr><td colspan="3">Year 8 Curriculum Overview:
In Year 8 students continue to go through the KS3 schemes of work, now building upon their basic knowledge and concepts and further deepening their understanding of science in the world. Students continue to develop their experimental and investigative skills. Students should be able to describe associated processes and key characteristics in common language and should also be familiar with technical vocabulary within science. The topics studied in Year 8 are:
• Digestion
• The Periodic Table
• Light and Space
• Materials and the Earth
• Electricity and Magnetism
• Matter
• Forces in Action</td><td>Science Museum

Natural History Museum

London Transport Museum</td></tr>
<tr><td>Year 8
HT1</td><td>8BD Digestion
This unit builds on the work done in year 7 on organ systems and diffusion. It begins by establishing the components of food and the use of each within the body. Student will look at what is meant by a balanced diet and the consequences when nutritional and calorie intake is not inadequate or excessive. Students will carry out practical to test foods for the main components and then move on to look at the organs of the digestive system and the role each plays in digestion. The role of enzymes is introduced as part of this, as well as the role of gut bacteria.
• 8BD – Digestion
• Drawing conclusions from data and observations
• Evaluating the use of models</td><td>8BD TOPIC TEST – 30 MINS

KPIs</td><td>STEM Club

The Day

New Scientist</td></tr>
<tr><td>Year 8
HT2</td><td>8CP The Periodic Table
This unit of work begins what an element is and how elements can combine/mix to form compounds and mixtures. Some work is then done linking elements to the periodic table and their significance. Following this, compounds are studied in more detail including naming them and how to write a formula. The periodic table is then looked at in more detail starting first with the Dalton atomic model and moving on to the nuclear model and electron configuration.
• 8CP – The Periodic Table
• Making and evaluating predictions after experimental work
• Describing and explaining ideas from data</td><td>8CP TOPIC TEST – 35 MINS

KPIs</td><td>STEM Club

The Day

New Scientist</td></tr>
<tr><td>Year 8
HT3</td><td>8PL Light and Space
The unit builds on work done at KS2, which should be borne in mind in terms of starting points. The unit begins by looking at light as a wave, that transfers energy and what happens when it meets different surfaces. The unit then moves to reflection, refraction in more detail and this offers the opportunity to look at reproducibility in data and accuracy</td><td>MID-YEAR PPE – 60 MINS
8PL TOPIC TEST – 35 MINS

KPIs</td><td>STEM Club

The Day

New Scientist</td></tr>
</table>

	of measurements, before moving on to vision and problems with vision, the colours of the spectrum and how colour is seen and then how different coloured light can be produced and affects the colour of objects. The final section deals with the Earth in space, the cause of seasons and the Earth's place in the universe. • 8PL – Light and Space • Identifying IV, DV and CV's • Writing conclusions and using data to support conclusions		
Year 8 HT4	**8CM Materials and the Earth** The unit begins by looking at the structure of the Earth and some basic plate tectonics to highlight the changing nature of the surface and how this can lead to earthquakes and volcanoes. The formation of the three different types of rock and their physical properties is then covered, as well as fossil formation. The unit then moves on to the atmosphere, how it has changed over the Earth's history and more recently, and the human impact on that. Finally, the properties of some of the materials made from earth's resources and recycling. • 8CM – Materials + the Earth • Read and interpret graphs and tables of secondary data • Explain observations from practical work using scientific knowledge	**8CM TOPIC TEST – 35 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 8 HT5	**8PE Electricity and Magnetism** This unit begins with electricity – what it is and how current behaves in series and parallel circuits. Ohm's Law is introduced in a simple way. The unit then switches to magnetism and then the link between the two before investigating how to make electromagnets and some uses of them. • 8PE – Electricity + Magnetism • Use equipment to make measurements of current, voltage and resistance • Plot a graph and describe relationships shown • Use and manipulate equations to calculate unknown values	**8PE TOPIC TEST – 30 MINS** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 8 HT6	**9PM Matter + 9PF Forces in Action** The matter topic build extensively on the particles (7CP) and forces and motion(7PF) topics. In this topic students will reinforce their understanding of the particle model, kinetic theory and resultant forces. They will learn to apply these to situations revolving around pressure and diffusion. 9PF builds on forces from year 7 to look at how forces can cause turning effects, how this can be amplified, how forces can cause deformation and what elastic deformation is, how forces are linked to energy (work done) and how machines can reduce the force needed to do a particular job. Lots of opportunity to make links with real life objects (bikes, cars, screwdrivers) engineering, tools etc. There is a lot	**9PM TOPIC TEST** **END OF YEAR PPE 1 – 60 MINS** **END OF YEAR PPE 2 – 60 MINS** **9PF TOPIC TEST** **KPIs**	**STEM Club** **The Day** **New Scientist**

	of maths, although the relationships are simple, so challenge can be built by rearrangement and unit changes. • 9PM Matter + 9PF Forces in Action • How models allow us to understand phenomena • Writing conclusions from data collected		
Term	**Curriculum Content**	**Assessment(s)** ***(assessment title, duration and approx date)***	**Extra-Curricular Options** ***(Places to visit; wider reading; clubs to join)***
Year 9 Curriculum Overview: *In Year 9 students continue to go through the KS3 schemes of work, now building upon their knowledge and concepts from the previous 2 years and further deepening their understanding of science in the world. Students continue to develop their experimental and investigative skills. Students also prepare to begin KS4 content during the summer term. By the end of KS3 our students are expected to have developed their application skills and understanding of the key concepts in science in order to build upon them even more at KS4.* *The topics studied in Year 9 are:* • *Reactivity* • *Plants and Photosynthesis* • *Energetics and Rates* • *Biological Systems and processes* • *Sound* • *C1: Atomic Structure and the Periodic Table* • *C2: Structure and Bonding*			**Science Museum** **Natural History Museum** **London Transport Museum**
Year 9 HT1	**9CR Reactivity** The unit begins by recapping the work covered in year 8 on basic atomic structure and electron configuration and then adds on neutron numbers, atomic mass and formula mass. The skills introduced in the first few lessons (writing ionic formulae, RFM and balancing equations) are consolidated throughout the unit whilst they look at a variety of chemical reactions. The latter part of the unit introduces the reactivity series and how it can be used to predict and/or explain reaction outcomes. The required practical in this unit is displacement reactions and focusses on the application of the reactivity series. There are many opportunities within this scheme to interleave conservation of mass ideas by incorporating mass calculations that link directly to the reactions carried out. • 9CR Reactivity • Identification of hazards and risks, and suggestions for reducing risk • Method writing, including equipment names chemicals and processes	**9CR TOPIC TEST** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 9 HT2	**9BP Plants + Photosynthesis** This unit provides the foundation for work in key stage 4 on limiting factors in photosynthesis, energy transfer through an ecosystem and the mineral requirements of plants. The unit starts with exploring the structure and function of roots, with emphasis	**9BP TOPIC TEST** **KPIs**	**STEM Club** **The Day**

	on its adaptations. Pupils then progress on to the process of photosynthesis and its importance. This will include understanding that the carbon dioxide for photosynthesis comes from the air, that chlorophyll enables a plant to utilise light in photosynthesis, the role of the leaf in photosynthesis, the importance and roles of the xylem and phloem and the importance of photosynthesis to humans and other animals. • 9BP – Plants and Photosynthesis • Identifying variables to change, measure and control • Describing and explaining trends in graphs and using data to illustrate points		**New Scientist**
Year 9 HT3	**9CE Energetics + Rates** This topic will introduce the idea of rates and factors that affect rates for the first time. How rates are measured is covered first, focusing on the element of time that is essential. There is a required practical, which uses the same reaction as the first lesson to avoid confusion and just allow the changing of concentration. The ideas of surface area and catalysts are introduced. If you have time, you could also do the effect of temperature here. The unit then covers types of reaction – endothermic, exothermic, combustion as a type of oxidation reaction and thermal decomposition. • 9CE Energetics + Rates • Scaling and plotting graphs and drawing lines of best fit • Explaining choices for equipment to minimise heat loss and suggestions	**MID-YEAR PPE – 60 MINS** **9CE TOPIC TEST** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 9 HT4	**9BB Biological Systems and Processes** This unit of work begins with a recap of organizational hierarchy, with students recalling the function of different organ systems. Students will then focus on the skeletal and muscular systems, considering how these two interact to produce movement and locomotion. Students will be introduced to the concept of antagonistic muscle pairings and will investigate the forces exerted by different muscles involved in movement. Students will then examine the respiratory system, looking at the mechanism of breathing, lung volumes and the role of diffusion in gas exchange. The impacts of drugs and exercise on the respiratory and other systems will be explored. Finally, students will consider the basis of life by investigating the structure and function of DNA. Through this module students will be introduced to key biological concepts such as DNA as a blueprint for life and its link to cells, tissues, organs, organ systems and organisms. • 9BB – Biological Systems and Processes • Calculating means, spotting anomalies • Displaying secondary data appropriately and the analysis of it	**9BB TOPIC TEST** **KPIs**	**STEM Club** **The Day** **New Scientist**
Year 9 HT5	**9PS Sound** This unit builds on the work in year 8 on light waves and makes several links to it. The unit begins by reviewing the work from year 8 and establishing the different types of wave.	**9PS TOPIC TEST** **KPIs**	**STEM Club** **The Day**

	Waves in matter are introduced and water and sound waves are used as examples of this. The idea of absorption of energy leading to an increase in the thermal store of a substance is revisited here too. The unit then looks at the speed of sound in different media and is a chance to revisit accurate language around particle theory. Then, uses of ultrasound and how microphones and loudspeakers work. • 9PS – Sound • Identifying sources of error • Using SI units for wavelength, frequency, and speed • Calculating means and uncertainties		**New Scientist**
Year 9 HT6	**GCSE Chemistry** The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels. Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies • AQA trilogy combined science – Chemistry • Writing formulae and balanced symbol equations • Evaluating the use of models • Understanding the periodic table • Using equipment correctly to test a hypothesis	**CHEM 1 TEST – 45 MINS** **END OF YEAR PPE 1 – 60 MINS** **END OF YEAR PPE 2 – 60 MINS**	**STEM Club** **The Day** **New Scientist**

Term Curriculum Content	Assessment(s) *(assessment title, duration and approx date)*	Extra-Curricular Options *(Places to visit; wider reading; clubs to join)*
Year 10 Curriculum Overview: *What will year 10s study and learn this academic year? Why this/ why now?* Biology, chemistry, and physics will be studied in ways that help students to develop curiosity about the natural world, insight into how science works, and appreciation of its relevance to their everyday lives. After studying science, pupils should enable students to: 1. develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry, and physics. 2. develop understanding of the nature, processes, and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them. 3. develop and learn to apply observational, practical, modelling, enquiry, and problem-solving skills, both in the laboratory, in the field and in other learning environments. 4. develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence, and conclusions, both qualitatively and quantitatively. The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in biology, chemistry, and physics. These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment. • Life processes depend on molecules whose structure is related to their function. • The fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively. • Life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen. • Organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life. matter is composed of tiny particles called atoms and there are about 100 different naturally occurring types of atoms called elements • Elements show periodic relationships in their chemical and physical properties. • These periodic properties can be explained in terms of the atomic structure of the elements. • Atoms bond by either transferring electrons from one atom to another or by sharing electrons. • The shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave. • Chemical reactions take place in only three different ways: 1) proton transfer 2) electron transfer 3) electron sharing. • Energy is conserved in chemical reactions so can therefore be neither created or destroyed.		• **CGP** revision guide • **CGP** Student books for biology, chemistry, and physics • **Oxford Revise** revision guide In school activies: **Stem club** to be set up next year Visit: • Science museum • Natural History Museum • Horniman Museum • The Royal Observatory • Grant Museum of Zoology • Brunel Museum • St Bartholemew's Hospital Museum • Bletchley Park

	the use of models, as in the particle model of matter or the wave models of light and of sound. • The phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic, and gravitational effects. • That differences, for example between pressures or temperatures or electrical potentials, are the drivers of change. • That proportionality, for example between work and force of an object affects distance or between force and extension in a spring, is an important aspect of many models in science. • that physical laws and models are expressed in mathematical form.		
Year 10 HT1	**Bonding, structure, and the properties of matter** Students will learn about/ develop skills of: Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies. • Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. • Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding. • Recognise substances as metallic giant structures from diagrams showing their bonding. **Quantitative Chemistry** Students will learn about/ develop skills of: Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a keyway for chemists to communicate chemical ideas. • Opportunities within investigation of mass changes using various apparatus. • Recognise and use expressions in decimal form. • Recognise and use expressions in standard form. • Use an appropriate number of significant figures.	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks' worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed.	

	• Understand and use the symbols: =, <>, >, ∝, • Change the subject of an equation. • Use ratios, fractions and percentages. • Substitute numerical values into algebraic equations using appropriate units for physical quantities. • Substitute numerical values into algebraic equations using appropriate units for physical quantities. **Chemical Changes** Students will learn about/ develop skills of: Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the earth makes use of the way that some elements • Mixing of reagents to explore chemical changes and/or products. • An opportunity to investigate pH changes when a strong acid neutralises a strong alkali. • An opportunity to measure the pH of different acids at different concentrations. • Make order of magnitude calculations. • An opportunity to use safer alternatives for practical work such as anhydrous zinc chloride. **Required practical activity 8:** preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution. **Required practical activity 9:** investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis.		
Year 10 HT2	**Energy Changes** Students will learn about/ develop skills of: Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks.	

	bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way. • An opportunity to measure temperature changes when substances react or dissolve in water. **Cell Biology** Students will learn about/ develop skills of: Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. • Develop an understanding of size and scale in relation to cells, tissues, organs and systems. • Use other models to explain enzyme action. **Organisation** Students will learn about/ develop skills of: In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially about coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.	These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed.	

	• Use other models to explain enzyme action. • Observing and drawing blood cells seen under a microscope. • Evaluate risks related to use of blood products. • Evaluate methods of treatment bearing in mind the benefits and risks associated with the treatment. • Interpret data about risk factors for specified diseases. • Observation and drawing of a transverse section of leaf. • Measure the rate of transpiration by the uptake of water. • Investigate the distribution of stomata and guard cells. • Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand the principles of sampling and calculate surface areas and volumes. **Required practical activity 10:** investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals. **Required practical activity 1**: use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. **Required practical activity 2**: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. **Required practical activity 3:** use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein. **Required practical activity 4:** investigate the effect of pH on the rate of reaction of amylase enzyme.		
Year 10 HT3	**Infection and response** Students will learn about/ develop skills of: Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an	

	unusual or dangerous diseases our body's natural system can be enhanced using vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against several lethal diseases caused by bacteria. Unfortunately, many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics. • Evaluate the global use of vaccination in the prevention of disease. • Understand that the results of testing and trials are published only after scrutiny by peer review. **Bioenergetics** Students will learn about/ develop skills of: In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue. Evaluate the global use of vaccination in the prevention of disease. • Solve simple algebraic equations. • Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. • Investigations into the effect of exercise on the body. **Energy** Students will learn about/ develop skills of: The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century. Physicists and engineers are working hard to identify ways to reduce our energy usage. • Explore the link between work done (energy transfer) and current flow in a circuit is covered in Work done and energy transfer. • Students should be able to recall, apply and manipulate equations.	opportunity to persistently succeed. **PPE** What's assessed Chemistry topics: ○ Atomic structure and the periodic table; Bonding, ○ structure, and the properties of matter; ○ Quantitative chemistry; ○ Chemical changes; and ○ Energy changes. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, • open response.	

	• Investigate the transfer of energy from a gravitational potential energy store to a kinetic energy store. • Investigate thermal conductivity using rods of different materials. • **Required practical activity 5:** investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. **Required practical activity 14**: an investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.		
Year 10 HT4	**Electricity** Students will learn about/ develop skills of: Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors, semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future? • Students should be able to recall, apply and manipulate equations. • Investigate the relationship between the resistance of a thermistor and temperature. • Investigate the relationship between the resistance of an LDR and light intensity. **Required practical activity 15:** use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: • the length of a wire at constant temperature • combinations of resistors in series and parallel.	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed.	

	Required practical activity 16: use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature.		
Year 10 HT5	**Particle model of matter** Students will learn about/ develop skills of: The particle model is widely used to predict the behaviour of solids, liquids, and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain! • Students should be able to recall and apply this equation to changes where mass is conserved. • Investigate the relationship between the resistance of a thermistor and temperature. • Investigate the relationship between the resistance of an LDR and light intensity. **Atomic Structure** Students will learn about/ develop skills of: Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in medicine, industry, agriculture, and electrical power generation. • Students should be able to recognise expressions given in standard form. • Use the historical context provided as an opportunity for students to show an understanding of why and describe how scientific methods and theories develop over time. **Homeostasis** Students will learn about/ develop skills of: Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed.	

	include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. • Students should be able to recognise expressions given in standard form. • Evaluate information around the relationship between obesity and diabetes and make recommendations considering social and ethical issues. • Show why issues around contraception cannot be answered by science alone. • Explain every day and technological applications of science; evaluate associated personal, social, economic, and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Developments of microscopy techniques have enabled IVF treatments to develop. • Understand social and ethical issues associated with IVF treatments. • Evaluate from the perspective of patients and doctors the methods of treating infertility. • Interpret and explain simple diagrams of negative feedback control. **Required practical activity 17**: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects, and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers. **Required practical activity 6:** plan and carry out an investigation into the effect of a factor on human reaction time.		
Year 10 HT6	**Inheritance, variation and evolution** Students will learn about/ develop skills of: In this section we will discover how the number of chromosomes is halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to several genetic disorders or death. Very rarely a new mutation can be beneficial and	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of	

	consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them into the genome of another by a process called genetic engineering. Despite the huge potential benefits that this technology can offer, genetic modification remains highly controversial. • Model behaviour of chromosomes during meiosis. • Appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which arise. • Use the theory of evolution by natural selection in an explanation. • Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues. • Interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic engineering, including GM crops. • Use data to support the theory of evolution. • Extract and interpret information from charts, graphs and tables. • Appreciate why the fossil record is incomplete. • Understand how scientific methods and theories develop over time. • Interpret evolutionary trees.	learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed. **PPE 2** Three full paper 1 mocks. 50% of total GCSEs What's assessed **Biology** topics: • Cell Biology; • Organisation; • Infection and response; • Bioenergetics. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Chemistry** topics: ○ Atomic structure and the periodic table; Bonding, ○ structure, and the properties of matter; ○ Quantitative chemistry;	

		○ Chemical changes; and ○ Energy changes. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Physics** topics: • Energy; • Electricity; • Particle model of matter; • Atomic structure. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response.	

Term	Curriculum Content	Assessment(s) *(assessment title, duration and approx date)*	Extra-Curricular Options *(Places to visit; wider reading; clubs to join)*
Year 11 Curriculum Overview: *What will year 11s study and learn this academic year? Why this/ why now?* Biology, chemistry, and physics should be studied in ways that help students to develop curiosity about the natural world, insight into how science works, and appreciation of its relevance to their everyday lives. After studying science, pupils should enable students to: • develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry, and physics. • develop understanding of the nature, processes, and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them. • develop and learn to apply observational, practical, modelling, enquiry, and problem-solving skills, both in the laboratory, in the field and in other learning environments. • develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence, and conclusions, both qualitatively and quantitatively.			• **CGP** revision guide • **CGP** Student books for biology, chemistry, and physics • **Oxford Revise** revision guide In school activies: **Stem club** to be set up next year Visit: • Science museum • Natural History Museum • Horniman Museum • The Royal Observatory • Grant Museum of Zoology • Brunel Museum • St Bartholemew's Hospital Museum • Bletchley Park
Year 11 HT1	**Organic Chemistry** Students will learn about/ develop skills of: The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists can take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks' worth of learning. It provides pupils with excellent exam practise and an	

	• Make models of alkane molecules using the molecular modelling kits. • Investigate the properties of different hydrocarbons. **Chemical Analysis** Students will learn about/ develop skills of: Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive, and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work. • Recognise and use expressions in decimal form. • Use ratios, fractions, and percentages. • Make estimates of the results of simple calculations. **Chemistry of the atmosphere** Students will learn about/ develop skills of: The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity. • Recognise and use expressions in decimal form. • Use ratios, fractions, and percentages. • An opportunity to show that aquatic plants produce oxygen in daylight. **Using resources** Students will learn about/ develop skills of: Industries use the Earth's natural resources to manufacture useful products. To operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste, and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists' study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.	opportunity to persistently succeed.	

	• Translate information between graphical and numeric form. • LCAs should be done as a comparison of the impact on the environment of the stages in the life of a product, and only quantified where data is readily available for energy, water, resources, and wastes. • Interpret LCAs of materials or products given appropriate information. • Recognise and use expressions in decimal form. **Homeostasis** Students will learn about/ develop skills of: Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. To do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. • Students should be able to recognise expressions given in standard form. • Evaluate information around the relationship between obesity and diabetes and make recommendations considering social and ethical issues. • Show why issues around contraception cannot be answered by science alone. • Explain every day and technological applications of science; evaluate associated personal, social, economic, and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Developments of microscopy techniques have enabled IVF treatments to develop. • Understand social and ethical issues associated with IVF treatments. • Evaluate from the perspective of patients and doctors the methods of treating infertility. • Interpret and explain simple diagrams of negative feedback control. **Required practical activity 12**: investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.		

	Required practical activity 13: analysis and purification of water samples from different sources, including pH, dissolved solids and distillation. **Required practical activity 6:** plan and carry out an investigation into the effect of a factor on human reaction time.		
Year 11 HT2	**Inheritance, variation and evolution** Students will learn about/ develop skills of: In this section we will discover how the number of chromosomes is halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to several genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them into the genome of another by a process called genetic engineering. Despite the huge potential benefits that this technology can offer, genetic modification remains highly controversial. • Model behaviour of chromosomes during meiosis. • Appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which arise. • Use the theory of evolution by natural selection in an explanation. • Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues. • Interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic engineering, including GM crops. • Use data to support the theory of evolution. • Extract and interpret information from charts, graphs and tables. • Appreciate why the fossil record is incomplete. • Understand how scientific methods and theories develop over time. Interpret evolutionary trees.	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed. **PPE 1** Three full paper 1 mocks. 50% of total GCSEs What's assessed **Biology** topics: • Cell Biology; • Organisation; • Infection and response; • Bioenergetics. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier	

	Ecology Students will learn about/ develop skills of: The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms, and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. To continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity, and well-being. • Recording first-hand observations of organisms. • Extract and interpret information from charts, graphs and tables. • Interpret graphs used to model predator-prey cycles. • Explain how waste, deforestation and global warming have an impact on biodiversity. • Understand the conflict between the need for cheap available compost to increase food production and the need to conserve peat bogs and peatlands as habitats for biodiversity and to reduce carbon dioxide emissions. • Evaluate the environmental implications of deforestation. • Understand that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications. • Explain why evidence is uncertain or incomplete in a complex context. • Evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment. • Explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information. **Required practical activity 7:** measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.	Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Chemistry** topics: ○ Atomic structure and the periodic table; Bonding, ○ structure, and the properties of matter; ○ Quantitative chemistry; ○ Chemical changes; and ○ Energy changes. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Physics** topics: • Energy; • Electricity; • Particle model of matter;	

		• Atomic structure. How it's assessed: Written exam: 1 hour 15 minutes o Foundation o Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response	
Year 11 HT3	**Forces** Students will learn about/ develop skills of: Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible. • Students should be able to recall and apply this equation. • Students should recognise and be able to use the symbol for proportionality, $\propto$ • Students should be able to use ratios and proportional reasoning to convert units and to compute rates. • Measure the effect of distractions on reaction time. • Investigate collisions between laboratory trollies using light gates, data loggers or ticker timers to measure and record data. **Waves** Students will learn about/ develop skills of: Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks' worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed.	

	imaging and communication systems show how we can make the most of electromagnetic waves. • Students should be able to recall and apply this equation. **Required practical activity 18:** investigate the relationship between force and extension for a spring. **Required practical activity 19:** investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force. **Required practical activity 20:** make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements. **Required practical activity 21:** investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.		
Year 11 HT4	**Magnetism and electromagnetism** Students will learn about/ develop skills of: Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this. • The use of models, as in the particle model of matter or the wave models of light and of sound • The concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions • The phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic, and gravitational effects • That differences, for example between pressures or temperatures or electrical potentials, are the drivers of change • That proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science	**Fortnightly tests** These are tests that are set, under exam conditions in the classroom, every two weeks. These are designed to assess the progress made during the previous two weeks worth of learning. It provides pupils with excellent exam practise and an opportunity to persistently succeed. **PPE 2** Three full paper 1 mocks. 50% of total GCSEs What's assessed **Biology** topics:	

	• That physical laws and models are expressed in mathematical form.	• Homeostasis and response; • Inheritance, variation and evolution; • Ecology How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Chemistry** topics: • The rate and extent of chemical change; • Organic chemistry; • Chemical analysis; Chemistry of the atmosphere; • Using resources. How it's assessed: Written exam: 1 hour 15 minutes ○ Foundation ○ Higher Tier	

		Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response. What's assessed **Physics** topics: • Forces; • Waves; • Electromagnetism; How it's assessed: Written exam: 1 hour 15 minutes o Foundation o Higher Tier Maximum marks = 70 marks which makes up 16.7% of GCSE Questions will be assessed using • Multiple choice, • structured, • closed short answer, open response	
Year 11 HT5	**Revision and Exam prep** •		

Term	**Curriculum Content**	**Assessment(s)** *(assessment title, duration and approx date)*	**Extra-Curricular Options** *(Places to visit; wider reading; clubs to join)*
Year 12 Curriculum Overview:			

In Y12, students study the core topics of physics of particles and radiation, waves and optics, mechanics and martials, and electricity. These topics build on the KS4 curriculum studied in Y10 and Y11, refining knowledge and skills as students study the topics with greater depth and breadth. Students also develop their working scientifically skills through 6 core practicals over the course of the year.			
Year 12 HT1	**Particles** Particles introduces students both to the fundamental properties of matter, and to electromagnetic radiation and quantum phenomena. We begin with this topic to provide a new interest and knowledge dimension beyond GCSE. Through a study of these topics, students become aware of the way ideas develop and evolve in physics. They will appreciate the importance of international collaboration in the development of new experiments and theories in this area of fundamental research. Students will learn about/ develop skills of: • Constituents of the atom • Stable and unstable nuclei • Particles, antiparticles and photons • Particle interactions and classification of particles • Quarks and antiquarks • Applications of conservation laws **Mechanics - Moments** Vectors and their treatment are introduced followed by development of the student's knowledge and understanding of forces, energy and momentum. Students will learn about/ develop skills of: • Scalars and vectors • Moments	**Ch.1 Particles assessment** **Ch.2 Quarks and leptons assessment** **Ch. 6 Forces in equilibrium assessment**	**Richard Feynman's 6 easy pieces of physics** **Join the institute of physics (IoP)**
Year 12 HT2	**Quantum Physics** Building on particle physics, to electromagnetic radiation and quantum phenomena. This culminates in the study of wave-particle duality to have a full understanding of the particle and wave like nature of physics. Students will learn about • The photoelectric effect • Collisions of electrons with atoms • Energy levels and photon emission • Wave-particle duality **Mechanics - Projectile motion**	**Ch.3 Quantum Physics assessment** **Ch.7 on the move assessment** **Ch.8 Newtons law's of motion assessment** **PPE 1**	

	Vectors and their treatment are introduced followed by development of the student's knowledge and understanding of forces, energy and momentum. Students will learn about/ develop skills of: • Motion along a straight line • Projectile motion		
Year 12 HT3	**Waves and optics** GCSE studies of wave phenomena are extended through a development of knowledge of the characteristics, properties, and applications of travelling waves and stationary waves. Topics treated include refraction, diffraction, superposition and interference. Students will learn about/ develop skills of: • Progressive waves • Longitudinal and transverse waves • Principle of superposition of waves and formation of stationary waves • Interference • Diffraction • Refraction at a plane surface **Mechanics - Newtons Laws of Motion and Energy** Vectors and their treatment are introduced followed by development of the student's knowledge and understanding of forces, energy and momentum. Students will learn about/ develop skills of: • Newton's laws of motion • Momentum • Work, energy and power • Conservation of energy	**PPE 1** **Ch.4 Waves assessment** **Ch.9 Forces and momentum assessment** **Ch.10 Work, energy and power assessment**	
Year 12 HT4	**Electricity:** Electricity builds on and develops earlier study of these phenomena from GCSE. It provides opportunities for the development of practical skills at an early stage in the course and lays the groundwork for later study of the many electrical applications that are important to society. Students will learn about/ develop skills of:	**Ch.5 Optics assessment** **Ch.12 Electric current assessment** **Ch.11 Materials assessment**	**Visit Oxford University's School of Material Science.**

	• Basics of electricity • Current–voltage characteristics • Resistivity • Circuits • Potential divider • Electromotive force and internal resistance **Materials** The study of mechanics at Y12 culminates with the study of materials considered in terms of their bulk properties and tensile strength. Students will learn about/ develop skills of: • Bulk properties of solids • The Young modulus	**PPE 2**	
Year 12 HT5	**Further Mechanics:** The earlier study of mechanics is further advanced through a consideration of circular motion and simple harmonic motion (the harmonic oscillator). Students will learn about/ develop skills of: • Circular motion • Simple harmonic motion (SHM) • Simple harmonic systems • Forced vibrations and resonance	**Ch.13 DC circuits assessment** **Ch.17 Motion in a circle assessment** **Ch.17 Motion in a circle assessment**	
Year 12 HT6	**Revision** Students will revise for their end of year exams covering everything they have learnt in Y12. **Thermal Physics** Building on Y12 mechanics, further mechanics allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth. Students will learn about/ develop skills of: • Thermal energy transfer	**PPE 2 – end of year exams** **Ch.19 - Thermal Physics assessment**	
Term	**Curriculum Content**	**Assessment(s)**	**Extra-Curricular Options**

		(assessment title, duration and approx date)	*(Places to visit; wider reading; clubs to join)*
Year 13 Curriculum Overview: *In Y13 Physics students build on their Y12 physics knowledge, practical skills and mathematic skills to develop a complete understanding and fluency of physics. At the end of the course, students are ready to continue their studies in physics or science related degree.*			
Year 13 HT1	**Thermal Physics** Building on Y12 mechanics, further mechanics allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth. Students will learn about/ develop skills of: • Thermal energy transfer • Ideal gases • Molecular kinetic theory model **Fields and their consequences – Gravitational fields.** The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society. Students will learn about/ develop skills of: • Fields • Gravitational fields • Gravitational field strength • Gravitational potential • Orbits of planets and satellites	**Ch.19 - Thermal Physics assessment** **Ch.21 - Gravitation fields assessment**	
Year 13 HT2	**Thermal Physics** Building on Y12 mechanics, further mechanics allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth. Students will learn about/ develop skills of: • Thermal energy transfer • Ideal gases • Molecular kinetic theory model **Fields and their consequences – Electric fields**	**Ch.20 - Gasses assessment** **Ch.22 - Electric fields**	

	The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society. Students will learn about/ develop skills of: • Coulomb's law • Electric field strength • Electric potential		
Year 13 HT3	**Nuclear Physics – Radioactivity** This section builds on the work of Particles and radiation to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society Students will learn about/ develop skills of: • Rutherford scattering • α, β and γ radiation • Radioactive decay **Fields and their consequences – Capacitance** The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society. Students will learn about/ develop skills of: • Capacitance • Parallel plate capacitor • Energy stored by a capacitor • Capacitor charge and discharge	**Ch.26 - Radioactivity assessment** **Ch.23 - Capacitors assessment**	
Year 13 HT4	**Nuclear Physics – Nuclear energy**	**Ch.27 - Nuclear energy assessment**	

	This section builds on the work of Particles and radiation to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society Students will learn about/ develop skills of: • Nuclear instability • Nuclear radius • Mass and energy • Induced fission and safety issues **Fields and their consequences – Magnetic Fields and Electromagnetic Induction** The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society. Students will learn about/ develop skills of: • Magnetic flux density • Moving charges in a magnetic field • Magnetic flux and flux linkage • Electromagnetic induction • Alternating currents • The operation of a transformer	**Ch.24 - Magnetic fields assessment** **Ch.25 - Electromagnetic induction assessment**	
Year 13 HT5	**Turning points in physics:** Turning points in physics is intended to enable key concepts and developments in physics to be studied in greater depth than in the core content. Students will be able to appreciate, from historical and conceptual viewpoints, the significance of major paradigm shifts for the subject in the perspectives of experimentation and understanding. Many present-day technological industries are the consequence of these key developments and the topics in the option illustrate how unforeseen technologies can develop from new discoveries. Students will learn about/ develop skills of: • The discovery of the electron	**Turning points in physics assessment.**	

	• Wave-particle duality • Special relativity		

Term	Curriculum Content	Assessment(s) *(assessment title, duration and approx date)*	Extra-Curricular Options *(Places to visit; wider reading; clubs to join)*
Year 12 Curriculum Overview: *A-Level Chemistry covers a wide variety of basic concepts such as the structure of the atom; the interaction of matter and energy an; how to control reactions; patterns in the periodic table and understanding carbon-based molecules. Students will build upon skills and knowledge learned at GCSE Chemistry. Many topics include mathematics calculations, and students will also be expected to carry out experiments regularly to consolidate class work and to build upon their skills and confidence in completing safe and accurate practical work. In Year 12, students study Year 1 of the 2-year A-Level Chemistry specification. The course is split into two, taught by 2 teachers simultaneously.* *The topics we teach in Year 12 are:* - *Physical Chemistry – Atomic structure, Amount of substance, Bonding and structure, Redox, Energetics, Kinetics, Equilibria* - *Inorganic Chemistry – Periodicity, Group 2, Group 7* - *Organic Chemistry – Alkanes, Alkenes, Haloalkanes, Alcohols, Organic analysis*			**Royal Society of Chemistry** **Chemistry Olympiads** **Playerfm/Chemistry podcasts** **Oxford Chemistry reading list**
Year 12 HT1	**Atomic structure** Atomic Structure introduces students to the fundamental ideas of chemistry, which are further built upon throughout the specification. Students will appreciate that knowledge and understanding of atomic structure has evolved over time. They will be able to determine the number of fundamental particles in atoms, ions using the periodic table and explain the existence of isotopes in addition to interpreting simple mass spectra of elements and calculating relative atomic mass from isotopic abundance. The should also be able to explain how first ionisation energies give evidence for electron configuration in sub shells. • Fundamental Particles • Mass number and isotopes • Electron Configuration **Amount of Substance** Amount of Substance introduces students to the maths skills that will be heavily required throughout the course. It builds upon basic maths skills learned at GCSE, and gives students a deeper understanding of why these calculations are so important for	**Atomic Structure Test** **Amount of Substance Test** **Bonding Test** **Kinetics Test**	

	chemists. In this unit students are also introduced to the first required practical, in which they will be assessed on their experimental and analytical skills. • Relative atomic mass + Relative molecular mass • The mole and Avogadro's constant • The Ideal Gas Equation • Empirical and molecular formula • Balanced equations and associated calculations • RP: Making up a volumetric solution **Bonding** Students build upon bonding knowledge and understand the physical and chemical properties of compounds depend on the ways in which the compounds are held together. They also are introduced to theories of bonding and how to deduce the shape of molecules, this unit of study again builds upon students basic knowledge obtained at GCSE level and is crucial to progressing throughout the 2 years of study. • Ionic Bonding • Covalent Bonding • Metallic Bonding • Shapes of simple molecules and ions • Bond Polarity • Forces between molecules **Kinetics** The study of kinetics enables chemists to determine how a change in conditions affects the speed of a chemical reaction. They also understand and appreciate whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are variables that can be manipulated to speed them up or slow them down. Students are also taught how to draw and interpret distribution curves for different temperatures, and are also introduced to another CPAC. • Collision Theory • Maxwell-Boltzmann distribution • Effect of temperature on reaction rate • Effect of concentration and pressure • Catalysts • RP: Investigation of how rate changes with temperature		
Year 12 HT2	**Energetics** Students will learn how to define the different types of enthalpy changes and understand reactions can be endothermic or exothermic. They will understand how the enthalpy change in a chemical reaction can be measured accurately and appreciate the	**Energetics Test** **Equilibria Test** **Intro to Organic Test**	

	importance of this value for chemical reactions, as well as be exposed to the applications of these reactions in everyday life. • Enthalpy Changes • Calorimetry • Applications of Hess' Law • Bond enthalpies • RP: Measurement of an enthalpy change **Chemical equilibria, Le Chatelier's principle, and Kc** In contrast with kinetics, a study of equilibria indicates how far reactions will go. Students learn how Le Chatelier's principle can be used to predict the effects of changes in temperature, pressure, and concentration on the yield of a reversible rection; which has important consequences for many industrial processes. The further study of the equilibrium constant Lc, considered how the mathematical expression for the equilibrium constant enables us to calculate how an equilibrium yield will be influenced by the concentration of the reactants and products • Chemical equilibria and Le Chatelier's principle • Equilibrium constant Kc for homogeneous systems **Introduction to Organic Chemistry** Students are introduced to Organic Chemistry, and will appreciate that there are various structurally diverse compounds in living systems and how organic compounds demonstrate human ingenuity in the vast range of synthetic materials created by chemists. Students will also be taught how organic compounds are named using the IUPAC system and understand how mechanisms are used to explain reactions. • Nomenclature • Reaction mechanisms • Isomerism **Alkanes** Students will learn how alkanes are the main constituent of crude oil, and the importance of this raw material for the chemical industries. They will also understand the uses of them and the environmental consequences of them are considered in this unit. • Fractional distillation of crude oil • Modifications of alkanes by cracking • Combustion of alkanes • Chlorination of alkanes	**Alkanes Test**	
Year 12 HT3	**Periodicity**	**PPE 1 (Paper 1)**	

	Students will learn about how the periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. In addition to appreciating the historical development of the periodic table and models of atomic structure providing good examples of how scientific ideas and explanations develop over time. • Classification • Physical properties of Period 3 elements **Oxidation, Reduction and Redox Equations** Student will be able to work out the oxidation state of a element in a formula or ion and write half equations identifying oxidation, reduction and redox processes; in addition to learning how to combine half equations to give an overall redox equation **Halogenoalkanes** Students will learn how to outline the mechanisms involved for these compounds. They will learn how halogenoalkanes are much more reactive than alkanes and their many uses as solvents and in pharmaceuticals. • Nucleophilic Substitution • Elimination • Ozone depletion **Alkenes** This section covers how the high electron density of the carbon-carbon double bond leads to attach on these molecules by electrophiles. It also covers the mechanism of addition to the double bond and introduces addition polymers, which are commercially important and have many uses in society • Structure, bonding and reactivity • Addition reactions of alkenes • Addition polymers	**PPE 1 (Paper 2)** **Periodicity and Redox Test** **Halogenoalkanes Test** **Alkenes Test**	
Year 12 HT4	**Group 2, the alkaline earth metals** Students will learn about the elements in group 2, the trends in the solubilities of the hydroxides and sulphates of these elements and how they are linked to their use. They will understand the applications of these in medicine and agriculture. **Group 7, the halogens** Students will learn about the halogens in Group 7. Trends in their physical and chemical properties are examined and explained. And the ability of the halogens to behave as oxidising agents and the halides to behave as reducing agents • Trends in properties • Uses of chlorine and chlorate (I) • RP: Carry out simple test-tube reactions to identify ions	**Group 2 + Group 7 Test** **Alcohols Test** **Organic Analysis Test**	

	Alcohols Students will learn how alcohols have many scientific, medicinal, and industrial uses. Students should also be able to outline the mechanisms for the formation of alcohols from alkenes and from fermentation. They will also be taught chemical tests used to distinguish between products of oxidation of alcohols. • Alcohol production • Oxidation of alcohols • Elimination • RP: Distillation of a product from a reaction **Organic Analysis** Students will learn our understanding or organic molecules, their structure, and the way they react, has been enhanced by organic analysis. This unit considers some of the analytical techniques used by chemists, including the test-tube reactions and spectroscopic techniques • Identification of functional groups by test-tube reactions • Mass spectrometry • Infrared spectroscopy • RP: Tests for alcohol, aldehyde, alkene, and carboxylic acids		
Year 12 HT5	**Revision** Students will revise for their end of year exams covering everything they have learnt in Y12. This time will also be used to address misconceptions, re-teach topics and catch-up for students to be ready for their End of Year exams/AS exams; and to be ready to begin Year 2 content after these exams.	**Mock PPE**	
Year 12 HT6	**Thermodynamics (A level)** Students will begin Year 2 content by studying thermodynamics which is the further study of energetics and builds upon knowledge and concepts learnt in that unit. It is important in understanding the stability of compounds and why chemical reactions occur. Students will understand how enthalpy change is linked to entropy change enabling the free-energy change to be calculated. • Born Haber cycles • Gibbs free energy change and entropy change **Optical Isomerism (A level)** Students will learn that compounds that contain an asymmetric carbon atom form stereoisomers that differ in their effect on plane polarised light.	**End of Year PPE 2 (Paper 1)** **End of Year PPE 2 (Paper 2)**	
Term	**Curriculum Content**	**Assessment(s)** ***(assessment title, duration and approx date)***	**Extra-Curricular Options** ***(Places to visit; wider reading; clubs to join)***
Year 13 Curriculum Overview:			

<table>
<tr><td colspan="3">In Y13 Chemistry students build on their Y12 chemistry knowledge, practical skills and mathematic skills to develop a complete understanding and fluency of chemistry. At the end of the course, students are ready to continue their studies in chemistry or science related degree.
The topics we teach in Year 13 are:
- Physical Chemistry – Thermodynamics, Acids and Bases, Electrode potentials, Rate equations, Equilibrium constant Kp
- Inorganic Chemistry – Period 3 Oxides, Transition Metals, Reactions of Aqueous ions in solution
- Organic Chemistry – Optical Isomerism, Aldehydes, Ketones, Carboxylic Acids, Esters, Amines, Aromatics, Organic Analysis</td><td>Royal Society of Chemistry

Chemistry Olympiads

Playerfm/Chemistry podcasts

Oxford Chemistry reading list</td></tr>
<tr><td>Year 13
HT1</td><td>Acids and Bases
Students will learn how acids and bases are important in domestic, environmental, and industrial contexts. They will understand how acidity in aqueous solutions is caused by hydrogen ions and a logarithmic scale, pH, as been devised to measure acidity. They will appreciate how buffer solutions can be made from partially neutralised weak acids, resist changes in pH and find many important industrial and biological applications.
• Bronsted-Lowry acid-base equilibria in aqueous solution
• Definition and determination of pH
• The ionic product of water, Kw
• Weak acids and bases, Ka for weak acids
• pH curves, titrations and indicators
• Buffer action
• RP: Investigate how pH changes when a weak acid reacts with a strong base
• RP: Investigate how pH changes when a strong acid reacts with a weak base
Equilibrium constant, Kp for homogeneous systems
Students will further study equilibria and consider how the mathematical expression for the equilibrium constant Kp enables us to calculate how an equilibrium yield will be influenced by the partial pressures of reactants and products and the consequences of this on reactions in industry.
Aldehydes and Ketones
Students learn how to construct mechanisms to show the addition reactions of aldehydes and ketones.
Carboxylic acids and esters
Students learn how carboxylic acids are weak acids, and the reactions of them with alcohols in the presence of an acid catalyst give an ester. Students also learn how to identify esters and the uses of products of reactions of carboxylic acids in industry, food and fuels.</td><td>Acids and Bases Test

Equilibrium constant Test

Organic Test</td><td></td></tr>
<tr><td>Year 13
HT2</td><td>Electrode Potentials and Electrochemical cells
Students will learn redox reactions take place in electrochemical cells where electrons are transferred from the reducing agent to the oxidising agent indirectly via an external circuit. A potential difference is created that can drive an electric current to do work.</td><td>PPE 1 (Paper 1)</td><td></td></tr>
</table>

	Students will appreciate the applications of electrochemical cells commercially as a portable supply of electricity to power electronic devices, and on a larger scale to power vehicles • Electrode potentials and cells • Commercial applications of electrochemical cells • RP: Measuring the EMF of an electrochemical cell **Properties of Period 3 elements and their oxides** The reactions of Period 3 elements with oxygen are considered. Students will learn the trends of melting points of the oxides in terms of structure and bonding, in addition to the reactions of these oxides with water and the types of products they produce. **Acylation** Students learn the structures of acid anhydrides, acyl chlorides and amides. As well as the industrial advantages of ethanoic anhydride over ethanoyl chloride in the manufacture of the drug aspirin - RP: Preparation of a pure organic solid and test its purity - RP: Preparation of a pure organic liquid **Aromatic Chemistry** Aromatic Chemistry takes benzene as an example of this type of molecule and students look at the structure of the benzene ring and its substitution reactions. Students should be able to use thermochemical evidence from enthalpies of hydrogenation to account for this extra stability and explain why substation reactions occur in preference to addition reactions **Rate equations** In rate equations, the mathematical relationship between rate of reaction and concentration gives information about the mechanism of a reaction that may occur in several steps. • Rate equations • Determination of rate equation • RP: Measuring the rate of reaction by initial rate method • RP: Measuring the rate of reaction by continuous monitoring method	**PPE 1 (Paper 2)** **PPE 1 (Paper 3)** **Electrode potentials Assessment** **Period 3 Oxides Assessment** **Acylation and Aromatics Assessment** **Rate equations Assessment**	
Year 13 HT3	**Transition metals** Students will learn how the 3d block consists of the most useful metals in industry and everyday life. The characteristics of these elements will be studied in much detail and students will be to explain the importance of these properties linked to their usefulness. In addition to understanding and drawing the shape of complex ions and building upon knowledge of stereoisomerism. • General properties of transition metals • Substitution reactions	**Transition metals Assessment** **Organic Assessment**	

	• Shapes of complex ions • Formation of coloured ions • Variable oxidation states • Catalysts **Electrophilic Substitution** Students should be able to outline the electrophilic mechanisms of nitration and acylation reactions. Students will appreciate how nitration is an important step in synthesis. **Amines** Students learn how amines are compounds based on ammonia where hydrogen atomcs have been replaced by alkyl or aryl groups. This unit also includes their reactions as nucleophiles • Preparation • Base properties • Nucleophilic properties **Polymers** Students learn the study of polymers is extended to include condensation polymers. The formation of condensation polymers is studied, together with their properties, uses and problems associated with the reuse or disposal of them • Condensation Polymers • Biodegradability and disposal of polymers **Amino Acids** Students learn how amino acids, proteins and DNA are molecules of life. In this unit the structure and bonding in these molecules and the way they interact is studied. This unit has cross-curricular links with A Level Biology. • Amino acids • Proteins • Enzymes • DNA • Action of anti-cancer drugs		
Year 13 HT4	**Reactions of ions in aqueous solution** Students will build upon knowledge obtained in transition metals and now look deeply at the reactions of transition metals in aqueous solution. They will understand how these ions can be identified by test-tube reactions in the laboratory. They will also be able to explain the acidity of the ions produced • RP: Carry out simple test-tube reactions to identify transition metal ions in aqueous solution	**PPE 2 (Paper 1)** **PPE 2 (Paper 2)** **PPE 2 (Paper 3)** **Reactions of aqueous solution Assessment**	

	Organic Synthesis Students will be able to explain why chemists aim to design processes that do not require a solvent and that use non-hazardous materials; in addition to explain why they aim to design a production with fewer methods and steps to ensure a high percentage atom economy. And to use reactions in this specification to devise a synthesis map for organic compounds; linking everything they have learned in organic chemistry. **Nuclear magnetic resonance spectroscopy** Students will have an appreciation that scientists have developed a range of analytical techniques which together enable the structures of new compounds. In addition to understanding how to use NMR spectra to determine the structure and how chemical shifts depend on the molecular environment and use proton and carbon NMR respectively. **Chromatography** Students will learn how chromatography provides an important method of separating and identifying components in a mixture. Different types of chromatography are used depending on the composition of mixture to be separated • RP: Separation of species by thin-layer chromatography	**Organic Synthesis Assessment** **NMR Assessment**	
Year 13 HT5	**Revision** Students will use this term to revise and prepare for their A-Level exams	**A-Level Chemistry Paper 1 (2 hours)** **A-Level Chemistry Paper 2 (2 hours)** **A-Level Chemistry Paper 3 (90 mins)**	