SCIENCE CURRICULUM OVERVIEW

A Lakelands Science student should be able to make observations of the world around them, create questions and test these either theoretically or practically. They should be able to understand information that is presented to them in the various formats e.g. news, social media and determine whether it is reliable or believable.

Lakelands Whole Academy Curriculum Intent:

Our aim is to provide a diverse, accessible, challenging and inspiring curriculum for the students of Lakelands, our core purpose to develop well-rounded, confident young people, with the integrity, resilience and high aspirations to thrive in the future. The curriculum is designed to provide them with the core knowledge they need to succeed in education, and to become successful members of society. We encourage them to be curious and open-minded, and develop the necessary critical, creative and problem-solving skills to be able to make a difference in their future lives. All students benefit from a culturally enriching curriculum that has depth, breadth and regular revisiting of knowledge to give them the confidence to succeed. It is a curriculum designed to encourage learners to step outside their comfort zone and embrace challenge. By drawing on the best that's been thought, said, and done in each subject, we hope that our curriculum enables our young people to appreciate and participate in the full richness of the human experience.

Science Curriculum Intent:

In this modern age of innovation, young people require the capacity to grasp diverse problems, retrieve and apply relevant knowledge and recognise meaningful patterns. At Lakelands our Science curriculum aims to develop the required abilities and understanding by focusing on developing powerful ideas of science and ideas about the nature of scientific activity and its applications. The Big Ideas of Science education highlights the global issues faced by humanity, such as climate change, health and population growth, creating an urgent need for young people to have a basic understanding of the relevant scientific ideas, technological and ethical issues and powers of reasoning, to be prepared to face these issues.

Our curriculum aims to develop successful scientists to work towards addressing the world's need for creative and solution producing individuals. We aim to incorporate skills by creating a curriculum where transferable and scientific skills are interwoven throughout the program of study with a focus on consolidating numeracy skills with links to the maths curriculum. Students' learning will be rooted in prior knowledge, using our close transition links with our feeder primaries. We work closely with or feeder primary schools and their science curriculum, enabling us to tailor accordingly to our local need. Learning in science will be multisensory, using the big picture to communicate the learning journey, highlighting and making the science relevant to local and national careers, with job, apprenticeship and training opportunities made clear to students in lessons.

Our GCSE and KS3 Science curriculum focuses on the three fundamental scientific disciplines of Biology, Chemistry and Physics, giving students a rounded understanding to appreciate and enquire about the world around them. The Big Ideas within these disciplines are appropriately sequenced in steps, using the BEST materials to ensure learning progression. The department uses diagnostic questions to reveal preconceptions and common misunderstandings and uses response activities to challenge these misunderstandings and encourage conceptual development. We aim to incorporate aspects of Science Capital within our lessons to inspire students to take on careers that have aspects of science within them. Students will be set challenging tasks using success criteria and scaffolds to allow them to connect prior knowledge to new material in both theoretical and practical applications, allowing them to challenge their misconceptions and develop their critical thinking skills. Tasks will be adapted to stretch and challenge students in lessons, to allow them to reach their potential.

By creating strong cross-curricular links between the sciences and other subjects within the school we aim to create well rounded individuals that can identify where science is used in the 'every day'. Our Science curriculum consolidates and extends key skills allowing the students to apply these in a range of scenarios. This allows progression to be promoted and facilitated throughout our students' scientific journey. As a result of the cross curricular linkage and Science curriculum our students will have an extensive understanding of fundamental scientific principles and associated vocabulary. These core principles will be regularly consolidated so that students are confident and comfortable using academic language in every context that requires it throughout their education and beyond. They will be able to plan and carry out increasingly complex, independent scientific enquiry activities, propose their own hypothesis based on their own relevant questions, interpret scientific data, to critically evaluate data sources to derive a reasoned, valid conclusion.

For a student to develop this understanding into true mastery, it is crucial for students to be provided with opportunities to frequently explore and revisit the simple concepts that combine to form the more complex big idea. Only through this approach can we be confident that our students have the skill and knowledge base required to make synoptic links between concepts and context that are both familiar and unfamiliar. In doing this we can facilitate success in both our students educational and post educational life, ensuring a well-rounded student who has a deep understanding of the world around them, and the ability to critically evaluate information, to make informed choices that impact upon their daily lives and the lives of others on our planet as a species.

Our young people are the future and will need to the skills and knowledge to solve challenges and problems that don't exist, using science and technology yet to be discovered and explored. Our curriculum aims to equip our young people to have the skills to adapt in this quickly changing, technologically advancing world.

How the Science curriculum links to our core Curriculum Principles:	
Lifelong Learning	We encourage our students to become independent and self-motivated to be able to make the most of life's learning journey. We focus on developing scientific thinking and questioning, alongside independent improvement of knowledge and understanding, with support after assessment activities. Teaching encourages students to realise that with every question, comes more questions!
Aspiration to succeed	We are developing our lessons to highlight career opportunities within the subject content covered and aspects of the world of employment and life that these topic areas touch upon. This will increase students' science capital. In conjunction with science video of the week this will expose students to careers they are otherwise unaware of and allow them to dream big.
Knowledge building	We help our students make the most of their brains' amazing capacity to absorb and retain knowledge, to equip them with the science capital to live a rich, fulfilling life, especially focusing on how things work, thinking scientifically and developing problem solving. This will allow student to be 'life smart' and question the media they consume and information they are presented, to ensure they are not misconceived by products or information available to them.
Empathy for others	We encourage our students to be 'Smart, Safe, Responsible and Kind', and grow to be good citizens who respect others, follow society's laws and participate in society. In Science we encourage students to effectively assess risks during practical activities and take steps to make these risks well-managed and safe. We encourage students to create a safe learning environment where scientific ideas and learning can be shared openly, encouraging students to ask questions about the world around them, the interactions that occur between objects and how the world works.

IMPLEMENTATION

Year 7 Curriculum Implementation The Year 7 Curriculum is designed to challenge students and narrow the gap, using our knowledge of working with our feeder primaries. We aim to instil a love for science in year 7 using our curriculum to allow students to develop their working scientifically skills, scientific enquiry and the foundations to allow them to build upon during their secondary school time with us. Where possible we aim to approach lessons with a practical approach to allow them to gain the hands-on practical experience, they need to be successful in KS4, and allow them to solve their own problems by discovering for themselves.		
	Knowledge and skills	**Assessment**
TERM 1	**Working Scientifically** Scientists work in a particular way to carry out fair and scientific investigations. This topic is about understanding how science works so that we can make decision about things that affect us. We are bombarded every day by new information. Scientific knowledge can help us to understand this information, and to figure out whether it is reliable or believable. Scientists have a key role in exposing 'fake news' and helping the population to be well-informed, using accurate information. This unit focuses on: How do scientists find out how things happen? How do you carry out an investigation? How do scientists use data to answer their questions?	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Cells This topic covers cells, the building blocks that make up all living organisms. It focuses on the tiny structures inside animal and plant cells and the special jobs that some cells do. It also looks at how substance move into and out of the cell by diffusion. There are lots of opportunities to look at cells.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Particles and their behaviour This topic covers the invisible particles that make up all matter. Students will discover how the arrangement, movement and separation of particles gives substances their properties, as well as what happens when substances melt, boil or condense. The ideas covered in this chapter will explain what students see when they boil water or freeze food to preserve it. They will learn how smells travel and why some materials are heavier than others for their size.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Body Systems In this topic students will look at the levels of organisation that exist in a multicellular organism. Two organ systems will be focused on in detail – the respiratory and skeletal system. Students will find out how the lungs help them to breathe and how the skeleton does much more than they learnt at KS2.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Elements, atoms and compounds In this topic students will learn about elements and use an international code to identify them. They will find out about the invisible particles – atoms – that make up elements, and how they join together in different combinations to make up all the substances on Earth and in the Universe. Students will learn how atoms, compounds and chemical formulae are used. Students will learn that just six elements of the that mentioned in this topic make up nearly 99% of a human's body mass. Every new material is made from atoms of one or more of the hundred or so elements that exist.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Light In this topic students will learn about light. They will learn where it comes from, and the journey it takes from a source to a detector, like an eye or a camera. They will find out how it can be reflected and change direction, and how fast it travels. Students will learn about the colours of light and filters, and how they can be used to change the way objects look.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks

TERM 2	Understanding light means that we can build telescopes that use light to see far into the Solar System and the Universe. This can give us clues about where the Universe came from. We can also take photos of what we see.	
	Space This topic teaches students about what we see in the night sky, and how far away things are. They will learn about the planets and the formation of the Solar System. Students will learn why we have seasons, and why they are different in different places. They will also learn about the phases of the moon and why there are eclipses.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Reactions In this topic students will learn about chemical reactions. They will discover how atoms rearrange and join together differently to make new substances, and why the total mass does not change. Students will learn to write word equations, classify chemical reactions, and use patterns to make predictions.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 3	**Forces** In this topic students will learn about different types of forces and where they come from. They will find out about contact forces and non-contact forces, and how you know forces are there. They will also learn to explain the motion of objects using forces.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Reproduction Students will cover the biology of sexual reproduction between a male and a female. They will cover the physical and emotional changes that take place in male and female bodies during adolescence. The structure and function of the male and female reproductive systems will be taught in detail along with the study of reproduction in plants, to include: the structure of flowers, pollination, fertilisation and germination.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Sound In this topic students will learn about sound, how it is produced, how it travels and its speed. They will learn how the wave properties of sound explain how we hear, and some ways that we can use sound and ultrasound to help us in everyday life	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
	Acids & Alkalis **Overview**: In this topic students will learn about acids, bases, and alkalis. They will cover how indicators work and the pH scale, to find out how acidic or alkaline a solution is, and how to work safely with these solutions. Towards the end of the topic, students will learn about neutralisation reactions, and they can be used to make crystals.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
Cross-curricular links in Y7: PE – Body Systems; PSHE – Reproduction, Benefits of vaccination programmes; History – development of medicines; Geography – Pollutants from fuels leading to environmental effects; RE – viewpoints of IVF; Food – Particles and their behaviour, Reactions, Working Scientifically; Music – Sound; Drama – Performance acoustics; DT – Forces; Maths – Calculation of forces, plotting numerical data onto graphs, calculating efficiency of appliances, calculations of distance and scales		
Careers: **Examples of careers in the Y8 curriculum – Biomedical Scientist, Paramedic, Reproductive Health Specialist, Chemical Technician, Analytical Chemist, Industrial Chemist, Environmental Chemist, Automotive engineer, Acoustic Engineer, Optics Engineer, and Astronomer.**		

Year 8 Curriculum Implementation

Having begun their Scientific journey in year 7, the year 8 curriculum continues this journey in establishing a broad foundation of both Scientific knowledge and skills, preparing our students to evaluate information provided in order to make informed choices. A skill vital not only in educational but also post educational life. In Year 8 we build upon previous knowledge extending this to enable our students to have a comprehensive understanding of how their bodies work and the complex interactions between ourselves and the environment in which we live. We seek to create outward looking considerate young people who are aware of themselves as custodians of the planet and who understand the impact that our choices can have on its delicate balance.

	Knowledge and skills	**Assessment**
TERM 1	**Health and Lifestyle** In this topic students will learn about the components of a balanced diet and how much of each component you should eat to remail healthy. They will also test a range of foods to identify which nutrients they contain. Students will study the main organs of the digestive system and the role of enzymes, and some bacteria play in digestion. Finally, they will look at the effect of drugs on the body, focusing on smoking and alcohol.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 1	**The Periodic Table** Everything on Earth and in the Universe is made up of atoms of one or more of the 100 or so elements that exist. Each element has its own unique properties, different to the properties of all the other elements. Students will Learn about metal and non-metal elements, and how to work out which are which. They will discover how the elements are organised in the Periodic Table to show patterns in their properties, and how to use the periodic table to make predictions.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 1	**Biological Processes** In this topic students will learn how plants make food through the process of photosynthesis, and its importance for all life on Earth. They will look at how leaves are adapted to maximise this process and the effects of minerals on plant growth. They will study how energy is transferred from the food that they eat to the cells in their body, through the process of respiration, and they will compare aerobic and anaerobic respiration in animals, and fermentation in plants.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 1	**Metals & Other Materials** There are hundreds of useful materials. Chemists classify these materials into groups, like metals and ceramics. In this topic students will learn how these properties make materials useful. They will study the properties of metals, ceramics, polymers, and composites. Students will also study the patterns in these properties and howe to obtain different metals from the Earth or the sea.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 2	**Energy** In this topic students will learn about the energy content of food and fuels, and the energy that is transferred doing different activities. They will compare energy resources and find out how they are used to generate electricity. They will compare energy and temperature and explore ways to model energy and its conservation. They will use the idea of particles to explain energy transfers and also those explained using radiation. They will learn how to do calculations of work and power. The ideas in this topic will explain their experiences with devices and processes that involve energy transfer such as cooking, generating electricity, electrical devices, and transportation.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 2	**Electricity & Magnetism**	In class, informal assessment of practical skills; Kerboodle;

	In this topic students will learn about electric charge and the link between charge and current. They will discover how ideas about current, potential difference, and resistance explain what happens in different types of circuits with different components. These ideas will help to explain the circuits we have in our houses and our cars. They will also learn how modelling electricity using rope can be useful. Students will compare permanent magnets and electromagnets, their strength, and the patterns of the magnetic fields they produce. They will learn about the uses of electromagnets and figure out when it is better to use an electromagnet rather than a permanent magnet. These ideas explain how electric motors work, which is important as they are used in a wide range of devices.	End of Unit Assessment; Post-unit test improvement tasks
TERM 2	**Separation Techniques** Students will learn about mixtures in their everyday lives such as hot chocolate, milk, and fruit juice. The different things that are in these are not joined together; they are just mixed up. In this topic, students will learn what mixtures are, and how mixtures are like – and unlike – compounds. They will find out how particles mix to make solutions, as well as how to separate solutions and make pure water. Finally, they will use chromatography to separate and identify substances in a solution	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 2	**Motion & Pressure** In this topic students will learn how to interpret a motion graph, which is a graph of distance against time. They will learn how to calculate speed from data, or from the graph. Students will learn how the pressure of a gas depends on temperature or volume, and why the atmosphere exerts a pressure that changes with height. They will compare pressure in gases to pressure in liquids and learn how to calculate the pressure exerted on the surface of a solid. They will learn how forces can make objects turn around a pivot and why some objects are more stable than others.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 3	**Ecosystems & Adaptations** In this topic students will begin to look at feeding relationships in food chains in more detail and how this can lead to build up of toxic materials within organisms. They will then study the interdependence of organisms within a food web by looking at population changes. They will also interpret graphs showing predator-prey interactions. Students will look in detail at the adaptations of a number of organisms that enable them to be successful competitors and survive in harsh and changing environments. This includes sampling ecosystems to identify the organisms present and the environmental conditions in which they live.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 3	**The Earth** You inhale a mixture of gases, including oxygen, nitrogen, and carbon dioxide. In this topic students will learn where these gases come from. They will learn how carbon atoms move between the atmosphere, the Earth, and the sea. The impacts of carbon dioxide in the atmosphere are explored, including global warming and climate change. They will also learn how to classify rocks into groups and learn how the material in rocks is recycled over millions of years.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks
TERM 3	**Inheritance** In biology, differences between organisms in a species ar0e due to variation. In this topic students will learn how to figure out if the variation is inherited, due to the environment, or both. They will discover that inherited characteristics are due to genes and how these are passed on from parents to their offspring. They will also find out about the scientists who discovered what DNA looks like. In the last part of the topic, they will study how organisms have evolved through the process of natural selection and why some organisms have become extinct. They will also learn about gene banks and how they help to stop other organisms going extinct.	In class, informal assessment of practical skills; Kerboodle; End of Unit Assessment; Post-unit test improvement tasks

Cross-curricular links in Y8: Geography – Human impact of waste on the environment; human impacts on the environment and interruption to food chains; DT – properties of metals and alloys; PSHE – impact of drugs and smoking on the body; PE - importance of flexibility and movement for muscle development; Maths – Calculations; drawing graphs and plotting data; drawing tables; interpreting data; using simple equations.
Careers: **Examples of careers in the Y8 curriculum – Healthcare practitioner, Nutritionist, Ecologist, Geneticist, Material Analyst, Spectrometer technician, Composite technician, Seismologist, National Grid technician, Crash Dynamics analyst, Theme Park Engineer.**

Year 9 Curriculum Implementation

The Year 9 curriculum is the beginning of our student's journey into GCSE. We have constructed this route to support our students from the transition from a KS3 curriculum to that of GCSE. The design of the route ensures students begin their GCSE journey on recognisable content to build confidence and a sense of achievement. Year 9 continues to consolidate and extend both individual student knowledge and skills linking new concepts back to previous learning through a spiral model curriculum, continuously revisiting and extending prior learning. Building the necessary practical skills, vocabulary and application to access the GCSE course.

	Knowledge and skills	Assessment
TERM 1	**B1 Cell structure & transport** In this chapter, students will have learnt about microscopy and cells, and should be able to explain how the development of microscopy techniques, particularly electron microscopy, has enabled scientists to investigate the sub-cellular structures. Students will be able to differentiate between animal and plant cells, differentiate between eukaryotic and prokaryotic cells, and identify adaptations of specialised animal and plant cells. They should also be able to use the formula size of image size of real object. Students will also have learnt about the transport of material into and out of cells by diffusion, osmosis, and active transport. It is important that students understand that in diffusion, material moves down a concentration gradient (from an area of high concentration to an area of low concentration); with active transport material moves against a concentration gradient (from an area of low concentration to an area of high concentration); and that osmosis is the movement of water across a partially permeable membrane to reduce a concentration gradient. When studying the processes for transferring material, students will also be able to explain the adaptations of exchange surfaces and link these to the processes of material transport.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**C1 Atoms, bonding & Calculations** In this chapter, students return to the concept of an atom as the smallest part of an element that can exist. However, they now learn that an atom consists of even smaller particles – sub-atomic particles. Students explore how the current model of the atom used at GCSE has developed relatively recently, beginning with Dalton's 'hard sphere' in the 19th century (similar to the model used at Key Stage 3) and then Thompson's 'plum pudding' model, before progressing to work that provided evidence for electrons, protons and neutrons, and the structure of an atom. Students will learn about the properties of these three sub-atomic particles, and how electrons are arranged in atoms. They will begin to relate some of what they already know about reactivity and trends in the Periodic Table to the electronic structure of the elements (students will go into more detail in Chapter 2 The periodic table). They will also learn what ions and isotopes are and how they relate to sub-atomic particles. Students should already know that each element has its own chemical symbol, that compounds can be represented by	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	combining element symbols, and that reactions can be represented by word equations. Now students develop their 'chemical literacy' further, learning how to include mass number and atomic number in element symbols, and how to write balanced symbol equations. Students also revisit the differences between elements, compounds, and mixtures. They learn practically how to separate mixtures through filtration, distillation, and paper chromatography, as well as understanding the theory behind these techniques.	
TERM 1	**P8 Forces in balance** In this topic students will learn about vectors and scalars, using the examples of distance and displacement along with the nature of forces. Representations of vectors using scale diagrams will lead to descriptions of the forces acting in a wide variety of situations and the identification of Newton's third law. The concept of balanced and unbalanced forces was used to determine the behaviour of objects and the application of Newton's first law of motion. Higher tier students will have produced free body diagrams demonstrating the forces acting on an isolated object. *GCSE Physics* students will have analysed the rotational effects of forces through the idea of moments using both a mathematical approach and an investigation into the turning effect. These students will also examine the application of levers and gears in increasing the size of the available force or the movement of an object. While all students will determine the centre of mass of an object experimentally, only the *GCSE Physics* students will have gone further with the idea of equilibrium and have used it to analyse the equilibrium conditions in seesaws, and other objects, mathematically using a rigorous approach. All higher tier students will have analysed the forces acting on an object in additional depth using a parallelogram of forces approach to determine the resultant force or a 'missing force' when an object is in equilibrium. In addition, the students will have resolved forces at right angles to analyse systems and determine if a system is in equilibrium.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**B2 Cell Division** In this topic, students will learn about the process of cell division and should be able to describe the three overall stages of the cell cycle. Students should understand mitosis as a stage within the cell cycle, but do not need to know about the different phases of the mitosis stage. They should be able to state the genetic material in the nucleus is doubled before the cell divides into two. Along with cell division, students will have also studied cell differentiation, and students should be able to make connections between cell differentiation and the specialised cells and adaptations they studied in Chapter B1 Cell structure and transport. Students will learn about stem cells as an undifferentiated cell that has the potential to become a specialised cell within an organism. Students should be able to describe some potential uses of stem cells, as well as the disadvantages and objections to the use of stem cells, particularly in relation to medical treatments.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**C2 The Periodic Table** The focus of this chapter is to bring together what students have learnt about the Periodic Table and groups 0, 1 and 7, with their understanding of atomic structure, including atomic number (elements are arranged according to atomic number, i.e. number of protons) and electronic structure. In this chapter, students get their first real taste of being able to explain chemistry in the world around them from 'first principles'. They begin to apply what they learnt about atomic structure in Chapter 1 to explain characteristic properties of elements in different groups of the Periodic Table and to explain trends in physical properties (e.g. melting and boiling points) and chemical properties (reactivity). Now, their understanding of the atomic model becomes a practical tool, as it is paired with an understanding of the structure of the Periodic Table. Being able to begin with the Periodic	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Table and logically follow through an argument to explain or predict a trend is appealing to students who find memorising a lot of information challenging. Students revisit what they learnt at Key Stage 3 about the history of the Periodic Table and about groups 0, 1 and 7. Now, knowledge of atomic structure – particularly proton number and electronic structure – enriches students' understanding and, like the chemists of the early 20th century, students begin to see how all of the pieces come together to explain familiar properties and reactions.	
TERM 2	**P9 Motion** This chapter expands students' understanding of motion and forces by building upon their prior knowledge from Key Stage 3. Initially, students will reinforce their understanding of speed and its quantitative relationship with distance and time, along with interpreting journeys on distance–time graphs and situations that involve relative motion. New concepts include rearranging the speed equation and utilising gradients of distance–time graphs to calculate speed. Students will also learn about circular motion and its effect on both speed and velocity. They will also calculate acceleration, using changes in velocity and time, and they use the gradients of velocity–time graphs to determine acceleration. More advanced topics include calculating distances travelled from velocity–time graphs, analysing motion data to understand speed, acceleration, and distance travelled, and applying the equation $v^2 - u^2 = 2as$ for situations where the initial or final velocity is both zero and non-zero.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**B3 The human digestive system** In this topic, students will learn about the principles of organisation. Building on their knowledge of differentiation and specialisation of cells, they should be able to define a tissue, an organ, and an organ system. They will study the human digestive system as an organ system in which several organs work together to digest and absorb food, breaking down large insoluble molecules so they can be absorbed into the bloodstream. They will link this with earlier work on diffusion and exchange surfaces in B1 Cell structure and transport. Students will understand the hierarchical organisation of the digestive system – for instance, the stomach is one organ, made up of muscular tissue, glandular tissue, and epithelial tissue, which digests food (especially protein). In studying chemical digestion, students will recognise carbohydrates, proteins, and lipids as large molecules that need to be digested and be able to name the molecules they are broken down into. They will be familiar with the enzymes that digest carbohydrates, proteins, and lipids, along with the sites of production of these enzymes in the digestive system. Students will be familiar with enzyme action and understand that enzymes are proteins with a specific shape including the active site. They will recall the lock and key model in which the substrate has a specific shape complementary to the active site, allowing it to bind to the active site where the reaction takes place, releasing products. They will be able to define enzymes as biological catalysts that are reused after each reaction. Students will study the effect of high temperature and extremes of pH on enzymes in changing the active site, which denatures the enzyme. They will be aware of how each part of the digestive system is adapted to provide an optimum pH for each enzyme, including the role of bile in the small intestine.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**C3 Structure and bonding** In this Chapter, students learn how the bulk properties of substances arise from their structure and bonding, which can be explained by electronic structure of the elements involved. Students will begin to explain their tangible experiences with the	Kerboodle online assessment; exam style questions and past papers in class; end of unit

	materials around them (bulk properties), rather than abstract ideas of single atoms. At Key Stage 3, students used the simple particle model to describe matter (identical solid spheres arranged and interacting in different ways in solids, liquids, and gases). Students will revisit the particle model and extend explanations of state changes to include energy transfers. Then, they will build on what they have learnt so far to explain and represent ionic, covalent, and metallic bonding based on information in the Periodic Table. In Chapter 1, students learnt to show the electronic structure of atoms of the first 20 elements of the Periodic Table and the basic principles of ion formation (loss or gain of electrons). Now, students draw dot and cross diagrams to represent ionic compounds involving Group 1 and 7 elements (e.g. NaCl), and Group 2 and 6 elements (MgO), and more complex compounds, such as Li_2O and $CaCl_2$. Students will learn to determine ionic formulae by the position of a compound's elements in the Periodic Table, and that ionic compounds form giant structures, with many ions and attractive forces extending in all directions. The chapter then moves on to covalent bonding. Students draw dot and cross diagrams to represent the sharing of one (single bond) or two (double bond) pairs of electrons. They learn that some covalent compounds exist as simple molecules (e.g. H_2, H_2O, CH_4), while others exist as giant covalent structures, and that properties can be explained by structure and bonding. Carbon is a very important element in chemistry. Students learn that, because carbon can form up to four covalent bonds, a wide array of carbon structures and carbon-based compounds exist. They explore allotropes of carbon including diamond, graphite, fullerenes, and graphene. Students revisit metallic bonding, updating their Key Stage 3 description of regularly arranged atoms to regularly arranged ions in a sea of delocalised electrons. Again, properties are related back to structure and bonding. Finally (Chemistry only), students explore the world of nanoscience for the first time.	assessments; Tassomai Daily Goal for factual recall
TERM 3	**P10 Forces & Motion** Students will begin this topic by experimentally determining the relationships between a force acting on an object and the acceleration, and the mass of the object and the acceleration. The results will lead to the formulation for Newton's second law of motion and its application. Higher-tier students will also define the inertial mass of an object. The students will then compare the concepts of mass and weight, linking them through the idea of a gravitational field before looking at the forces acting on an object as it falls through a fluid and the resulting terminal velocity. The forces acting during stopping a car will be analysed; identifying two phases of the motion; thinking and braking distance and the effects of a wide range of factors on both of these distances. Students will calculate the size of the accelerations experienced during braking with higher tier students deriving an appropriate equation involving the stopping distance. The higher tier students will investigate the concept of momentum and its conservation. Higher-tier GCSE Physics students will use the principle of conservation of momentum to allow them to determine the velocity of objects after collisions or explosion have taken place in a range of scenarios. Further analysis will allow higher tier students to use the concept of momentum to determine the force acting during collisions and relate this to the duration of the impact. Higher-tier GCSE Physics students will also apply their knowledge of impacts to discuss the safety features of a car. Finally, all of the students will investigate the effect of forces on the stretching of a range of materials identifying both linear and non-linear relationships between the force and extension. Students will apply Hook's law as appropriate and identified its limitations.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
Cross-curricular links in Y9:		

Maths – translating between numerical and graphical form; constructing and interpreting frequency tables; probability; calculating mean, mode, median and range; plotting experimental data onto graphs; decimal form; standard form; using ratios; fractions and percentages; determining the gradient of a graph; order of magnitude; significant figures; change the subject of equations; substitute numerical values into algebraic equations; solve simple algebraic equations English – Evaluate arguments in written prose; construct logical prose to explain methods and findings. DT – Levers and moments; Forces
Careers: **Examples of careers in the Year 9 curriculum – Microbiologist, Oncologist, Gastroenterologist, Particle physicist, Additive manufacturing engineer, Aerospace engineer, Formula 1 Technician.**

Year 10 Curriculum Implementation

The Year 10 curriculum is the next stage in the student's Scientific journey consolidating and developing upon the foundation of knowledge from Year 9. Students are expected to retrieve knowledge across, and skills taught within science and throughout the school curriculum, applying these to newly discovered concepts in order to further enhance their understanding. Year 10 students continue to develop exam literacy applying these in all assessments or reading important information from texts.

	Knowledge and skills	Assessment
TERM 1	**B4 Organisation in animals and plants** In this chapter, students will learn about the organisation of animals and plants. They will be able to recognise the components of blood, describe their functions, and summarise the process of blood clotting. They should recognise the three main types of blood vessel, link their structures with their functions, and understand the importance of a double circulatory system. In studying the heart, students should be able to describe the main structures of the human heart and their functions. They should be aware of problems that can develop in the blood vessels and their treatments. They should know how the heartbeat is maintained by the pacemaker, and why some people may have problems with their heart and may need an artificial pacemaker or artificial heart. Students should be able to compare different treatments of heart problems. Students have studied breathing and gas exchange and should recognise the main structures of the gas exchange system along with their functions. They should know that gas exchange happens in the alveoli and describe adaptations of alveoli. They should be able to describe the processes of ventilation and gas exchange and the differences in composition of inhaled and exhaled air. In studying plant tissues and organs, students should be familiar with the different plant tissues and their functions. They should recognise plant organs such as a leaf. They should understand that the roots, stem, and leaves form a plant organ system for transport of substances around the plant. They should be able to state the functions of xylem and phloem tissue. In studying transpiration, they should understand the function of stomata and recognise factors that affect transpiration rate.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**C4 Chemical Calculations** In this chapter, students encounter the foundations of quantitative chemistry for the first time, and apply calculations to some familiar reactions from Key Stage 3, including neutralisation, the reaction of metals with acids, and the oxidation of metals.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Up until this point, students have done very little in the way of chemical calculations. Key Stage 3 chemistry involved some data handling and some simple percentage yield calculations. This means students are unlikely to begin the chapter with a lot of misconceptions. However, students who are less confident mathematicians may find the chapter challenging and will benefit from additional support. This chapter can broadly be broken down into four areas: introduction of some fundamental concepts, efficiency calculations, calculations for solutions, and calculations for gases. The major difference between foundation and higher tier content is set up in the first lesson, with only higher tier students needing to calculate with moles. All students learn to calculate relative masses and percentage composition by mass of simple compounds. They calculate theoretical and percentage yield, and atom economy, and begin to evaluate reactions in terms efficiency and sustainability. All students calculate concentration as mass of solute per unit volume, and they learn how to carry out acid-base titrations. In Chapters 1 and 3, students learnt about the size and structure of atoms and about bonding. But how *many* particles (atoms and molecules) are there in and around us? Higher tier students will get a sense of this quantity in C4.1, where they learn about the mole. They will work with the keystone formula relating amount in moles to mass and relative formula mass. This is then carried through the rest of the unit, with students applying it to reactions involving solutions (concentration and titration calculations) and those involving gases (molar gas volumes). The tools that higher tier students acquire in this chapter are crucial for any going onto further study of chemistry.	
TERM 1	**P11 (GCSE PHYSICS ONLY)** In this chapter the students have defined pressure as a force acting over a surface before measuring pressure and describing its effects on materials and calculating the pressure acting on a surface. Higher tier students moved on to describe the pressure in a liquid, explaining the change of pressure with depth in terms of particle behaviour, the pressure in a liquid column, and the relevant equation. Students then discuss the cause of atmospheric pressure in terms of the behaviour of particles in the air, variations in density, and temperature. They described some of the consequences of atmospheric pressure such as the suction cup and how it grips surfaces. Higher-tier students also apply the relationship between pressure, height, density, and acceleration due to gravity to determine pressures at different points in the atmosphere. The higher-tier students continue with their examination of the effects of particles in fluids by investigating upthrust and then explaining the effect by considering the effects of differences in pressure inside the fluid. They apply the concept to explain why some objects float while others do not.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**B5 Communicable Diseases** In this chapter, students will see how the concept of health (as a state of physical and mental well-being) is affected by communicable (infectious) diseases. They will look at the different pathogens that can cause communicable disease, including bacteria, viruses, and protists, and how these can be spread between organisms - both animals and plants. As part of this, they will look at the development of simple hygiene methods to prevent the spread of pathogens as well as the isolation of individuals who are infected, the destruction of or control of vectors, and the use of vaccination. Students should be able describe the different pathogens, the symptoms and treatments of a range of different animal and plant diseases, and the different defence mechanisms of the human body and plants. They should also complete the required practical to grow bacteria in the laboratory to investigate the effect of disinfectants and antibiotics.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**C5 Chemical Changes**	Kerboodle online assessment; exam style questions and past

	In this chapter, students will revise and developed their understanding of the reactivity series from KS3. They will study the reactions of the metals potassium, sodium, lithium, calcium, magnesium, zinc, iron, and copper with water and acids and should be able to recall and describe these reactions. They will apply their understanding of the reactivity series to displacement reactions and the extraction of metals, higher-tier students will be introduced to the concepts of oxidation and reduction as the loss and gain of electrons respectively. Students will also learn about salts and how they are prepared, including from metals and acids, acids and bases, and acids and carbonates. Students should be able to prepare a pure, dry sample of a salt from an insoluble metal oxide or carbonate as part of the required practical. Finally, students will learn about the pH scale. Higher-tier students should be able to explain how pH relates to H+(aq) ion concentration and the difference between strong and weak acids.	papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**P12 Wave Properties** In this chapter the students will observe and describe the properties of mechanical and electromagnetic waves in terms of energy transfer with or without the need for a transfer medium. They have compared transverse waves and longitudinal waves by examining the relationship between the direction of propagation and the direction of the oscillations. The students will analyse wave properties such as wavelength, amplitude, and period leading to the relationships between period, frequency and wave speed, frequency, and wavelength. They will also measure the speed of sound in air and the speed of ripples on water. Higher-tier students will investigate and describe both the reflection and refraction of waves describing these effects in terms of wave fronts. The processes of absorption, transmission, and reflection of waves in terms of energy will also be described. GCSE Physics students will investigate how sound waves are transmitted through a medium in terms of the vibration of particles in the medium. The concept of echoes being used to measure distances in water or other media will be used in calculations. In addition, higher-tier GCSE Physics students will investigate the properties of sound waves in more detail using oscilloscope traces, comparing both amplitude and frequency before looking at the ear's response to frequency.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**B6 Preventing and treating disease** In this chapter, students will study the prevention of disease by vaccination. They should know how the immune system works and what is meant by an antigen. They should appreciate that the shapes of antigens and antibodies are complementary. They should understand what a vaccine contains and how it works, giving examples, and the concept of herd immunity. They should understand that memory cells remain in the body to provide long-term immunity. Students will study the treatment of disease by drugs including painkillers and antibiotics. They should understand that painkillers such as aspirin and paracetamol treat the symptoms and not the cause of disease. They should be aware that antibiotics are drugs used to cure bacterial infections. They should know how they work and be aware of the current crisis of antibiotic-resistant strains of bacteria, linking with work in B14.8 Antibiotic resistant bacteria. Students will study the discovery of drugs in plants and microbes, including the discovery of penicillin. They should be aware of how drugs are made today to be effective and safe, and be able to outline the processes of clinical trials including double blind trials and using placebos. This chapter includes the higher-tier GCSE Biology only topic of the production and uses of monoclonal antibodies. Higher-tier GCSE Biology students should be able to name lymphocytes as the white blood cells responsible for producing antibodies. They should recall the stages in stimulating the correct lymphocyte to be made and then fused with a tumour cell to form a	I Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	hybridoma cell. They should link this work with B2 Cell division and B5.9 Human defence responses. They should be able to give examples of how monoclonal antibodies are used, as well as their disadvantages.	
TERM 1	**C6 Electrolysis** In this chapter, students are introduced to electrolysis. They build upon their knowledge from Chapter C3 to explain why ionic compounds can undergo electrolysis when molten or in solution. They should also be able to explain the movement of particles during electrolysis, and the reactions that occur at the electrodes. Students then apply their understanding of electrolysis to the extraction of aluminium, and learn how to investigate the electrolysis of a solution. They should be able to predict the products of electrolysis and higher-tier students should be able to write balanced half equations.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**P13 Electromagnetic Waves** In this chapter students will describe the electromagnetic spectrum in terms of different regions related to wavelength. The speed of electromagnetic waves in a vacuum will be described as constant, allowing the use of the wave equation, to link wavelength and frequency which has then been tied to the energy carried by the wave. Each of the regions of the electromagnetic spectrum will be described along with associated uses and students will investigate the relationship between surface colour, temperature, and the rate of emission of infra-red radiation. The use of radio waves in communications for television and mobile phones will be described along with outlining transmissions of signals through optical fibres. Higher tier students will also describe the process of modulation of carrier waves to give a more complex picture of how information can be transmitted using waves. All students will describe the application of ultra-violet waves in phosphorescence and the damage these waves can cause to skin and eyes before describing the uses of X-rays and gamma rays in medical applications. The process of ionisation will be outlined as well as the cause of tissue damage as a useful technique in killing bacteria or cancerous cells. Further details of the use of X-rays will be described, including contrast media and detection devices such as the CCD and the concept of radiation dose. Higher tier students will compare the intensity of imaging and therapeutic X-rays.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**B7 Non-communicable diseases** In this chapter, students will study non-communicable diseases and should understand what is meant by risk factors for a disease. They will analyse the impact of disease at several different levels. Students should recognise correlations between data sets and the need for evidence to secure a causal mechanism. They should understand the difference between correlated data and causal mechanisms, and be able to read graphs and quote data to support correlations and causations. Students will study cancer and the different types of tumours, along with the general causes and treatment of cancer. They should link this to mitosis and the cell cycle in B2 Cell division. Students should be aware of the risks of diseases from smoking, linked to work on the heart and blood vessels in B4 Organising animals and plants. They should recall the roles of nicotine, carbon monoxide, and tar, and understand how each specifically affects health, as well as recalling the dangers of smoking whilst pregnant. They should apply the concept of a causal mechanism to data on smoking and developing lung cancer. Students should understand the impact of smoking on the heart. In considering the effect of diet and exercise on disease, students should appreciate the connection between obesity and other diseases such as type 2 diabetes. Students will study alcohol and health, and should understand the effect of alcohol on the brain and liver, and of drinking alcohol during pregnancy. Finally, students should be aware of the sources and carcinogenic effects of ionising radiation.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

TERM 2	**C7 Energy Changes** In this chapter, students will learn about the energy transfers that occur during chemical reactions. They should understand that an exothermic reaction transfers energy from the system to the surroundings, and an endothermic reaction transfers energy from the surroundings to the system. This is a key concept that students should be confident with. Students should be able to interpret experimental data to identify if a reaction is exothermic or endothermic and should be able to describe some uses of exothermic and endothermic reactions. Students further develop their qualitative understanding of the energy transfers in a reaction into a quantitative understanding. They should be confident with sketching and interpreting reaction profile diagrams and higher-tier students should be able to use bond energies to calculate overall energy changes for a reaction, identifying if it is exothermic or endothermic. Students should also apply their understanding of the reactivity series and electrolysis to chemical cells and fuel cells.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**P14 Light (GCSE PHYSICS ONLY)** The students begin this chapter by looking at the reflection of light by plane mirrors using both a wave front and ray model. This will lead to descriptions of real and virtual images and their properties and why images are not formed by 'rough' surfaces. Then they move on to investigate and describe refraction of light in more detail - analysing the change in direction of rays at boundaries between surfaces. The students also describe the relationship between colour and wavelength for visible light investigating the reflection of both white and coloured light from coloured or white surfaces along with the additive nature of coloured light. They describe the differences between translucent and transparent media. Students also describe the action of lenses using the ray model of light and a range of ray diagrams. This includes the behaviour of converging and diverging lenses with an investigation of image formation for a converging lens. The image properties will be described, along with the concept of magnification and its calculation from image and object height. Methods used to construct ray diagrams for the convex lens for objects at a range of positions will be described alongside image formation for a concave lens.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**B8 Photosynthesis** In this chapter, students will study photosynthesis in both plants and algae. They should be familiar with the word equation for photosynthesis, and also the symbol equation in the case of higher-tier students. They should be aware that photosynthesis is an endothermic reaction. Students will study the adaptations of leaves to achieve maximum efficiency in photosynthesis. They should link this work with B1.2 Animal and plant cells, B1.5 Specialisation in plant cells, and B4.6 Tissues and organs in plants. Students will study factors that affect the rate of photosynthesis. They should understand the concept of limiting factors. They should have carried out data interpretation exercises and be able to explain the results. Higher-tier students should understand that that any one factor could become limiting as the factors interact. Students should be confident in analysing two or three factors displayed on a graph and deciding which factor is limiting. They should be confident describing the inverse square law as applied to light intensity. All students should be aware of the fate of glucose - its use in respiration, and also how it can be assimilated into starch and cellulose. They should link this with B1.2 Animal and plant cells, B1.7 Osmosis, and B9 Respiration. Students should also consider the need for nitrate ions as well as glucose to make proteins, and how glucose can be used to make lipids. They should link this with B3.3 The chemistry of food where they carried out food tests.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Finally, students will consider the use of greenhouses and study how the conditions can be monitored and manipulated to achieve the highest rate of photosynthesis. Higher-tier students should have an appreciation of the economics of increasing the rate of photosynthesis - they should be aware that using a greenhouse is expensive, and weigh it up against the profit gained in increased biomass.	
TERM 2	**C8 Rates and equilibrium** In this chapter, students will learn about the factors that affect the rate of a reaction, including temperature, surface area, concentration, and pressure. Students should be able to explain the effect of each factor on the rate of reaction using collision theory - understanding that each factor increases the frequency of effective collisions, not just the number of collisions. They should also be able to explain the effect of catalysts on the rate of a reaction in terms of providing an alternative reaction pathway with a lower activation energy. Students will also learn about reversible reactions and dynamic equilibrium. Students will apply their knowledge on endothermic and exothermic reactions to equilibrium reactions to be able to predict the effect of temperature changes on the reversible reactions and the position of the equilibrium. Higher-tier students should also be able to use Le Chatelier's principle to explain the effect of temperature and pressure on the position of equilibrium.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**P15 Electromagnetism** Students begin this chapter by reinforcing their knowledge of magnetism by looking at the magnetic fields around permanent magnets and the concept of induced magnetism in some materials. The students will be reminded of the techniques used to plot a magnetic field and the shape of the Earth's field. Students move on to examine the magnetic field produced by a current and investigate the factors that affect the direction and strength of this field. They compare the field shape of a solenoid to that produced by a simple bar magnet. Building on this understanding GCSE Physics students investigate the factors affecting the strength of an electromagnet before moving on to describe how these devices can be used in a variety of devices. All higher-tier students describe how a current carrying wire placed in a magnetic field would experience the motor effect before going on to explain how this effect could be used to create an electric motor. The force produced on the motor is linked mathematically to the magnetic flux density of the magnetic field. Only those studying GCSE Physics at higher level look at the generator effect and the factors which affect the current induced in a wire as it is moved through a magnetic field. These concepts are applied to the design of a practical generator and the a.c. waveform produced as the coil in the generator rotates. Higher-tier GCSE Physics students also describe the operation of a transformer in terms of changes in magnetic fields before constructing a practical transformer. The transformer question is used to determine changes in potential difference along with a discussion of transformer efficiency. Finally, these students describe the application of transformers in the National Grid.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**B9 Respiration** In this chapter students will study respiration, and should recall that this is one of the most important processes in living cells. They should be able to describe the process of respiration and write the word equation, and higher-tier students should also be able to write the balanced symbol equation. Students will look at mitochondria as the site of respiration, linking this with B1.2 Animal and plant cells and cell specialisation in B1.4 and B1.5. Students should be able to list examples of living processes that	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	need the energy released from respiration. They should link this with work in B1.9 Active transport, in particular the transport of mineral ions into the root hair cell. Students will study the response of humans to exercise, including changes in heart rate, breathing rate, and breakdown of glycogen, all to increase the rate of respiration in muscle cells. They should link this with work on the heart and blood vessels in B4 Organising animals and plants. In studying anaerobic respiration, students should be aware of this process in mammalian muscles, and be able to write the word equation. Students should be aware that anaerobic respiration occurs in yeast cells and some plant cells. They should know that fermentation is an economically important reaction and be able to write the word equation, with higher-tier students knowing the balanced symbol equation for fermentation. Higher-tier students should also be able to link aerobic respiration in mammalian muscles to the oxygen debt. Students will study metabolism, and should be able to list common metabolic reactions. They should ink these with B8.1 Photosynthesis and B8.3 How plants use glucose. Finally higher-tier students should recall the roles of lactic acid, urea formation, and the liver.	
TERM 3	**C9 Crude oil and Fuels** In this chapter, students will learn about hydrocarbons and be introduced to the alkanes. They should be able to identify alkanes from their formulae, and be able to name and draw the displayed formula of the first four alkanes. Students will learn about some of the reactions of hydrocarbons, including combustion (both complete and incomplete) and cracking. All students should be able to write balanced symbol equations for the complete combustion of hydrocarbons and to describe the conditions of cracking. All students should be able to describe the test for alkenes (a product of cracking) but students studying AQA GCSE Combined science: Trilogy do not need to know the names of the alkenes produced. Students will also learn about crude oil as a source of hydrocarbons and the fractional distillation of crude oil. They should be able to describe how the size of the hydrocarbon molecule affects its properties, including viscosity, boiling point, and flammability.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**P16 Space (GCSE PHYSICS ONLY)** In this chapter students will examine the formation of the solar system from a nebula, particularly the formation of the Sun from hydrogen gas into a protostar until it reaches the main sequence. The source of materials for formation of the planets has also been described. Students move on from the main sequence to describe the pathways for small stars from main sequence through red giants, white dwarfs, and finally black dwarfs along with the pathway for larger stars through red supergiant, supernova and neutron star/black holes has been described. The students note the role of supernovae in the production of heavy elements. They will also examine the orbits of planets, with higher-tier students discussing the role of centripetal force and acceleration in more detail for planets and artificial satellites. All students will also evaluate the evidence for an expanding universe prompted by the red shift of the majority of galaxies leading to Edwin Hubble's conclusions. This, combined with the evidence provided by the cosmic microwave background radiation, is used in discussion of the Big Bang theory. Finally, these students discuss the models predicting the distant future of the universe touching on the role of dark matter and dark energy.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

TERM 3	**P1 Conservation and dissipation of energy.** In this chapter, students develop their understanding of energy and energy transfer, begun in KS3. This includes development of an energy stores model and the processes (pathways), such as forces and electrical currents, through which energy can be transferred. Students will learn how to measure the work done by a force acting over a distance and how this concept can be used to analyse energy transfers in gravitational stores, through lifting and falling, and elastic potential stores during stretching using the relevant mathematical relationships. The conservation of energy through changes in the gravitational, kinetic and elastic stores is also discussed. They will consider the dissipation of energy during transfers such as those caused by friction or electrical heating, leading to the idea of efficiency during different energy changes and its calculation. The concept of efficiency will be applied to a selection of electrical devices. Finally, the students will learn about the rate of energy transfer in different systems through the concept of power and how this power rating can be used to determine the total energy transfer over time.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**B10 The human nervous system** In this chapter students will study the principles of homeostasis, and should be able to give some examples and outline the control system involved. They should link this work with studies on enzyme action in B3.2 The human digestive system and B3.4 Catalysts and enzymes. Students will recall details of the human nervous system and its structure and function. They should link this with work on nerve cells in B1.4 Specialisation in animal cells. They should be able to describe a reflex arc, with detail of synaptic transmission. Students should appreciate that receptors detect a change in a stimulus and not the stimulus itself. They should be able to describe an electrical impulse accurately. Students studying AQA GCSE Biology will study the brain, linking each area with its function. There is a higher-tier topic of investigating the brain and the treatment of brain damage. Students should link this with the role of the brain in controlling body temperature, the role of the pituitary gland in the brain, and the role of ADH release in maintaining water and nitrogen balance in the body, studied in B12 Homeostasis in action. Students studying AQA GCSE Biology will also study the structure and function of the human eye and the process of accommodation. They should understand that the ciliary muscles contract in accommodation. These students should be able to describe common defects of the eye including myopia, hyperopia, and the role of new technology in the treatment of these conditions.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**C10 (GCSE CHEMISTRY ONLY) Organic Reactions** In this chapter, students will learn about more organic functional groups - alkenes, alcohols, carboxylic acids, and esters. Students should be able to identify, name, and draw the structural formula of the first four alkenes, alcohols, and carboxylic acids, and should be able to identify, name, and draw the ester ethyl ethanoate.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Students will also learn about the reactions of these four functional groups. They should be able to describe the reactions and conditions of alkenes (with halogens, water, and hydrogen), alcohols (combustion, oxidation, and reaction with sodium), and carboxylic acids (to make esters). Students should also be able to explain why carboxylic acids are called weak acids, referencing back to their understanding from Chapter C5.	
TERM 3	**P2 Energy transfer by heating** In this chapter the students will develop their understanding of the heating and cooling processes, which transfer energy within a material or from one object to another. They will investigate thermal conductivity and the differences in the processes of thermal conduction in metals and non-metals. GCSE Physics students will describe the transfer of energy between objects through absorption and emission of infra-red radiation as a part of the electromagnetic spectrum. This includes the factors that affect the rate of this transfer such as temperature and surface colour. Higher-tier GCSE Physics students will apply this knowledge to the concept of the Greenhouse Effect and its relationship to the wavelength of the radiation penetrating or being absorbed by Earth's atmosphere. All students will analyse the changes in temperature when a material is heated, leading to the experimental determination of specific heat capacity along with corresponding calculations. The concept of specific heat capacity is then used to explain the choice of materials used in heating systems. Finally, the reduction of energy transfers to the surroundings by insulation will be studied and applied to the context of reducing the rate of energy transfer in buildings to reduce heating costs including the idea prioritising home improvements in line with payback time.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall to be applied to new situations.
Cross-curricular links in Y10: Maths – translating between numerical and graphical form; constructing and interpreting frequency tables; probability; calculating mean, mode, median and range; plotting experimental data onto graphs; decimal form; standard form; using ratios; fractions and percentages; determining the gradient of a graph; order of magnitude; significant figures; change the subject of equations; substitute numerical values into algebraic equations; solve simple algebraic equations DT – structure and use of materials English – Evaluate arguments in written prose; construct logical prose to explain methods and findings.		
Careers: **Examples of careers in the Year 10 curriculum – Cardiologist, Pharmacist, Submarine Technician, Pathologist, Food Storage Product Developer, Optic and Acoustic Engineer, Virologist, Metal Processing Technician, Telecoms Engineer, Lifestyle & Fitness Coach, Reaction Efficiency Technician, Optical Engineer, Arable Farming Advisor, Chemical Facilities Manager, Wind Turbine Technician, Respiratory Nurse, Astronomer, Neurologist, Organic Molecule Analyst, Housing Surveyor.**		

Year 11 Curriculum Implementation

Students are expected to be able to retrieve knowledge from across their learning and apply it to both familiar and unfamiliar contexts. Students' solid knowledge and skill base is used effectively to decode and construct appropriate responses to questions posed. Once leaving us at the end of year 11 students will be confident in their skill and knowledge using this to make informed choices contributing positively to their environment.

	Knowledge and skills	Assessment
TERM 1	**B11 Hormonal coordination** In this chapter students will study the principles of hormonal control and the endocrine system. They should be able to identify the main parts of the endocrine system and recall the hormones they produce. Students should recall how blood-glucose concentration is controlled, including the role of insulin. Higher-tier students should also be able to explain the role of glucagon, and clearly distinguish between glucose, glycogen, and glucagon. All students should be aware of the causes and treatments of both type 1 and type 2 diabetes. They should link this with work in B2.3 Stem cells and with the effect of lifestyle on type 2 diabetes in B7.4 Diet, exercise, and disease. Higher-tier students should understand the process of negative feedback, particularly as applied to the hormones, adrenaline and thyroxine. All students have studied hormones in human reproduction. They should recall the action of hormones in bringing about puberty. They should be aware of the role of oestrogen in the menstrual cycle in females, and of testosterone in males. Higher-tier students should have a more detailed understanding of how hormones interact to control the menstrual cycle. Students should understand how hormones are used in the control of fertility as applied to contraception, and for higher-tier students, to infertility treatments. Finally, students studying AQA GCSE biology will study the role of hormones in plants, and the tropism responses they cause. Higher-tier students should understand the use of plant hormones in agriculture and horticulture.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**C11 (GCSE CHEMISTRY Only) Polymers** In this chapter, students will learn about different types of manufactured polymers, including addition polymers and condensation polymers. Students should be able to identify an addition polymer from polymer and monomer diagrams - drawing the monomer from the polymer and the polymer from the monomer. Students will be introduced explicitly to poly(ethene), but it is important that they can identify and draw other addition polymers and associated monomers. Higher-tier students should also be able to describe the basic principles of condensation polymerisation. Students will also study natural polymers, including polysaccharides, proteins, and DNA. Students should be able to identify the types of monomers that form these polymers, and be able to describe the basic structure of DNA. Higher-tier students should understand in greater detail how amino acids react together to form proteins. With all polymers, students should understand the difference between the monomer and the repeating unit of the polymer.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**P3 Energy Resources** In this chapter the students will examine the different sources of energy that are used to generate electricity or provide heating for homes. They will consider the effect of the production and use of biofuels on the environment along with the concept of carbon-neutrality before outlining the use of nuclear power in comparison to fossil fuels.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Student will describe and evaluate renewable resources such as wave power, wind power, hydroelectricity and tidal technology and how these can be used to generate electricity in specific locations. In addition, students will describe the operation of geothermal power stations and their links to radioactive decay. The principles of solar cells and both small-scale and large-scale solar heating systems will also be outlined. The students will compare all of the energy resources in terms of local environmental impacts, such as pollution, and global environment impacts, such as acid rain, and their contribution to global warming. Finally, the students will describe how the different resources could be applied in combination, to meet the base load, and changing energy demands throughout a single day, before finally considering the capital costs and operating costs over the operational lifetime of the resource.	
TERM 1	**B12 Homeostasis in action (GCSE BIOLOGY only)** This chapter is exclusively for students studying GCSE Biology rather than Combined Science. Students will study homeostasis, starting with why and how the body controls its temperature. They should recall the role of the thermoregulatory centre in the brain and be able to describe the body's responses if the body temperature starts to become too high or too low. Higher-tier students should be able to explain these mechanisms in a given context. In studying the removal of waste products, students should recall that water, ions, and urea are lost from the skin in an uncontrolled way, and that the removal of excess water, ions, and urea by the kidneys is a controlled process. They should link the removal of carbon dioxide with their studies of breathing and gas exchange in the lungs in B4 Organising animals and plants. Higher-tier students should be aware that the digestion of proteins may result in excess amino acids, which are deaminated in the liver to ammonia and then converted to urea for safe excretion. Students should understand the role and functions of the human kidney, linking with work on diffusion, osmosis, and active transport in B1 Cells and organisation. They should recall that the kidneys produce urine by filtration of the blood and selective reabsorption of useful substances such as glucose, some ions, and water. Higher-tier students should recall the action of ADH as a hormone working by negative feedback, linked with B11.4 The role of negative feedback. Finally, students will study treatments for kidney failure. They should understand how dialysis works, and link this with earlier work on diffusion. They should recall the process of kidney transplantation including the problems of rejection, linked with B5.9 Human defence responses and B6.1 Vaccination. Students should compare dialysis with transplantation and be able to analyse the advantages and disadvantages of both treatment options	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 1	**C12 Chemical Analysis** In this chapter, students will learn about various techniques for analysing substances. All students will understand the difference between a pure substance, a mixture, and a formulation, and what is meant by purity. Students should also have built upon their understanding of chromatography experiments from Chapter C1 and be able to analyse a chromatogram, both qualitatively and quantitatively using R, values. Students should also be able to describe the different experimental tests for gases, including both the procedure and positive result.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Students studying AQA GCSE Chemistry should also be able to describe experimental tests for positive and negative ions, and be able to write balanced symbol equations for them. They should be able to apply their knowledge of all of the tests they have learnt to be able to plan and investigation to identify positive and negative ions. Students will also study flame emission spectroscopy, and should be able to interpret instrumental results.	
TERM 2	**P4 Electric Circuits** In this chapter the students describe the structure of an atom in terms of charged sub-atomic particles and the process of charging by friction resulting in ions and the transfer of electrons. This leads to the concept of an electric field surrounding charged objects causing attractive or repulsive forces between them. The students then describe electric circuits and the components used to construct them using the concept of current as the rate of charge flow through components due to a potential difference between points in the circuit. Resistance is introduced and the cause of a heating effect and corresponding energy transfer. Students then investigate the factors affecting the resistance of a wire and the corresponding current-potential difference graphs. Further investigations of the components and analysis of the current-potential difference graphs will show ohmic and non-ohmic behaviours for wires, filaments, and diodes. The relationship between the resistance of a thermistor and its temperature along with the relationship between the resistance of a light-dependent resistor and light level will be investigated. Finally, the students investigate and analyse a range of series and parallel circuits describing the path of current at junctions, the potential difference across branches and components, and the effect on resistance of series and parallel branches.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**B13 Types of reproduction** This chapter on reproduction includes some content for students studying GCSE Biology only, as well as some higher-tier content. All students will be able to outline asexual and sexual reproduction, and should be aware of the importance of meiosis, fertilisation, and variation in sexual reproduction. They should link this with work on chromosomes and mitosis and the cell cycle in B2 Cell division. AQA GCSE Biology students should be able to compare the advantages of each type of reproduction. AQA GCSE Biology students should recall that fungi, plants, and malaria parasites are able to use both types of reproduction. They should link this with work on the life cycle of the malarial protist in B5.8 Diseases caused by fungi and protists. All students will study DNA and its role in inheritance. They should be aware of the genetic code and genomes, including how the data produced by genome research can be used. AQA GCSE Biology students should be able to outline DNA structure, with higher-tier students recalling the detailed structure of DNA and also studying protein synthesis, including how the genetic code is used to assemble amino acids into proteins. Another higher-tier AQA GCSE Biology topic is different types of mutation and their consequences. All students will study inheritance, and should be able to use genetic terms and set out a genetic cross with the use of a Punnett square. They should be able to predict ratios of different phenotypes, and apply this to sex determination and family trees. Students should be able to describe the inheritance of genetic disorders as applied to polydactyly and cystic fibrosis. They should be aware of developments in genetic engineering with the aim of curing genetic disorders. Finally, students should be able to discuss screening for genetic disorders and the implications of using this technology. This links in with the AQA GCSE Biology topic of monoclonal antibodies in B6 Preventing and treating disease.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

TERM 2	**C13 The Earth's Atmosphere** In this chapter, students will learn about the Earth's atmosphere. Students will only need to be able to describe the volcanic activity theory of the origin of the atmosphere, but they should be able to interpret evidence concerning other theories, and be able to evaluate them. To describe the history of the atmosphere students will need to have a sense of the timescales involved. Along with an understanding of the origins of the atmosphere, students will also understand how it has evolved over time. This includes both how the general composition of the atmosphere has changed and how the atmosphere is currently being affect by human activity. Students should be able to describe the human activities that are thought to cause global warming, and be able to explain some of the effects this has on the climate of the Earth. Students should also be able to explain the effect of other pollutants on the Earth, including carbon monoxide, sulfur dioxide, nitrogen oxides, and particulates. Throughout this chapter, students have had many opportunities to develop their working scientifically skills, including evaluating models and interpreting and evaluating evidence for scientific theories.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**P5 Electricity in the home** In this chapter the students will compare direct and alternating currents in terms of current direction. An oscilloscope will be used to analyse changes in the potential difference that causes the current and to measure the peak voltage, period and frequency of a low voltage sinusoidal a.c. signal. The students will describe the UK mains supply and the wires used within it, outlining the National Grid and the high voltages associated with it. Understanding of mains circuits, including the function of the neutral and earth wires, will be applied to three pin plugs and a simple ring-main. The choice of materials used for construction of mains circuits such as wires, cables, and plugs will be discussed along with the need for a fuse to prevent overheating and insulation for protection from short circuits. Students will mathematically analyse circuits to determine the power supplied by a current and the relationship between power and the resistance of components. This will be linked back to the charge transfer in a circuit and the concept of electrical heating as charges move within or through components. Finally, students will consider the importance of efficiency within mains powered electrical devices, linking this concept back to energy transfer by a current and to the simplified system of energy efficiency ratings used when considering the purchase of an appliance.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**B14 Variation and evolution** This chapter on variation and evolution includes some content for AQA GCSE Biology students only, as well as some higher-tier content. All students will be able to discuss the causes of variation in terms of genetic, environmental, or a combination of both. They should link environmental variation with the effect of alcohol on a foetus in B7.5 Alcohol and other carcinogens. In studying evolution by natural selection, students should understand the role of mutation in variation, understand the theory of evolution by survival of the fittest and natural selection, and be able to give examples. They should link this with previous studies on sexual reproduction and meiosis in B13.2 Cell division in sexual reproduction.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	Students will study the process of selective breeding. They should understand this as an example of artificial selection, and be aware of its limitations. In studying genetic engineering, all students should understand what is meant by the term, and be able to give examples of its use and consider the potential benefits and problems. They should link this with work on diabetes treatment using human insulin in B11.3 Treating diabetes, and with the treatment of cystic fibrosis in B13.9 Inherited disorders. Higher-tier students should be able to recall the steps involved in the process of genetic engineering. Finally, AQA GCSE Biology students will study cloning as applied to both plants and animals. They should recall different ways of creating clones, and be able to describe why they are useful. They should link cloning plants with work in B11.10 Using plant hormones. They should understand the processes of embryo transplants and adult cell cloning in animals, and be able to discuss the choices that need to be made about all genetic technologies.	
TERM 3	**C14 The Earth's Resources** In this chapter, students will learn about the difference between finite and renewable resources. It is important that students understand that renewable resources are not an infinite supply, but are replaceable at a rate similar to the rate they are used up, whereas finite resources are used up faster than they can be replenished. Students understanding of finite and renewable resources will be applied to the need to reuse and recycle, and they should be able to describe and evaluate ways of reducing the use of finite resources, and carry out life cycle assessments on products. Students will look at specific resources that we use, including water and metals (in particular copper). Students should be able to describe the different ways that water is treated, both to create potable water and to remove waste products so it is safe to release into the environment. Students have already met metal-ore extraction and electrolysis, and higher-tier students should have applied that knowledge to the extraction of copper, as well as understanding alternative biological methods used to extract copper.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 2	**P6 Molecules and matter** In this chapter the students will increase their understanding of the concept of density as a property of a material or object by measuring and calculating the density of solids and liquids. This leads to a discussion of the states of matter, the properties of matter in these states, and the changes that occur as a material changes from one state to another. The changes in the properties of matter is used to introduce the kinetic theory and to analyse the changes in temperature occurring during heating and the concept of latent heat. The students move on to discuss the concept of internal energy in more detail; analysing the behaviour of particles in a solid, liquid or gas as the temperature changed. Students describe latent heat of fusion and vaporisation mathematically, calculating energy changes during the appropriate phase changes and attempted to measure the latent heat of fusion for ice using electrical heating. The students analyse the relationships between the pressure and temperature of a fixed mass of gas, determining that the pressure is proportional to the absolute temperature. They describe the cause of pressure in terms of random particle behaviour and impact between the particles and its container, explaining the changes in pressure in terms of changes in the motion of the gas particles as the temperature decreases. Finally, GCSE Physics students investigate the relationship between gas pressure and volume, determining that as the pressure increases the volume of the gas is decreased or vice versa. Noting that this linear relationship led to Boyle's law and calculations	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	based on it. The behaviour of the gas during compression is again explained using a particle model. Higher level students also note that work was done during the compression of a gas, and this can have a heating effect.	
TERM 3	**B15 Genetics and Evolution** This chapter includes the theory of evolution, which is for AQA GCSE Biology students only. These students will study Mendel and his discoveries, and should understand how later understanding of the mechanism of inheritance and genetics applies to his findings. They should be able to describe several theories of evolution including the work of Lamarck and Darwin, focusing on Darwin's theory of natural selection. They should link this with B14.2 Evolution by natural selection. AQA GCSE Biology students should also be able to outline the reasons why Darwin's ideas were not accepted for some time. They should be familiar with Wallace's ideas on evolution and how he established our current theory of speciation. Students will understand that each part of a divided population undergoes natural selection separately and therefore differently, and over a long period of time can end up being very different from each other. All students should be aware of evidence for evolution, including the fossil record and reasons for extinction. They should be able to describe antibiotic resistant bacteria and their fast evolution, in particular the problem of MRSA. They should link this with work in B6 Preventing and treating disease on antibiotics and the discovery and development of drugs. Finally, all students will understand how living organisms are classified. They should recall the natural system designed by Linnaeus and be able to give the rules of the binomial system of naming living things. They should be familiar with the three-domain system developed in the light of recent technological advances. They should link this with B1.3 Eukaryotic and prokaryotic cells.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**C15 Using Our Resources (GCSE CHEMISTRY Only)** In this chapter, students will develop their understanding of rusting from KS3 to understand how both water and air are required for iron to corrode. They should be able to explain how the two methods for preventing rusting - barrier methods and sacrificial methods - disrupt the oxidation of iron and prevent corrosion. Students will also study a series of different material types - alloys, polymers, ceramics, glass, and composites. Students have previously met alloys and polymers in Chapter C3 and Chapter C11 respectively and students should have built upon this understanding. For each material, students should be able to identify key properties and link these to their common uses. Students will study the Haber process and how it is carried out economically on an industrial scale. This builds extensively upon knowledge of equilibrium conditions in Chapter C8, and students should be able to explain why the industrial conditions for the Haber process are described as a compromise. Students should also be able to recognise the importance of the Haber process in the production of ammonia, being able to explain how ammonia is an important feedstock in the production of fertilisers, both in the laboratory and industrially alongside potassium and phosphorus fertilisers.	
TERM 3	**P7 Radioactivity** In this chapter the students will describe how the structure of the nucleus was discovered by the radiation emitted during nuclear decay and how experimentation and developments in our understanding of sub-atomic particles have driven changes in the model used to describe the atom from the plum pudding model, through to the Rutherford model and then the Bohr model.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	The students will describe the changes in the nucleus which occur during alpha, beta, and gamma decay along with neutron emission in terms of atomic (proton) number and mass number using the appropriate nuclear notation for isotopes. The properties of alpha, beta, and gamma radiation will be demonstrated leading to a discussion of their use in thickness monitoring and then the safety measures required when using radioactive materials. Students then move on to discuss the concepts of activity, count rate, and the patterns in radioactive decay that explain half-life and the associated graphs despite the random nature of individual decays. Higher tier students will perform calculations involving the relationship between the initial activity, current activity, and half-life. GCSE Physics students discuss the application of radioactivity to medical tracers within the body releasing gamma rays detected by gamma cameras and evaluated in terms of risks and benefits. These students will also look at both nuclear fission and fusion in relation to nuclear power. Chain reactions involving fissionable isotopes will be described along with an outline of a fission reactor, its fuel rods, control rods, and physical construction. The dangers associated with nuclear fission, in particular accidents and the handling of waste will be debated. Nuclear fusion reactions in stars is discussed and compared to the difficulties of producing stable fusion reactions on Earth.	
TERM 3	**B16 Adaptations, interdependence, and competition** In this chapter students will study communities, environments, adaptations, and competition. There are a number of ecological terms including community, population, habitat, ecosystem, abiotic factor, and biotic factor, and students should recall the precise meaning of each. Students should understand the importance of communities including the interdependence of all the species present, and be able to give real examples to illustrate interdependence. In studying organisms in their environments, students should recall the effects of abiotic and biotic factors on populations. They should link this with the importance of temperature and pH on the action of enzymes in B3 Organisation and the digestive system. Students will measure the distribution of organisms with quadrats and transects, and carried out a practical to investigate the population size of a common species in a habitat. Students will study competition in animals and plants and should recall what factors they compete for and how they compete, and how they become successful in their environments. Students should understand how organisms are adapted to survive in many different conditions. They should be able to give examples of the ways in which animals and plants are adapted to their environments. In studying animals in cold climates students should make the link to surface area to volume ratio in their work on diffusion in B1 Cells and organisation.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall
TERM 3	**B17 Organising an ecosystem** In this chapter students will study how feeding relationships are represented in food chains. They should understand the importance of photosynthesis in feeding relationships, linking with work in B8 Photosynthesis. They should recall the main feeding relationships within a community and understand how the numbers of predators and prey are inter-related, including interpreting predator-prey population graphs. Students will look at mineral cycling and the microbes involved. They should understand how materials are recycled through the abiotic and biotic components of an ecosystem, and the importance of decay. They should link this with the main chemicals that	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

	make up cells in B1.2 Animal and plant cells, respiration in B9 Respiration, and transpiration in B4.8 Evaporation and transpiration. Students will study the water cycle and should recall the main stages of condensation, precipitation, evaporation, transpiration, and respiration. They should understand what the carbon cycle is and recall the processes that remove carbon dioxide from the atmosphere and return it again. They should understand the role of microbes in the carbon cycle as carrying out respiration to release carbon dioxide. AQA GCSE Biology students will study factors that affect decomposition and the rate of decay, and the importance of decay in recycling. They will conduct a required practical investigating the decay of organic matter. These students should be able to apply the processes of decay to the recycling of organic waste to produce compost, and also recall that anaerobic decay produces methane gas in a biogas generator.	
TERM 3	**B18 Biodiversity and ecosystems** In this chapter students will study biodiversity and ecosystems, starting with the reasons for and the effects of the human population explosion. Students should understand the effect of different types of pollution including land, water, and air pollution. Students will be able to outline the processes of deforestation and peat destruction. They should link this with how materials are cycled in B17.3 The carbon cycle. Students will understand what is meant by the greenhouse effect, global warming, and its predicted effects. Students should be able to distinguish greenhouse gases from those that cause acid rain. GCSE Biology higher-tier students will study the impact of environmental change and should be able to recall how changes in the distribution of organisms can be evaluated. On the topic of maintaining biodiversity, all students will understand how waste, deforestation, and global warming affect biodiversity, and be able to give examples of some of the actions being taken to stop the reduction in biodiversity. GCSE Biology students will study trophic levels, how biomass is transferred from one trophic level to the next, pyramids of biomass, and the efficiency of this energy transfer. They will also study some of the factors that affect global food security. They should be able to outline ways of improving the efficiency of food production, discuss the ethics of factory farming, and understand the concept of sustainable food production with a focus on fisheries. Finally, GCSE Biology students will be familiar with biotechnological methods of food production including the production of mycoprotein and the use of genetically modified organisms.	Kerboodle online assessment; exam style questions and past papers in class; end of unit assessments; Tassomai Daily Goal for factual recall

Cross-curricular links in Y11:

Maths – translating between numerical and graphical form; constructing and interpreting frequency tables; probability; calculating mean, mode, median and range; plotting experimental data onto graphs; decimal form; standard form; using ratios; fractions and percentages; determining the gradient of a graph; order of magnitude; significant figures; change the subject of equations; substitute numerical values into algebraic equations; solve simple algebraic equations

PSHE – Use of contraception and fertility treatment; Theories of evolution and embryonic screening

Geography – Greenhouse effect; global warming; climate change; impact of mining on the environment; water cycle; treatment of drinking and waste water; indicator species; ecosystems and habitats.

English – Evaluate arguments in written prose; construct logical prose to explain methods and findings.

Careers:

Examples of careers in the Year 11 curriculum – Endocrinologist, Diabetes Nurse, Polymer Engineer, Sustainable Energy Advisor, Chemical Analyst, Electrician, Fertility Consultant, Evolutionary Biologist, Geologist, Metallurgist, Geneticist, Radiographer, Nuclear Power Technician, Ecologist.

IMPACT OF THE SCIENCE CURRICULUM

Science lessons use a Key Questions Quiz most lessons to support students, ensuring they have identified the basics of all KS3 and KS4 topics, and aid in retention and deeper learning of key principles which are required to apply and synthesise answers to new contexts. This enables the students to identify areas of weakness in their subject knowledge in preparation for end of topic assessments. Through this methodology of highlighting areas of development, we aim to support independence in revision for students to identify and close their own knowledge gaps. Revision at the end of each topic uses a range of strategies to help students develop revision techniques over their school career, to prepare them for their GCSE exams and life beyond.

Modular assessments are used to measure progress of our students at the end of each topic. Each activity at KS3 and KS4 comes with a success criterion that teachers will use to mark the students work. Students will be graded with a GCSE style grade and individual feedback will be given on gaps in MARCKS. This acronym allows students to analyse where they have dropped marks for the following areas: Maths or graphical error, Application of Knowledge, Reading the Questions properly, Clarity and Statements per mark. MARCKS reflection sessions follow these assessment points enabling the teacher to deliver feedback for each individual child based on their need as well as identifying and rectifying misconceptions that may have developed whilst also enabling students to pose learning questions to close the gap in knowledge.

KS3 and KS4 students will use peer marked activities in most lessons this can be an exam question or extended piece of writing e.g. Required Practical writeup. Students will be expected to answer the exam question using information they have learnt in lesson. Extended pieces of writing will have a success criterion that students should follow. Data for each assessment will be added to a tracker called Pupil Progress that the HOD and SLT can monitor to check the progress of classes, individual or key groups of students. Analysis of assessment and mock data will help teachers decide which topics require intervention or extra focus in intervention sessions; teachers will decide on whether to teach topics again that students have performed badly on or challenge students by looking at topics from a different perspective. Up to Year 10 data will be used to inform class changes, those students that consistently perform well in assessments and assessment activities will be recognised and where appropriate may be moved groups if this is conducive to their learning and subject progress

Knowledge organisers will be used in KS3 and KS4. In KS3 teachers will use them to set homework activities, students will need to learn a set of key words and their definitions and then will be tested with a short quiz in lessons both during and after topics as part of the Key Questions quizzes. KS4 students will use the knowledge organisers as an extra revision guide that they can refer too when doing revision and teachers will talk to students about how to best utilise these to revise and make their own revision resources if required.

Measuring the impact of our curriculum is important to the department and we strive to get more students be successful in Science and to opt to complete the Triple Science courses. Each year we monitor the number of students that have taken up Science as well as the progress made by each students within our cohorts to identify areas of departmental focus. Supporting our students to achieve is at the heart of the Science departments philosophy, to this end the Science department utilises three online resource bases in the form of Kerboodle, which allows the class teacher to assign tasks to individual students to either act as a therapy activity or to support revision for assessments, Tassomai, which enables students to access low stakes quizzes to help reinforce recall and application style questions. Finally, Exampro, which allows teachers access to all past paper questions that can be sorted by topic and ability, so past paper questions can be assigned to students dependent on their need and academic progress.

WIDER CURRICULUM OFFER

The following sections clarify how areas such as Personal development, Careers and Cultural Capital are woven into the intention, implementation and impact of the subject curriculum.

Personal Development within the Science curriculum	
Personal Development	Science contributes to the school curriculum by developing students' abilities to investigate hypotheses, to calculate numerically and algebraically, to process data and draw valid conclusions based upon scientific understanding. Science is important for students and has a multitude of cross-curricular links in both knowledge and skill in areas such as Mathematic, Humanities and Technology. It is also important aspect in everyday life, in many forms of employment, and in public decision-making. As a subject, Science presents numerous opportunities for creativity in developing experimental methodologies, and can stimulate a sense of achievement and wonder when a scientific theory is understood and observed. Science enables students to build a fuller understanding of the world in which they inhabit and the complex interactions that occur within an environment. Through studying the scientific method and developing a foundation of both skill and knowledge, students are able to apply this with confidence in order to make better informed decision and develop a fuller appreciation of the world in which they live. The power of this reasoning lies in its use of precise and concise forms of language, symbolism and representation to reveal and explore general relationships. These forms are widely used for modelling situations, a trend accelerated by computational technologies. The subject transcends cultural boundaries, and its importance is universally recognized. Science helps us to understand and change the world.
SMSC	Science directly involves SMSC as part of the scientific method, exploring moral and ethical considerations when studying topics such as stem cells, birth control, the human impact on our environment, to name but a few. Science and the skills it imbues are a key component in modern life, both socially and within the workplace, particularly when making informed choices and decisions. The development of critical thinking skills enables students to analyse, evaluate and reflect upon their solutions, enabling our students to make informed choices (conclusions) based upon evidence provided. **Spiritual development** Science is using evidence to make sense of the world that we inhabit. It has the ability to make us feel both insignificant, in comparison to the scale of our solar system, galaxy and universe, as well as the ability to feel enormously significant, when considering our unique genetic make-up, fingerprint and our stewardship of our unique planet. Science develops understand of our relationship and interdependencies with the world around us (how the physical world behaves, the interdependence of all living things). Making new discoveries increases our sense of awe and wonder at the complexities and elegance of the natural world. For scientists, this is a spiritual experience and drives us onwards in our search for understanding. The scientific method and development of a logical, investigative approach to exploring the world promotes the spiritual growth of our students. Within Science lessons, students are always encouraged to delve deeper into their understanding, questioning their hypotheses and conclusions, relating their experience and knowledge to the world around them. **Moral development** Science supports moral development through supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change, and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. Our understanding of science has allowed us to develop technology that was not possible 50 years ago. Science explores the idea that although we now possess the knowledge and technology to affect the world in which we live, we must now start to determine whether we should complete all the scientific activities we are capable of through the exploration of moral and

	ethical issues. Ethical and moral dilemmas feature heavily within the Science curriculum and allow our students to explore their own moral compass through the evaluation of the implications of scientific principles. **Social development** The Science curriculum supports the Social development of our students by encouraging our students to be respectful for other people's ideas. Through the scientific method, students develop social skills through group and practical work, considering and evaluating safety risks associated with practical work to ensure the safety of both themselves and others. The impact and relevance of science on our students' lives is explored throughout the Science curriculum, e.g. through an exploration of a range of topics, such as enhancing plant growth to feed an ever-increasing population on a finite land mass and how the rights of others may be affected by pollution, building wind farms, etc. **Cultural development** Science is a multinational enterprise with the aim of developing our understanding of our universe, traversing geographical boundaries, uniting individuals of different nationalities and beliefs. As part of the Science curriculum, cultural development is enhanced by consideration of the work done by influential and significant scientific figures, including Pasteur and Darwin, amongst others. Students learn how cultural differences can influence the extent to which scientific ideas are accepted, used and valued. They also consider the historical context that influenced the way new theories emerged e.g. the motion of the Earth, evolution, plate tectonics and Big Bang theory.
British Values	There are many learning opportunities in Science and these will be framed within compliance with health and safety legislation. This will include the role of risk assessment in identifying and mitigating risks. Opportunities will often arise in this context e.g. law on controlled spaces (laboratories) and what this means for students in lessons. There are a diverse range of topics areas withing Science which will allow students to explore the nature of scientific evidence and how this interplays with scientific communities, the media, politicians and policy makers. Students will find it necessary to distinguish between opinions based on repeatable, valid and reproducible evidence and opinions based on non-scientific ideas e.g. prejudice and hearsay. Students of Science will have opportunities to use their knowledge and understanding to construct scientific questions and define scientific problems. This may include producing primary and secondary data to evidence their viewpoint and they will develop an understanding of the perspective of others. The Science curriculum will also introduce students to the idea that Science cannot provide all the answers to some questions and in some instance may just create more questions! E.g. where beliefs, ethics or opinions are important in situations.
Extracurricular & Enrichment	• Science competition days at other venues • Science video of the week • Science enrichment (after school) • Warhammer club
Careers in the Science curriculum	
There is a demand for Scientific knowledge and understanding across a number of employment sectors. Scientists work in the petroleum and nuclear industries, medicine and health, IT, business consultancy and operational research, space science and astronomy, as well as many forms of engineering and different government departments.	
Cultural Capital in the Science curriculum *The essential knowledge that students need to be educated citizens, introducing them to the best that has been thought and said and helping to engender an appreciation of human creativity and achievement*	
We follow STEM Learning's publication 'Science Capital Made Clear' which is based on research to give the biggest impact to our young people.	

The principles are:
1. Scientific literacy: a young person's knowledge and understanding about science and how science works. This also includes their confidence in feeling that they know about science. **Working scientifically skills developed in lessons and asking students to pose scientific questions and reasoning to new situation and science in the news.**
2. Science-related attitudes, values and dispositions: this refers to the extent to which a young person sees science as relevant to everyday life (for instance, the view that science is 'everywhere'). **Making lesson relevant and contextual.**
3. Knowledge about the transferability of science: understanding the utility and broad application of science qualifications, knowledge and skills used in science (e.g. that these can lead to a wide range of jobs beyond, not just in, science fields). **Making science lesson explicitly link or highlight careers that relevant to the lesson topic area.**
4. Science media consumption: the extent to which a person, for example, watches science-related television, reads science related books, magazines and engages with science-related internet content. Key dimensions of science capital. **Science video of the day and exposure to science media in lessons.**
5. Participation in out-of-school science learning contexts: how often a young person participates in informal science learning contexts, such as science museums, science clubs, fairs, etc. **Increase in science trips to increase science capital in the aspect**
6. Family science skills, knowledge and qualifications: the extent to which a young person's family have science-related skills, qualifications, jobs and interests. **Making science relevant to everyday jobs and how it is used in these jobs. Validating the science of the 'every day'.**
7. Knowing people in science-related roles: the people a young person knows (in a meaningful way) in their family, friends, peer, and community circles who work in science-related roles. The Enterprising Science national survey of 3,658 11-15 year olds in England found that: 5% have 'high' science capital – these students more likely to be boys, South Asian and socially advantaged 27% have low science capital 68% have medium levels of science capital. **Making science jobs more at the for of student's awareness and asking them if they know anyone on these roles.**
8. Talking about science in everyday life: how often a young person talks about science out of school with key people in their lives (e.g. friends, siblings, parents, neighbours, community members) and the extent to which a young person is encouraged to continue with science by key people in their lives. **Creating inspiring lessons, made relevant to the 'every day' to spark interest and conversation amongst their peers and family.**

SEND in the Science curriculum

Supporting Special Educational Needs and Disabilities (SEND) in the science curriculum involves creating an inclusive and accessible environment through tailored adaptations, such as multi-sensory learning, explicit keyword definitions both in lessons and through knowledge organisers and vocabulary sheets, and structured scaffolding. Key approaches in science include using visual aids, simplifying instructions into manageable chunks, pre-teaching concepts to build confidence, and implementing regular movement breaks for certain students to boost focus.

We follow guidance from STEM Learning and the EEF in the Science curriculum. We implement the following:

- **Create a Supportive Environment:** Set high expectations while utilizing proactive behaviour management to ensure all students can engage with scientific concepts.
- **Explicit Instruction & Scaffolding:** Break down complex skills, such as scientific investigations, into smaller, manageable steps, providing expert scaffolding and integrated instructions for required practical.
- **Address Misconceptions:** We identify preconceptions via formative assessment to actively adjust or replace them with scientifically accurate ideas. We use summative assessment to allow students to make improvements to gaps in their knowledge in feedback lessons after assessments.
- **Use Technology:** Employ tools like visualizers and worked examples to help processing, enhancing accessibility.

- **Effective TAs:** Teaching assistants are used effectively to supplement teacher instruction by facilitating active engagement rather than merely helping with recording. Teaching assistants are informed of the direction of the lesson by staff members to allow them to be effective in facilitating learning.
- **Instructional Strategies:** Utilize "pre-learning" (introducing topics early) and "over-learning" (repeating key concepts) to embed understanding through the use of low stakes quizzes and knowledge organisers. We explicitly teach vocabulary such as "variables," "analyse," and "predict", and these are also displayed in our Laboratories for students to reference.
- **Classroom Environment:** We organise, workspaces with an aim to reduce sensory overload. We optimize seating to minimize distractions.
- **Practical Work:** We allow hands-on experience with equipment to build interest and confidence and develop understanding of disciplinary and substantive knowledge. We use diagrams and checklists to support investigation tasks.
- **Assessment & Inclusion:** Tasks are structured to allow students to work toward the same learning objectives as peers where possible, focusing on scaffolding rather than lowering expectations.

Safeguarding in the Science curriculum

Safeguarding in the science curriculum involves the teaching of topic areas that incorporate health, safety, and wellbeing lessons into practical experiments and theoretical studies, fostering a safe learning environment.
It includes teaching students risk assessments and how to risk assess, healthy lifestyles, and safe handling of materials; ensuring pupils understand both physical hazards and personal welfare.

Key areas where safeguarding is integrated into science include:

- **Practical Safety & Risk Management:** Science lessons, particularly in chemistry and biology, provide opportunities for students to learn how to identify risks, follow safety procedures, and understand the consequences of actions, often involving safe handling of equipment and the impacts of lifestyle choices in health.
- **Health and Lifestyle:** Science curricula promote understanding of healthy bodies, including nutrition, hygiene, and the effects of substances, which supports physical well-being.
- **Human Biology and Relationships:** Aspects of Sex and Relationships Education e.g. substance use and contraception are taught in science in compliment to the PSHE curriculum, covering bodily awareness, health and reproductive health through the science curriculum.
- **Environmental Awareness:** Understanding environmental science can include aspects of staying safe in the natural world, such as learning about hazards and impact of Global Warming and Climate Change.
- **Developing Critical Thinking:** Science promotes questioning, allowing pupils to develop critical thinking skills necessary for identifying potential dangers and assessing safety in real-world scenarios and to use scientific thinking to question Media content and to question the validity of online content.

By covering these topics, the science curriculum serves as a key component of a school's overall safeguarding strategy, equipping students with the knowledge to stay safe and healthy.