SCIENCE

2026 – 2027

THE GRANGE SCHOOL

Science – Year 7

Key Learning Objectives	• Develop scientific thinking and curiosity. • Develop scientific investigation skills to plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. • Apply knowledge and understanding of scientific concepts to unfamiliar and real-life situations.
Curriculum Content: **GELS:**	
Autumn Term 1st Half **September - October**	**Topics:** **<u>Nurture Course:</u>** Introduction to the Laboratory and Investigation Skills. There are four key investigations in this course. Students are introduced to their laboratory, health and safety and the Investigation process. **<u>The particle model</u>** In this topic students will be able to: • Use the particle model to explain why different materials have different properties • Describe the properties of a substance in its three states • Interpret data about melting points • Use the particle model to explain boiling • Interpret data about changes of state • Use the particle model to explain evaporation, condensation, and sublimation • Explain diffusion and describe evidence for diffusion • Explain gas pressure and factors that affect it. **<u>Cells</u>** In this topic students will learn about: The basic structure of animal and plant cells. Movement of substances across cell membranes. Specialised cells and their special features for adaptations. Parts of an Amoeba and Euglena and how their structures compare. Cross Curricular Skills: Literacy • Specialist vocabulary, anatomical terms for plants and the human body. Numeracy • Simple formula to calculate magnification. Thinking Skills • Limitations of the technique or model of Diffusion
Autumn Term 2nd Half **November - December**	**<u>Forces</u>** In this topic students will learn: • What are forces and how we measure forces using a newton meter? • Describe how forces deform objects • Investigate Hooke's Law and relate extension of a spring with force • Describe the effects of drag forces and friction- explain why they happen • Describe the effects of gravitational forces on Earth and in space • Balanced and unbalanced force. <u>Practical Skill Topic: Physics</u> • Students will conduct a simple investigation and will learn how to write a full report including a method, result table, conclusion and evaluation.

	Cross Curricular Skills: Literacy • Specialist vocabulary – comparing and describing different types of forces • Key investigation skills vocabulary Numeracy • Plotting straight line graphs (Hooke's Law) • Interpreting what a linear relationship between two variables tells you • Represent sound and light as a wave- measuring amplitude, frequency and wavelength. Thinking Skills • Explain why the speed or direction of motion of objects can change using force arrows • Predict and present changes in observations for unfamiliar situations • Links to particle model to explain transmission of sound and reflection (linked later to the light topic) • Use of models • Interpreting experimental data. **<u>Atoms, Elements and Compounds</u>** In this topic students will learn about: • What an element is and know that elements symbols can be found on the periodic table • Compare the properties of elements • Explain how compounds have different properties to the elements in it • Write and interpret chemical formulae. Cross Curricular Skills: Literacy • Use secondary sources to extract information about objects in the solar system • Critical analysis on sources of information • What makes a good source of information? • Precision in writing, using capitals correctly in chemical symbols, use of subscripts in formula. Numeracy • Ray diagrams- measuring angles, scale drawings • Extracting data from tables. Thinking Skills • Links to particle model and explaining the refraction and reflection of light • Interpreting experimental data • How can we know what other planets are like? Is it likely that there is light on other planets? How can look for this? • Comparing the properties of elements.
Spring Term 1st Half **January - February**	**Structure and Function of the Body Systems** In this topic students will learn about: • The Levels of Organisation - cells, tissues and organs • Gas exchange • The skeleton, muscles and joints **<u>Sound</u>** In this topic students will learn: • The nature of sound waves • The differences between transverse and longitudinal waves • Explain why the speed of sound is different in different material • The difference between loudness and pitch • Describe how the ear works and how hearing can be damaged

	• Describe what ultrasound is used for and some uses of it. **<u>Chemical Reactions</u>** In this topic students will learn about: • Explain why chemical reactions and useful • Compare chemical reactions and physical changes • Identify reactants and products in word equations • Write word equations to represent chemical reactions • Predict products of combustion and categorise oxidation reactions as useful or not • Identify decomposition reactions from word equations • Explain conservation of matter and calculate masses • Describe characteristics of exothermic and endothermic reactions.
Spring Term 2nd Half February - March	**<u>Reproduction</u>** In this topic students will learn about: • Reproduction in humans, adolescence, menstrual cycle. Reproduction in flowering plants. <u>Practical Skill Topic: Biology</u> • Students will conduct a simple investigation and will learn how to write a full report including a method, result table, conclusion and evaluation. Cross Curricular Skills: Literacy • Specialist vocabulary, anatomical terms for plants and the human body • Writing conclusion and evaluations. Numeracy • Ideas about scale and size- development of the foetus • Graph plotting and interpretation. Thinking Skills • Ethical issues touched on related to reproduction (contraception)
Summer Term 1st Half April- May	**<u>Light</u>** In this topic students will learn about: • Describe what happens when light interacts with materials • Explain how images are formed in a plane mirror • Explain the difference between specular reflection and diffuse scattering. **<u>Acids and Alkali</u>** In this topic students will be able to: • Compare properties of acids and alkalis • Use a pH scale to measure acidity and alkalinity and categorise these into an acid, alkali or neutral • Describe how pH changes in neutralisation reactions Make a salt crystal using copper oxide and sulfuric acid. <u>Practical Skill Topic: Chemistry</u> • Students will conduct a simple investigation and will learn how to write a full report including a method, result table, conclusion, and evaluation. Cross Curricular Skills: Literacy • Precision in writing, using capitals correctly in chemical symbols, use of subscripts in formula. Numeracy

	• Extracting data from tables, mass calculations. Thinking Skills • Use of Models (particle model) to represent and understand change of state • Limitations of Models.
Summer Term 2nd Half June- July	**Space** In this topic students will learn about: • Describe the structure of the Universe • Name and describe the objects in the Solar System • Explain the motion of the Sun, Stars and the Moon • Explain why seasonal changes happen • Describe the phases of the Moon Explain why eclipses happen. Literacy • Specialised vocabulary. Numeracy • pH scale and categorising into acid, alkali and neutral. Percentage of gases at the start and end of aerobic processes. Thinking Skills • Explain how different niches can co- exist in the same habitat • Describe effects of insecticides on food webs.
Assessments	Year 7 students will write their first test on the Nurture Course and Cells There will be a full written test every term, as well as a shorter assessment on science skills once a term. Students will use checklists in class to identify which topics/ concepts are strengths and weaknesses.
Homework Structure	Homework is set on Satchel One. Students are required to log in and follow the instructions. Homework activities can range from building models, research about a topic, doddle quizzes, and revision activities.
School-based enrichment opportunities	STEMNET club for targeted students Science and Technology are linked to provide students with an idea of what Science is like outside of lessons. Science week activities in class and lunchtime demonstrations Science Challenge Workshops with other schools. STEM talks in Assembly and in class.
Resources available for home-based study	**Revision guides and books** CGP Key Stage 3 Science Workbook (with answers) **ISBN-10:** 184146239X **ISBN-13:** 978-1841462394 CGP Key Stage 3 Science Complete Study & Practice **ISBN-10:** 184146385X **ISBN-13:** 978-1841463858 Activate: Student Book 1 (Year 7 topics) **ISBN-10:** 0198392567 **ISBN-13:** 978-0198392569
	Useful websites: http://www.bbc.co.uk/education/subjects/zng4d2p https://www.cgpbooks.co.uk/Student/books_ks3_science_revision https://www.kerboodle.com/app

Science – Year 8

Key Learning Objectives	• Develop scientific thinking and curiosity. • Develop scientific investigation skills to plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. • Apply knowledge and understanding of scientific concepts to unfamiliar and real-life situations.
Curriculum Content:	
Autumn Term 1st Half **September - October**	The curriculum of study describes a sequence of knowledge and concepts. While it is important that students make progress; it is also vitally important that they develop secure understanding of each key block of knowledge and concepts to progress to the next stage. **<u>Energy</u>** In this topic students will learn about: • Compare the energy in foods with the energy needed for different activities • Explain what brings about changes in energy • Describe what happens when you heat up solids, liquids and gases • Describe how energy is transferred by particles in conduction and convection • Describe some sources of infrared radiation • Describe the difference between a renewable and non-renewable energy resource • Explain the difference between energy and power • Calculate work done and apply the conservation of energy to simple machines. Cross Curricular Skills: Literacy • Specialist vocabulary of Physics. Numeracy • Understanding energy in food • calculating work done and mean averages • calculating power • use of equations. Thinking Skills • Evaluating rate of transfer in a home • Explaining why insulating your house reduces energy bills • Making predictions and evaluating results. **<u>Health and Lifestyle</u>** In this topic students will be able to: • Describe the components of a healthy diet and explain the role of each food group in the body • Describe how to test foods for starch, lipids, sugar and protein • Describe some health issues caused by unhealthy diet and calculate the energy required of different people • Describe the structure and function of the main parts of the digestive system • Describe the role of enzymes in digestion, describe the role of bacteria in digestion • Describe the difference between recreational and medicinal drugs • Describe the effect alcohol has on conception and pregnancy • Describe the effect of tobacco smoke on pregnancy.

Autumn Term 2nd Half **November - December**	**<u>The Periodic Table</u>** In this topic students will learn: • Explain how elements are classified as metals and non-metals • Use patterns to classify an element as a metal or non-metal • Compare patterns in properties in the groups and periods of Periodic table • Interpret data and use patterns to predict properties of Group 1 elements • Use patterns to predict properties of Group 7 elements • Describe the physical and chemical properties of the Group 0 elements. **<u>Electricity and Magnetism</u>** In this topic students will learn about: • Explain how objects become charged and how they interact • Describe and measure current • Describe potential difference and what is meant by rating of a battery • Describe the difference between series and parallel circuits • Calculate the resistance of a component and of a circuit • Describe how to represent magnetic fields and compare this with the Earth's magnetic field • Describe how to change the strength of an electromagnet • Describe how a simple motor works and some uses of electromagnets.
Spring Term 1st Half **January - February**	**<u>Ecosystem</u>** In this topic students will be able to: • Describe the process of photosynthesis and state the word equation for photosynthesis • Describe the structure and function of the main components of a leaf and explain the distribution of chloroplasts • Describe how a plant uses minerals for healthy growth and explain the role of nitrates in plant growth • Describe the process of chemosynthesis and where it takes place. Cross Curricular Skills: Literacy • Specialist vocabulary in Biology Numeracy • Changes in gases on exhalation and inhalation. Graph analysis and evaluations. Thinking Skills • Ethical and Moral issues on should a pregnant women drink • Impact of drug addiction on economical and social issues. **<u>Metals and Acids</u>** In this topic students will learn about: • Compare the reactions of different metals with dilute acids • Explain how to test for hydrogen • Compare the reactions of different metals and oxygen • Use state symbols in balanced formula equations • Use the reactivity series to predict reactions • Predict pairs of substances that react in displacement reactions • Make decision on extracting metals based on the reactivity series • Describe ceramic properties and explain their suitability for their use • Explain how polymer properties make them suitable for their uses • Explain why composite properties make them suitable for their uses.

Spring Term 2nd Half February - March	**<u>Adaptations and Inheritance</u>** In this topic students will be able to: • Describe how organisms are adapted to their environment • Describe how competition can lead to adaptation • Describe the difference between environmental and inherited variation • Represent variation within a specie using graphs • Describe how characteristics are inherited and how scientist worked together to develop the DNA model • Describe the process of natural selection and how organisms evolve over time • Describe some factors that may lead to extinction and the purpose of gene banks. Cross Curricular Skills: Literacy • Specialist vocabulary in Biology • Natural selection process – Essay writing. Numeracy • Predator- Prey graph showing the interdependence and students using the numbers to make valid conclusions • Use of histogram to show continuous data of height • Patterns of variation analysis. Thinking Skills • Variation data collection and evaluations • How can we prevent extinction (forward planning and thinking). **<u>Motion and Pressure</u>** In this topic students will learn about: • Calculate speed and describe relative motion. Interpret distance- time graphs and calculate speed using the graph • Describe how atmospheric pressure changes with height • Explain why some things float and some things sink • Apply ideas of pressure to different situations • Calculate the moment of a force. Cross Curricular Skills: Literacy • Specialist vocabulary of Physics. Numeracy • Interpreting graphs • Using equations to calculate speed and momentum • Making use of data and ratios to make predictions • Analysis of data from external sources. Thinking Skills • Investigation of objects moving in a straight line and at an angle, drawing conclusions from data • Describing a journey from a d-t graph • Comparing big and small pressure with the use of the pressure equation.
Summer Term 1st Half **April- May**	**<u>The Earth</u>** In this topic students will learn about: • Describe the composition of the atmosphere • Explain how sedimentary rocks are made • Explain how igneous and metamorphic rocks are formed • Use the rock cycle to explain how the material in rocks is recycled • Explain why the concentration of carbon dioxide in the atmosphere did not change for many

	years • Explain why global warming happens • Analyse the advantages and disadvantages of recycling. Cross Curricular Skills: Literacy • Specialist vocabulary of Chemistry • Making valid observations • Describing methods to compare properties of Group 1 and 7 elements • Writing equations using the correct superscripts and capital letters • Comparing finite resources. Numeracy • Interpreting graphs • Use of negative numbers to compare melting and boiling points • Analysing climate change graphs. Thinking Skills • Comparing year by year of temperature changes to draw conclusions and describe impact • Extend thinking to the current climate and world related issues.
Summer Term 2nd Half June- July	**<u>Separating Techniques</u>** In this topic students will learn: • Explain how to identify pure substances • Use particle models to explain dissolving • Explain the meaning of solubility • Explain how and why filtration works • Explain how to use evaporation to separate mixtures • Explain how distillation works • Explain how chromatography separates mixtures and analyse chromatograms. Cross Curricular Skills: Literacy • Specialist vocabulary of Chemistry • Making valid observations • Describing methods to compare properties of Group 1 and 7 elements • Writing equations using the correct superscripts and capital letters. Numeracy • Interpreting graphs • Use of negative numbers to compare melting and boiling points. Thinking Skills • Making predictions of unknown elements based on given data (predicting boiling and melting points) • Are group 1 metals like other metals? • Analysis of chromatograms • Comparing the different separating techniques.
Assessments	End-of-topic test for each module. Students will track their tests in class to identify which topics are strengths and weaknesses.
Homework Structure	Homework will be set on Bromcom. Students are required to log in and follow the instructions. Homework activities can range from building models, research about a topic, doddle quizzes, and revision activities.

School-based enrichment opportunities	STEMNET club for targeted students, by invitation only. Science and Technology are linked to provide students with an idea of what Science is like outside of lessons. Science Quiz inter-class activities, Science week activities in class and lunchtime demonstrations, Science Challenge Workshops with other schools.	
Resources available for home-based study	**Revision guides and books** CGP Key Stage 3 Science Workbook (with answers) **ISBN-10:** 184146239X **ISBN-13:** 978-1841462394 CGP Key Stage 3 Science Complete Study & Practice **ISBN-10:** 184146385X **ISBN-13:** 978-1841463858	**https://www.cgpbooks.co.uk/Student/books_ks3_science_revision** Activate: Student Book 2 (Year 8 topics) **ISBN-10:** 0198392575 **ISBN-13:** 978-0198392576 **Useful websites:** **http://www.bbc.co.uk/education/subjects/zng4d2p**

Activate 3 Science Course – Year 9

Key Learning Objectives	• Use scientific theories and explanations to develop hypotheses. • Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. • Apply knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.
Curriculum Content: Activate 3 Curriculum	
Autumn Term 1st Half Term 1 September-October	**Introduction to Investigation Skills** Students will be able to: • Plan and carry out safe investigations • Plot graphs accurately and describe patterns and trends • Calculate mean values identifying anomalous results • Draw valid conclusions and evaluating the investigation. **C3 Chapter 1: Particle Model and State change** Students will be able to: • Describe how nanoparticles are used in medical treatments • Describe an example of how scientists are investigating nanoparticles safely • Explain how combustion reactions in car engines produce exhaust gases • Describe some advantages and disadvantages of cars and new vehicle fuels • Explain using the word equations how catalytic converters clean up exhaust gases • Explain why hybrid electric cars use less fuel than cars fuelled by petrol alone • Compare the advantages and disadvantages of different types of cars Cross Curricular Skills: **Literacy** • Specialist vocabulary, anatomical terms for human body and essay writing • Explain how scientists can use fingerprints to prove that a suspect was present at the scene of a crime • Using superscripts to write equations and describe the number of molecules. **Numeracy** • Units of measurements and the idea of relative size when learning about nanoparticles • The use of standard form • The use of data tables to compare thermal conductivity • Different factors of suncream and what they mean in terms of exposure to UV rays. **Thinking Skills** • Interpreting and comparing information regarding fingerprinting to solve crimes • Will fossil fuels last forever and how can we plan for future needs. Linked to finite resources. **B3 Biology Chapter 1: Cells** • Students should now be familiar with the concept of all living organisms being composed of cells, that cells have similarities, and should also be aware that not all cells are the same. They will have used microscopes to view cells from animals and plants. In this chapter, students will learn how the development of microscopes has helped us to understand cells and how specialised plant cells – phloem and xylem – are adapted to transport materials around a plant. • They will use their knowledge of the respiratory and circulatory systems, alongside their knowledge of respiration, to investigate how the body responds to the increased demands for energy during exercise. • Cells can only survive if they have the capability of gaining substances from their environment and removing substances from within. Students have already learned about the process of diffusion. In this chapter, they will move on to investigate the factors that

	affect the rate of diffusion as well as discover the process of active transport. • Finally, they will develop their knowledge of unicellular life in finding out about prokaryotic cells. **P3 Chapter 1: Forces and Motion** • To jump up in the air, you first have to push down on the ground. But why push down to move upwards? When you push down on the ground, the ground pushes back up on you with the same size force but acting in the opposite direction. Forces always occur in pairs due to these interactions. To understand why or how the motion of an object changes, you concentrate on the forces acting on that object only. In this case, the gravity force pulling you downwards and the upwards force from the ground. If you are accelerating upwards the upwards force must be bigger. However, you always come back down. Once your feet lose contact with the ground, the only force acting on you is gravity acting downwards. • The force of gravity is an example of a non-contact force. All masses produce a gravitational field. This is a region in space where any other object with a mass feels a force. Like the magnetic field around a magnet, you can represent the gravitational field with field lines. The closer the field lines are together the stronger the gravitational field strength. You are attracted to other objects and they to you. However, the mass of the Earth is so much bigger than anything on it that the attraction to the Earth trumps all others. • There is often more than one force acting on an object. The resultant force is the single force that would have the same effect as all the forces combined. You represent forces with arrows because forces have both size and direction. When you combine them to find the resultant, you have to consider this. **Literacy** Scientific terms. This chapter has some key terms that students may have encountered in everyday life but that have specific meanings in science, such as 'rate.' Students need to be able to define terms such as 'weight,' 'mass,' and 'acceleration **Numeracy** Units: As students start to look at data quantitatively, it is important to emphasise that you can only put numbers into a formula if the quantities have the right units. Gradients of straight lines: The formula for weight provides a chance to introduce y = mx graphs in a physics context (P3 1.3 Mass, weight, and fields). With weight on the y-axis and mass on the x-axis, the gradient is the gravitational field strength of the planet/moon. **Working Scientifically** Links made to National Curriculum in detail for each lesson
Autumn Term 2nd Half Term 2 November-December	**B3 Biology Chapter 2: Cell Systems** • In this chapter, students will revisit the hierarchical nature of the levels of organisation within an organism using the circulatory system and nervous system as examples. • Students will discover how new technology and ideas lead to changes in our understanding of how organisms work. Students have already been introduced to enzymes and will now look at how they can be used commercially in washing detergents. • The concept of exchange is found throughout biology and this chapter will allow students to revisit it and discover the main features of exchange surfaces and their function in multicellular organisms, focusing on the alveoli in the lungs, villi in the intestines, and the structure of a leaf. • Finally, they will study transport systems in both animals and plants by looking at the circulatory system and the transpiration stream. **Literacy** Enzyme names: When introducing enzyme names, explain that the suffix -ase is used in biology to form the names of enzymes. The most common way to name enzymes is to add this suffix onto the end of the substrate – for example, an enzyme that breaks down carbohydrates is called carbohydrase. You could ask students to predict the names of other enzymes – for example, peroxides are broken down by peroxidase.

	Numeracy Surface area to volume ratio: Students will have been taught how to calculate the volume and surface area of common 3D shapes in maths, but you may need to recap these skills. To find volume, remind students to find the area of one face and then multiply this by the depth of the shape. (Note: some students may refer to this as height; in this case, volume = length × width × height.) Some students may find it easier to draw out the net of the shape when working out surface area. In this concept, limit the shapes to cubes and cuboids. **Working scientifically** Model gut: When revising the digestive system, ask students to imagine their body as having a hosepipe running from their mouth to their anus. This tube carries food and fluids into (and out of) the body. The analogy is limited, however, as unlike a hose the gut is permeable in parts so that nutrients and waste products can pass into the body from the tube, or from the body back into the tube. In this model, the villi would be tiny projections that stick into the tube to increase the surface area for absorption. **P3 Chapter 2: Energy** Students will be able to understand that: • Energy is quantifiable. • Energy is stored in different forms and can be transferred between them. • Energy can transfer by heating in the following ways: conduction, convection, radiation. • Infrared radiation is a wave, like (visible) light, that can travel through a vacuum. • Energy cannot be created or destroyed. • Work done is energy transferred, work done formula. • Machines make jobs easier, but the total amount of work done is the same. • Power is the rate of transfer of energy, the power formula. **Literacy** • Scientific terms: This chapter has many key terms that students may have encountered in everyday life but have specific meanings in science, such as 'work done' and 'power' or 'efficiency.' Encourage students to make their own glossary of key terms which they can add to throughout the topic and refer to when answering questions. In lesson 2.7 Efficiency, students plan and write an extended answer to a question. Students have to link scientific ideas to explain why more efficient appliances benefit the environment. Model the PEEL structure to answering exam questions to support them. **Numeracy** • Manipulating formulae: Always model how to use and rearrange formulae. Note the units required and how to convert (if the context requires conversions). Lesson 2.6 has conversions when calculating work done and power. The elastic energy formula has a power in it – it is a good idea to check students know how to handle this. **Working Scientifically** • Weighing arguments: Students will have the opportunity to role-play government ministers and scientific advisors, using evidence to decide whether the government should invest in solar roads. You may wish to decide in advance which students will take which roles and who they will work with. • Modelling: Modelling energy stores with labelled jugs and pouring water between them is an effective way to model energy transfers and conservation of energy/dissipation.
Spring Term 1st Half Term 3 **January-February**	**C3 Chapter 2: Atoms and the Periodic Table** Students will be able to: • Describe evidence for Dalton's atomic model. • Explain one way of developing a scientific explanation. • Explain how scientist discovered electrons and the nucleus. • Describe how Mendeleev devised the Periodic Table. • Describe how Tackle and Noddack discovered rhenium. • Describe how fossils are formed. Explain what fossils tell us about the ages of rocks.

	• Explain how a recent fossil find makes scientist question earlier explanations about evolution. • Describe the process of peer review. **B3 Biology Chapter 3: Fertilisation and Implantation** Topics Covered • The production of new life is astonishing when you think about it. What are the chances that you happen to be alive? Why do we get new plants in the garden and fields every year? How babies are made is one of those questions that fascinate young people, and while many revel in the scientific details, some find it embarrassing and difficult to talk about. Teachers need to be sensitive to this. This unit revisits how new life is produced through sexual reproduction as well as introducing students to asexual reproduction by looking at cloning. • Sexual reproduction in humans has the biological purpose of producing offspring but that is not always the desired outcome and, in this chapter, students will revisit the conditions needed for a pregnancy to occur and different methods which can prevent it. • The fact that plants can reproduce sexually is one that students can find tricky to understand as they equate the process of sexual intercourse with being sexual reproduction. This unit allows them to recap the fact it is the fertilisation of gametes that is key and in plants the product is a seed which then goes on to develop into a new organism. **P3 Chapter 3: Waves, Sound and light** Students will be able to understand. • The concept of a wave as something that transfers energy from a source. • Sound is a longitudinal wave that travels through solids, liquids, and gases, and can be represented as sinusoidal waves – it has many applications involving reflection. • Waves have amplitude, wavelength, and frequency. • Light is a transverse wave – we represent light as a ray to show its direction. • Humans can only hear/see certain frequencies of sound/light. • Different frequencies of light correspond to us seeing different colours. • White light is made up of all other colours.
Spring Term 2nd Half Term 4 February-March	**C3 Chapter 3: Chemical Changes** Topics covered • When we look around the streets today, we see a mix of cars, vans, and lorries of all shapes and sizes. Some use fossil fuels like petrol and diesel – other more modern cars run on electricity. When Carl Benz invented the car in 1886, he chose to use petrol as the fuel because it was cheap and readily available. Along with his wife Bertha, who invented many of the recognisable features of the car, like windscreen wipers and mirrors, Benz pioneered the car as we know it. His company, named after his daughter Mercedes, still exists today. • However, electric cars are not new. Thomas Edison famously had an electric car in 1912. Electric power was seen as a rival to petrol early on due to its speed and calm ride. However, petrol had a range advantage and eventually won out. When Henry Ford invented the Model T 1908, it had a petrol engine and was the first affordable car. • Both petrol and batteries take advantage of chemical reactions in different ways. In both cases, a reaction occurs that releases energy. In the petrol engine, the combustion reaction releases heat energy, and it is used to drive the pistons round. In the battery, the main energy transfer is by electric current to the motors caused by a difference in reactivity between two chemicals. • In this topic, we will revisit all the knowledge that we have built up in Activate 1 and 2 on chemical reactions and look at how it can be applied to a new situation. We will look at how this has led to the development of new technologies and bridge the gap to further study at GCSE.

	Cross Curricular Skills: **Literacy** • Specialist vocabulary. • Critical review of Dalton's ideas on his work on gases. **Numeracy** • Patterns in element properties. • Arrangement of atoms according to atomic weights in the periodic table. • Calculate neutron numbers. • Allocating electrons into shells of atoms. • Appreciate what the subatomic particles bring to the understanding of patterns and trends within each group in the periodic table. **Thinking Skills** • Why does gravity not separate the heavier gas from the lighter gas. • Clue from fossils can give us information, students need to give explanations for these clues. **P3 Chapter 4: Electricity and Magnetism** Students will be able to understand. • Charges can be positive or negative – like charges repel and opposite charges attract. • Electrons have negative charge. • If you rub two things together, you can rub electrons off one onto the other, making both objects charged. · Forces at a distance. · Static electricity and charge. · Circuits and current. · Uses and dangers of static electricity. · Drawing electric fields. · Magnetic fields around permanent and induced magnets. · Determining the direction of the Earth's magnetic field, using a compass. • Current is the charge per second passing a point – potential difference depends on the energy given to a component by the charges passing through it. · Resistance is a measure of how difficult it is for a p.d. to push a current through a component, V = IR. · Simple series and parallel circuits. · What a 'field' is, and what shape the magnetic field is around a current-carrying wire and an electromagnet. · Magnetic poles can be north or south; like poles repel and opposite poles attract. • The main parts of a power station. **Literacy** • Wave speed, wavelength, amplitude, frequency, time period: These quantities are not conceptually difficult, which is perhaps why students tend to forget them. It is worth including games and quizzes on these terms regularly to improve student recall and avoid confusion when they are used in explanations. · Linking words: In lesson 3.3, students write a letter where they imagine they are a doctor explaining ultrasound. In the activity, they are encouraged to use linking words to show the relationships between their ideas. **Numeracy** • Using formulae: Students may need help rearranging, f = 1 /T, as some may be confused by the '1'. The classic error in echolocation questions is forgetting to double the distance (or halve the time). It is worth reminding students how to convert into standard units (milliseconds to seconds, kilometres to metres), before setting them away on calculations. **Working Scientifically** • Science communication: This chapter allows you to focus on science communication, on how we decide what information to believe, and the potential problems that can arise when people do not understand a piece of science or technology. A suggested example is the vandalism of mobile phone masts during lockdown by people who believed the masts caused and/or spread COVID-19.
Summer Term 1st Half Term 5	**B3 Biology Chapter 4: Variation and natural selection** Topics Covered

April- May	• Seed dispersal is used as the context for students to develop their skills in working scientifically with a particular focus on collecting valid data. The amazing variety of life is one of the world's natural wonders and should stimulate students to want to know more about the world they live in. Where did all the variety come from? Why is life so diverse? Why are some species similar and others so very different? • This chapter will allow students to further explore the variation seen within species looking again at both genetic and environmental factors. Students should now be familiar with species having adaptations and, in this chapter, they can delve deeper by categorising them into being structural, functional, or behavioural. Adaptations increase the chances of survival and reproduction by increasing the ability to compete successfully in a habitat. • The location a species is found in is where it must be competing successfully. Students will investigate the distribution of plants across an area and will examine biotic and abiotic factors in an environment. The chapter revisits natural selection and evolution using the context of antibiotic resistance which can then be linked to the need for maintaining biodiversity and the methods being used to conserve species before they become extinct. **Literacy** Prefixes: When helping students to learn the difference between abiotic and biotic, explain that the prefix a- means 'without' or 'not'. Therefore, abiotic means without life – hence, biotic factors are non-living factors. Other examples include amorphous (without form) or atypical not typical). Can students think of any others? Encourage students to read about different conservation methods. They could research UK species which are in decline as well as the more high-profile worldwide species. There are many scientific terms which students should be encouraged to practice spelling correctly. **Numeracy** Percentage change can be calculated from the data in lesson 4.2. Students may need reminding of how to calculate this using change in value / original value * 100. There are several opportunities for the development of graph drawing skills such as lessons 4.4 and 4.6. During Lesson 4.4 students are investigating the distribution of plants in a habitat. This provides opportunity for discussion of estimating values. Lesson 4.5 is extended to calculate the population of bacteria after a given time which would allow discussion of exponential growth. **Working Scientifically** Photosynthesis in different areas
Summer Term 2nd Half June- July	**Biology Paper 1 Content** Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. **Topics:** Organising plants and animals. Communicable diseases. Preventing and treating diseases. Non-communicable diseases. Photosynthesis. Respiration.
Assessments	There will be an end-of-topic test for each module. Students will track their tests in class to identify which topics are strengths and weaknesses.

Homework Structure	Homework will be set on Bromcom weekly. Students are required to log in and follow the instructions. Tests dates will also be shared with the students on Satchel One. The homework is more likely to focus on reading for understanding, revising, and designing investigations.
School-based enrichment opportunities	STEMNET club will help challenge our future scientists to think beyond the classroom. Science and Technology are linked to provide students with an idea of what Science is like outside of lessons. Science Quiz inter-class activities, Science Challenge Workshops with other schools. Science week lunch activities during Science Week.
Resources available for home-based study	Smart Active 3 book All students have access to digital AQA textbooks through Kerboodle. Students will be given passwords in the classroom. Key Stage 4 GCSE books are also available on the same site. **GCSE books if students want to access work early** Revision books: Revision books can be purchase at most bookstores and on CGP Revision books: Foundation (1-5) ISBN: 978 17 82945659 Higher ISBN (5-9): 978 17 82945642 CGP Exam practice book Foundation (1-5): 978 17 8294 5093 Higher ISBN (5-9): 978 17 8294 5086 **Useful Websites** https://www.senecalearning.com/ http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/ https://www.teachitscience.co.uk/ http://www.bbc.co.uk/education/subjects/zrkw2hv http://www.creative-chemistry.org.uk/ http://www.s-cool.co.uk/gcse/chemistry http://www.revisionworld.co.uk

iii. Science: Combined Trilogy Science

Course Details	**Exam Board: AQA code 8464** **Examination Structure:** There are six papers: two biology, two chemistry, and two physics. Each of the papers will assess knowledge and understanding from distinct topic areas. There are 21 required Practical's, which are completed in class and assessed with the structure of the six papers. • Each paper is 1 hour 15 minutes long with 16.7% of the overall GCSE grade. 70 marks for each paper. • Foundation assesses Grade 1-5, Higher Grade 5-9. • There is a variety of multiple choice, diagram structures, closed short answer and open responses in the exam paper. • Students will be required to demonstrate mathematics skills in all papers. • There is no coursework.
Key Learning Objectives	• Demonstrate knowledge and understanding of scientific ideas, scientific techniques and procedures. • Apply knowledge and understanding of scientific ideas, scientific enquiry, techniques and procedures. • Analyse information and ideas to interpret and evaluate; make judgments and draw conclusions; develop and improve experimental procedures.
Subject Specific Skills that are embedded within the Curriculum throughout GCSE	• Manipulation of practical equipment • Scientific modelling • Data Analysis • Ethical Considerations • Development of Scientific thinking • Experimental Skills and Strategies • Analysis and Evaluation • Scientific Vocabulary, Quantities, Units, Symbols and Nomenclature • Extended Writing • Investigation planning • Conclusion writing • Evaluation writing • Application of Mathematical formulae
Curriculum Content: Year 9	
Summer Term (May- July) Year 10	**Biology Paper 1 Content** Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. **Topics:** Organising plants and animals. Communicable diseases. Preventing and treating diseases. Non-communicable diseases. Photosynthesis. Respiration. **Chemistry Paper 1**

Autumn Term (September – December)	The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels. **Topics:** Atomic Structure The Periodic Table Structure and Bonding Chemical Calculations Electrolysis Energy Changes
Spring Term (January - April)	**Physics Paper 1** Students know that power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. Students should have a basic understanding of the following biological principles and be able to apply them in all their papers: the structure and functioning of cells and how they divide by mitosis and meiosis from sections Cell biology and Meiosis. **Topics:** Energy Transfer and Resources Electrical Circuits Electricity in the home Molecules and Matter Radioactivity
Summer Term (May – July)	**Biology Paper 2** Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to support this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. **Topics:** Nervous System Hormonal Control Variation Genetics Adaptations and Ecosystems Human Impact
Curriculum Content – Year 11	
Autumn Term (September – December)	**Chemistry Paper 2** In chemistry, a pure substance is a single element or compound, not mixed with any other substance. Pure elements and compounds melt and boil at specific temperatures. Melting point

	and boiling point data can be used to distinguish pure substances from mixtures. In everyday language, a pure substance can mean a substance that has had nothing added to it, so it is unadulterated and in its natural state. Students should be able to use melting point and boiling point data to distinguish pure from impure substances. **Topics:** Rates and equilibrium. Crude Oil and Fuel. Chemical Analysis. The Earth's Atmosphere.
Spring Term (January - May)	**Physics Paper 2** Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible. **Physics** Forces in balance. Motion. Wave Properties. Electromagnetic waves.
Assessment	Assessments are written once per half-term, the department will decide on which modules are selected. Students use knowledge organisers and PLC sheets to prepare for assessments.
Homework / independent study	Homework will be set on Bromcom weekly. Students are required to log in and follow the instructions. The homework is more likely to focus on SPARX Science as well as reading for understanding and revising required practical work. The effort students put into homework will enhance their participation and enjoyment of classroom learning. Confidence in Science is linked to effort in class and homework.
School-based enrichment opportunities	Easter booster sessions are offered. We cover retrieval practice as part of our lessons before assessments. Teachers will post revision resources on Satchel One for students prior to assessments.
Resources available for home-based study	All students have access to digital AQA textbooks through the Kerboodle website. Students will be given passwords in the classroom. Revision books: Revision books can be purchased at most bookstores and on www.amazon.co.uk. **CGP Revision books:** Foundation (1-5) ISBN: 978 17 82945659 Higher (5-9) ISBN: 978 17 82945642 **CGP Exam practice books:** Foundation (1-5): 978 17 8294 5093 Higher ISBN (5-9): 978 17 8294 5086 **Useful websites:** www.bbc.co.uk/schools/gcsebitesize/science/aqa/ www.teachitscience.co.uk/ www.bbc.co.uk/education/subjects/zrkw2hv www.gojimo.com/gcse-science-revision/ www.s-cool.co.uk/gcse/chemistry www. senecalearning.com www.revisionworld.co.uk www.sciencerevisioncoach.org

BTEC Level 3 National Extended Certificate in Applied Science

Course Details	**Exam Board: Pearson** **Level: BTEC Level 3 National Extended Certificate in Applied Science.** 2-year curriculum which is equivalent in size to one A-Level 360 GLH. **Examination Structure:** The qualification has four mandatory units covering the following topics: **Unit 1: External Exam:** Principles and Applications of Biology – Structure and function of cells and tissues, biological molecules, enzymes and their role in organisms **Unit 2: External Exam:** Principles and Applications of Chemistry – Structure of the Periodic Table and its implications on physical and chemical properties of substances, through analysis of different bonding methods **Unit 3: External Exam:** Principles and Applications of Physics – Waves and their applications; force principles and their application in transportation and construction of electrical circuits **Unit 4: Internal Coursework** Practical Scientific Procedures and Techniques – Practical applications across the sciences, including chromatography, colorimetry and electrical circuits. The Optional Unit for the Year is Unit 6 **Unit 6: Internal Coursework** Contemporary Issues in Science – Contemporary scientific issues including the reliability of sources of scientific information and their associated validity **Coursework/Controlled Assessment:** Achievement in the qualification requires a demonstration of depth of study in each unit, assured acquisition of a range of practical skills required for employment or progression to HE, and successful development of transferable skills. Learners achieving a qualification will have achieved across mandatory units, including external and synoptic assessment. Units are assessed using a grading scale of Distinction (D), Merit (M), Pass (P), Near Pass (N) and Unclassified (U). The grade of Near Pass is used for externally assessed units only. All mandatory and optional units contribute proportionately to the overall qualification grade, for example a unit of 120 GLH will contribute double that of a 60 GLH unit. Qualifications in the suite are graded using a scale of P (Learners must pass each unit to pass the qualification). **Re-sit information:** The learner is permitted one re-sit/re-take in relation to each unit of the qualification. Where a unit is examined/externally assessed, this means one re-sit. Where a unit is internally assessed and externally quality assured, this means one re-take. *Please note that the order we teach the units might change.
Key Learning Objectives	The mandatory and optional content provides a balance of breadth and depth, while retaining a degree of choice for individual learners to study content relevant to their own interests and progression choices. Also, the content may be applied during delivery in a way that is relevant to local employment needs. • Demonstrate knowledge and understanding of scientific concepts, procedures, processes and techniques and their application in a practical investigative context. • Interpret and analyse qualitative and quantitative scientific information to make reason judgements and draw conclusions based on evidence in a practical investigative context. • Evaluate practical investigative procedures used and their effect on the qualitative and

	quantitative scientific information obtained to make reasoned judgements. • Be able to make connections between different scientific concepts, procedures, processes and techniques to make a hypothesis and write a plan for a practical investigation.
Subject Specific Skills that are embedded within the Curriculum	• Manipulation of practical equipment • Scientific modelling • Data Analysis • Ethical Considerations • Development of Scientific thinking • Experimental Skills and Strategies • Analysis and Evaluation • Scientific Vocabulary, Quantities, Units, Symbols and Nomenclature • Extended Writing • Investigation planning • Conclusion writing • Evaluation writing • Application of Mathematical formulae
Curriculum Content – Year 12	
Autumn Term (September – December)	**Unit 3: Principle and Applications of Physics (Exam module) 60 GLH** Students will explore the use of practical and mathematical skills in the study of waves, motion and electricity. Unit introduction If you've ever considered how the mechanics of a car, your mobile phone or how circuitry work, you shouldn't be surprised that physics plays a huge part in their action. This unit will explore the role physics has on our everyday tasks and activities, communication networks and our work with electrical circuits. In this unit, you will learn about waves and how electromagnetic waves are the basis for our modern communication systems. Mobile phones, Wii-FI and Bluetooth© will no doubt be concepts you're already familiar with. This unit will enable you to develop an insight into how these systems work and the activities they perform. The study of motion and laws of motion are also important when developing safety products for our everyday lives. Seat belts, air bags and crumple zones are just three innovations that came about through the study of motion. Electricity, electrical circuits and their relationship to energy usage, are also very important as our use of electrical devices continues to rise. By using physics, it is possible to understand how we can create energy alternatives that can help us develop greater more sustainability in our future environment. Understanding the physical principles, practical investigations and mathematical skills developed in this unit will allow for progression to higher education and professional qualifications such as nursing, health and social care, technicians in medicine, dentistry and laboratory quality control
Spring Term (January - April)	**Unit 2: Principle and Applications of Chemistry (Exam module) 60 GLH** Students will explore some of the fundamental concepts which underpin the chemistry and chemical reactions of the world around them. Unit introduction Chemistry is not just a subject; it influences many aspects of other sciences. Everything you see, everything you do, everywhere you go, you are surrounded by chemistry and the chemical reactions that are needed for it. Chemistry makes up the world we live in today. In this unit, you will re-examine basic chemistry (the periodic table, atomic and electronic structure, bonding and structure) with more advanced concepts such as ionisation energy, electronegativity, polarity, molecular shape and intermolecular forces. Periodicity will be explored through the study of Period 3 elements and their compounds, focusing on changes in oxidation number, physical and chemical properties, and making predictions for other elements. You will learn about the main branches of physical chemistry (chemical kinetics, energetics and equilibrium), perform mole calculations, and consider the impact of green chemistry in the chemical industry.

	You will learn the basics of organic chemistry, naming and drawing formulae, understanding isomerism and other properties, the reactions of different types of organic compound, and the benefits or problems that organic chemistry can provide. The content covered at the beginning, will provide you with the pre-requisite knowledge to explore the subject further in the latter stages of the unit. The content enables you to build on your understanding as you progress towards your final assessment. This unit will help you progress to higher education and professional qualifications either in chemistry, or other science-based qualifications. It will also help you to progress to employment in the chemical or scientific industry.
Summer Term (June - July)	**Unit 1: Principle and Applications of Biology (Exam module) 60 GLH** This unit explores the key components of biological science. It will examine cells and tissues, their varied structures and functions and the biological components that interact with their existence. The topic areas covered in this unit include: · animal and plant cells and tissues, including specialised cells · biological molecules, including water, carbohydrates, proteins and nucleic acid cell transport. enzymes activity, students need to understand the structure and workings of cells. They build on this knowledge to understand how the body stays healthy as well as the symptoms and causes of some diseases. This allows them to diagnose and treat illnesses. The study of bacterial prokaryotic cells gives an understanding of how some other diseases are caused and can be treated. Students need to understand the structure and function of plant cells to enable them to develop food crops that produce greater yields. The knowledge and understanding you will learn in this unit will provide a strong basis for you to progress in the science sector and to a variety of science related programmes such as higher nationals and degrees.
Curriculum Content – Year 13	
Autumn Term (September – December)	**Unit 4: Practical Scientific Procedures and Techniques (Internal) (90 GLH)** This unit introduces students to standard laboratory equipment and techniques, including titration, calorimetry, calorimetry, chromatography, calibration procedures and laboratory safety. Through the practical tasks in the unit, students will develop proficiency in the quantitative analytical techniques of titration and calorimetry, including learning to calculate the concentration of solutions. Students will use measurement of temperature to study cooling curves and be introduced to paper and thin-layer chromatography (TLC). Students also could calibrate equipment and will be encouraged to be aware of the safety aspects of given laboratory procedures and techniques. While students develop your practical competence, the discussion and analysis of group results will allow you to understand your progress in relation to that of others and to gain an understanding of the reliability, repeatability and reproducibility of various procedures and techniques. Students will have the opportunity to use problem-solving skills when you undertake calorimetry work. Apparatus and equipment of an appropriate standard for Level 3 practical work, to include: • Laboratory equipment for taking physiological measurements (including peak flow, lung volume, heart rate) • Respirometers to measure rate of respiration • Equipment for photosynthesis • Centrifuge, blender/food mixer, freezer, refrigerator • Laboratory equipment for volumetric analysis and calorimetry • Laboratory equipment for measuring resistivity (including Vernier calipers / micrometer / travelling microscope) and for measuring specific heat capacity.

Spring Term (January - May)	**Unit 6: Contemporary Issues in Science** This unit will explore contemporary science issues and their impact on the world we live in. It will develop the students' skills of analysis and interpretation across a broad range of scientific issues while exploring how they are reported in the media and in publications. Unit introduction Scientific issues are all around us and impact on the day to day lives of everyone. Some of the problems facing humans and the planet have been the result of some scientific and technological advances, but science is also key to finding solutions. These issues affect us in various ways, for good or harm, and in various dimensions. They may have social, economic, political, ethical and environmental implications and you will explore these in this unit. You will develop skills of analysing information and research to find out how various organisations exert effects on the issues. You will need to draw on your learning from across the Applied Science qualification. You will develop critical thinking skills and be able to analyse various articles that convey scientific information and be able to evaluate the effects of misinformation and disinformation spread via social media. You will understand the importance of validity and reliability when reporting scientific information and how it can influence the accuracy of information that's needed in contemporary science. You will also write articles on scientific issues that are suitable for a general audience and for a professional audience. **Learning aims: In this unit you will:** A Investigate contemporary scientific issues that impact the global population and environment. B Examine the effect different organisations have on contemporary science. C Understand how to evaluate and report scientific information.
Assessment	There are 3 External Exams and 2 Internal pieces of Coursework, marked by your teachers and then externally sampled by an Examiner to ensure consistency and accuracy across the Peason curriculum.
Homework / independent study	Homework will be set in lessons and will be essential in fully understanding the content of this course. This is a course that requires independent listening and learning skills.
Equipment required	Student textbooks and online access to resources. Calculators, rulers and essential writing equipment.
School-based enrichment opportunities	Revision classes and external investigation skills. Leadership opportunities are available to help with Science Clubs Stemnet and Brainiacs. Local Primary School outreach.
Resources available for home-based study	**Web sites:** • Revision notes on a range of biological topics: biology-innovation.co.uk • Resources for teachers and learners, from the Association of the British Pharmaceutical Industry (ABPI): abpischools.org.uk/page/index.cfm abpischools.org.uk/page/usefullinks.cfm • Kimball's Biology Pages, an online biology textbook: biology-pages.info • Visking tubing: nuffieldfoundation.org/practical-biology/evaluating-visking-tubing-model-gut • Heart dissection: biologycorner.com/anatomy/circulatory/heart/heart_dissection.html biologyjunction.com/heart_dissection.htm • Information on homeostasis and negative and positive feedback mechanisms: anatomyandphysiologyi.com/homeostasis-positivenegative-feedback-mechanisms • Testing for diabetes: diabetes.org.uk/Guide-to-diabetes/Monitoring/Testing nlm.nih.gov/medlineplus/ency/article/003482.htm • Organisation offering comprehensive blood screen tests: medichecks.com/find-a-test/test/Essential-Blood-Screen_01MC/?gclid=CJbmh8iqy8cCFUFmGwod cSoKCA