Science Curriculum Unit Overview Year 9

Students will be assessed during class using questioning, quick quizzes, group activities and low stakes testing. They will be provided with knowledge organisers that clearly sets out a checklist of concepts required for that topic. End of topic tests will give a clear indication of knowledge that still needs to be embedded and then targeted tasks will be issued to students as and when required. Homework will occasionally be based on previous topics and not current topics, so that additional judgements can be made on student's progress.

Science lends itself to interleaved learning (a process where students mix, or interleave, multiple subjects or topics while they study in order to improve their learning) and many concepts and topics are often naturally revisited in our Science learning journey. Prior knowledge is checked before moving on to ensure no student is left behind.

Science Genetics and Evolution Year 9 Unit 9A				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
Environmental Variation **Inherited Variation** **DNA** **Genes** **Extinction** **Natural Selection**	**Knowledge:** What are examples of environmental and genetic variation in species? Why are animals classified into groups? What is DNA and how are sex cells (gametes) different to normal cells? What is extinction? What are some examples of animal and plant adaptations? What is biodiversity? What is natural selection and who discovered it? **Understanding:** What causes variation in organisms? How are organisms classified into groups? What is the relationship between DNA, genes, chromosomes and nuclei? Why do sex cells (gametes) have a different number of chromosomes to other body cells? What are some causes for extinction? How do adaptations benefit organisms? How can biodiversity be conserved? How does natural selection lead to the evolution of a species? **Skills:** Developing numeracy skills when collecting and manipulating class data. Calculating probabilities. Developing literacy skills through taking concise notes, formulating a method and using annotated diagrams to explain methods and concepts.	Students will be able to explain: How variation in a species is caused in a species and what the different types are. The relationship between DNA, genes, chromosomes and nuclei and how DNA was discovered. How the variation in a species can lead to natural selection, which in turn, can lead to the evolution of a species over time. What can cause the extinction of a species. Why it is important to maintain biodiversity and methods of doing this. **Working Scientifically** Use appropriate techniques, apparatus, and materials during laboratory work- paying attention to health and safety. Undertake basic data analysis including simple statistical techniques (probability).	KS1 Plants: Structure, function and life cycle. Living things and their habitat: Classification and the effect of environmental change. KS2 Living things and their habitat: Reproduction in plants and animals and classification. Evolution and Inheritance: Evolution (adaptations) and animal reproduction. KS3 7A- Cells, Tissues, Organs and Systems: Cell Structure 7B- Sexual Reproduction in Animals 7D- Ecosystems: Variation, environments and adaptations 8B- Plants and their Reproduction: - Classification, types of reproduction and plant reproduction	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**

Science Plant Growth Year 9 Unit 9B				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
Reactions in plants **Plant Products** **Growing Crops** **Farming Problems** **Organic Farming**	**Knowledge** Photosynthesis and respiration. Movement of water and minerals. Adaptations. Plants require nutrition for growth and synthesis. Humans try to control some aspects of the environment to avoid population decrease. Cross-breeding can produce individuals that are more useful to humans. Ecosystems. Human activity can damage ecosystems. Nitrogen and Carbon Cycles. **Understanding** Recall the processes of photosynthesis and respiration, explain the role of limiting factors. Describe how respiration can be detected using [limewater, hydrogen carbonate indicator, temperature. Explain common adaptations in roots, leaves and stems. Describe some functions of lipids, carbohydrates, proteins]in plants. Explain why certain minerals are important for plants. Explain how humans can maximise food production using a variety of breeding and pest-management strategies. Explain the effects of common pollutants on ecosystems. Explain how toxins can accumulate in food webs. Explain how changes in a population or community in an ecosystem affect other populations. **Literacy & Communication skills** Develop clear sentences and paragraphs by use of appropriate emphasis, in order to present ideas and opinions. Develop logical sequences of points in writing. **Maths skills** Bar chart and line graph drawing and interpretation, identifying random samples (and their use in avoiding bias)	Recall and apply photosynthesis and respiration in context. Identify and describe the role of adaptations of a variety of plant tissues and structures that ensure a plant can get what it needs. Discuss molecules synthesised in plants, and their uses. Describe how farmers may need to manipulate an ecosystem or breeding patterns to maximise yield. Competent completion of practical work.	From previous work, most students will be able to: Describe how organisms and organism parts are adapted to their functions (7D) Interpret food webs (7D, 8D) Recall the processes of photosynthesis and aerobic respiration (8C, 8D) Describe the concept of a limiting factor (8D) Recall the main food groups and their uses (carbohydrates, fats, proteins) (8A) Describe the importance of pollinators (8B) Use the carbon cycle model (8D).	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**

Science Making Materials Year 9 Unit 9E				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
About Ceramics **Polymers** **Composite Materials** **Problems with Materials** **Recycling Materials**	**Knowledge:** Properties of ceramics, polymers and composite materials Structure of ceramics and polymers. Monomers and polymerisation. Natural and synthetic polymers Thermal decomposition, Exothermic and endothermic reactions Incomplete combustion Toxic substances and their effects Biodegradability Recycling Landfill sites **Understanding:** Explain how the properties of ceramics and composites make them useful. Explain how the properties of a substance depend on its bonding and structure Identify the monomer structures in a given polymer chain. Classify changes as [exothermic, endothermic] from temperature changes. Identify thermal decomposition reactions. Explain how [sulphur dioxide, nitrogen oxides] help to cause acid rain. Explain how [atmospheric gases help, carbon dioxide helps] to cause the greenhouse effect. Explain what a landfill site is and some of the problems they cause. Explain the advantages of recycling metals **Skills:** Recognise the use of biased language in texts. Calculating mean values and percentages Drawing and interpreting bar charts, scatter graphs and line graphs.	Students will be able to explain: • properties of ceramics, polymers and composites. • the production of carbon dioxide by human activity and the impact it has on climate. • Earth has a source of limited resources and the efficacy of recycling. • combustion, thermal decomposition, exothermic and endothermic reactions Working Scientifically: • Knowing that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review.	From KS3 topics most students will: Use the particle model to explain observations about matter (7G) Explain what a landfill site is and some of the problems they cause (7G) Describe the difference between elements and compounds (7H) Describe examples of combustion and decomposition reactions (7H) Explain the advantages of recycling materials (7H) Describe how biomagnification of toxins can occur (7D & 8D) Describe the difference between atoms, molecules and lattice structures (8F) Model chemical reactions using word and symbol equations (8G) Describe the sources and effects of the greenhouse gas carbon dioxide (8E) Explain how sulphur dioxide and nitrogen oxides help to cause acid rain (8E)	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**

Science Reactivity Year 9 Unit 9F				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
Types of Explosion **Reactivity** **Energy & Reactions** **Displacement** **Extracting Metals**	**Knowledge:** To know the reactivity series of metals. To know how metals are found in nature. To know how to measure the energy released from a reaction. **Understanding:** To be able to justify why some metals are harder to obtain than others. To be able to calculate changes in mass during chemical reactions. To be able to predict when a reaction is likely to happen and state what the products of the reaction would be. **Skills:** Would be able to make the case for and against banning explosives. Would be able to write a scientific method for carrying out an experiment. **Working Scientifically:** solve problems involving percentage change, percentage increase, decrease. **Literacy and communication skills:** Analyse how to make a persuasive case for a position. **Maths skills:** Use ratios to balance equations.	Know the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure Know changes of state in terms of the particle model. Know a simple (Dalton) atomic model Be able to use chemical symbols and formulae for elements and compounds Know what conservation of mass is Know that chemical reactions are the rearrangement of atoms Be able to represent chemical reactions using formulae and using equations for, combustion, thermal decomposition, oxidation and displacement reactions.	From previous units, most students will be able to: Recall the meaning of thermal decomposition (7H) Recall the difference between physical changes and chemical reactions (7H and 8F) Describe the particle model (7G and 8I) Explain the cause of gas pressure (7G and 8I) Recall the fire triangle (8E) Describe what happens in a combustion reaction (8E) Use information on the reactions of metals to place them in an order of reactivity (8G) Recall how some elements are found in their native state and how metals are extracted from ores (8H).	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**

Science Forces and Motion Year 9 Unit 9I				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
Forces and Movement **Energy for Movement** **Speed** **Turning Forces** **More Machines**	**Knowledge:** Effects of balanced and unbalanced forces; storing and transferring energy; relating speed, distance and time; distance-time graphs; levers and their uses; moments; ramps and pulleys; relation between force, distance travelled and work done. **Understanding:** How do forces affect objects and the way they move? Which energy resources can be used to move things? How is writing suited to its purpose and audience? How do we calculate speed? How do we draw and interpret distance-time graphs? How can you increase the size of a force? What other simple machines make it easier to move things? **Skills: Mathematical skills:** Draw and interpret distance-time graphs; calculate average speed from a distance-time graph; substitute into formulae; change subject of a simple formula; calculate gradient of a line graph. **Literacy and communication skills:** Identify features of writing produced for different purposes and audiences; write material in different styles depending on purpose, audience and format.	Describe speed and the quantitative relationship between average speed, distance and time (speed = distance/time). Know how to represent a journey on a distance–time graph. Explain relative motion: trains and cars passing one another. Describe how simple machines give bigger force at the expense of smaller movement (and vice versa): product of force and displacement unchanged. Calculate work done and describe energy changes on deformation. Describe non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity. Describe forces as pushes or pulls, arising from the interaction between two objects. Use force arrows in diagrams. Calculate forces in one dimension, balanced and unbalanced forces. Describe forces associated with: deforming objects; stretching and squashing – springs; rubbing and friction between surfaces; pushing things out of the way; resistance to motion of air and water. Know that forces are measured in newtons, measurements of stretch or compression as force is changed. Explain other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. Describe energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change. Compare the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical composition. Use physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.	From previous year 7 work, most students will be able to: Identify forces on stationary and moving objects and describe the effects of balanced and unbalanced forces on objects. Recall ways in which energy can be stored and transferred, and identify energy stores and transfers in different situations	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**

Science Force Fields and Electromagnets Year 9 Unit 9J				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**What does mastery look like?**	**How does this build on prior learning?**	**What additional resources are available?**
Force Fields **Static Electricity** **Current Electricity** **Resistance** **Electromagnets**	**Knowledge:** Magnetic fields; gravitational fields; static electricity; positive and negative charges; attraction and repulsion; electric fields; current; series and parallel circuits; resistance; electromagnets; motor effect; motors; space flight. **Understanding:** Magnetic fields exert a force, magnetic poles; magnetic field lines; shapes of magnetic fields; masses have a gravitational field; g is 10N/kg; energy can be stored in fields; interaction of charges; inducing a charge; shape of eclectic fields; current is a flow of charge; how current and voltage behave is series and parallel circuits; units of resistance; factors affecting resistance; magnetic field around a wire and solenoid; factors affecting field strength; force on a wire in a magnetic field; how this produces the motor effect; risks of space flight. **Skills** **Scientific writing:** Plotting magnetic fields; use of equations to calculate resistance; measuring current and voltage; constructing circuits; rounding and use of significant figures	Construction of circuits independently and without mistakes. Highly effective fault finding in circuits without help. Consistently accurate measurements and data collection. Consistently accurate presentation of data. Accurate calculations and manipulation of equations. Cohesive and logical scientific writing. Safe working at all times.	This unit builds on the ideas previously introduced in: Basic electricity and magnetism form KS2. Static electricity; series and parallel circuit; current and voltage from year 7 (7J). Magnetic Earth; gravity in space from year 8 (8K)	**Exploring Science Year 9 Textbook** **BBC Bitesize KS3** **KS3 Revision Guide** **KS3 Knowledge Organisers and Retrieval booklets** **You Tube Videos** **Seneca**
Students will then move on to the GCSE topics in January. Please see the Curriculum Pathway for the next topics.				