The Radclyffe School
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Long Term Plans – Science

KS3

Vision: To deliver a curriculum that fosters curiosity, and make scientifically literate members of society who have the tools to make informed decisions about the world around them. The KS3 plan is designed to increase the depth and scientific rigour of the studies the students will have experienced at primary school. We will take advantage of both our specialist resources and knowledge to push students beyond their current levels of understanding and provide a grounding for further study. It is our goal that all students should be prepared to study science at KS4 and beyond based on the foundations they have mastered during years 7-9.

Year 7	Particle model Substances and Mixtures	Cells Organ Systems	Forces Speed	Atoms and Elements Introduction to chemical reactions	Reproduction in humans and plants	Organisms in their Habitat	• Describe how the particle model can be used to explain the differences between solids, liquids and gases. • Explain that all materials are made up of either a single substance or a mixture of substances and describe how these can be separated. • Explain that cells are the basic units of life and are organised into tissue, organs and organ systems. • Explore cell structures and difference between plant and animal cells. • Explain that forces arise when two objects interact. • Describe the movement of objects. • Describe the differences between atoms, elements and compounds. • Explain the difference between chemical and physical changes. • Explore some simple chemical reactions. • Describe the male and female reproductive parts of humans and plants. • Describe how plants and animals interact with their environment and with each other.
Year 8	Sound Light	Understanding chemical reactions Digestion	Circuits Acids and Alkali	Heating and Cooling Structure of Earth	More on forces	Biochemistry	• Describe how light travels and how we see objects. • Explain how sound travels through a media. • Describe chemical reactions in terms of conservation of mass. • Represent chemical reactions using formulae and using equations. • Learn about acids and alkalis as classes of chemicals with distinct properties and uses. • Circuit components and symbols • Drawing simple series circuits • Build a series circuit to measure potential difference. • Content of a healthy human diet, including detailed information of each nutrients use.

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							• Learn about the structure and function of organs of the digestive system. • Learn about mechanism of heat transfer: conduction, convection and radiation. • Describe the structure of the Earth and the rocks found. • Describe the rock cycle and the formation of sedimentary, metamorphic and igneous rocks. • Describe the water cycle and carbon cycle. • The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure. • Describe the chemical reactions that make and break down substances in living cells: photosynthesis and cellular respiration. • Describe forces associated with deforming objects; stretching and squashing.
Year 9	Periodic Table and Reactivity Magnets and Electromagnets	Inheritance and Evolution	Earth's Atmosphere and Resources	Energy Resources Health and Diseases	Health and Diseases Solar System	Enquiry Process	• Metal and non-metals have different physical properties. • Use of the reactive series of metals to identify which metals are more reactive. • Use data to describe a trend in physical properties. • Use observations of a pattern in chemical reactions to predict the behaviour of an element in a group. • Describe heredity as the process by which genetic information is transmitted from one generation to the next. • Learn about the simple model of chromosomes, genes and DNA. • Learn about the greenhouse effect, global warming, and climate change. • Look at human activity is causing global warming or climate change. • Describe how human activities affect the carbon cycle. • Explain that fossil fuels are non-renewable energy resources. • Explain that renewable energy resources can be a used to generate electricity. • State different types of energy resources. • Calculation of fuel uses and costs. • Explore energy stores and transfers. • Explain that the physical nd mental health of an individual results from the interaction between

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							the organism's body, behaviour environment and other organism. • Explore the solar system. • Explain that a lunar eclipse occurs when the moon goes into the shadow of the Earth. • To know the life cycle of a star. • Explain that the Earth is the only planet (in the Solar system) with an oxygen-rich atmosphere and liquid water on the surface that supports life. • Make predictions using scientific knowledge and understanding. • Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate • Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety • Make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements. • Undertake basic data analysis.

Combined Science

Vision: This course is designed to support all students through their science studies. This means it must perform a wide number of roles. The more able students must be challenged and stretched, allowing them to access all further education opportunities in science. The least able must be supported through the difficulties of the subject. All students must be given the opportunity to succeed whilst maintaining the joy and engagement that science can offer. All students should leave the Radclyffe school with a clear understanding of the scientific process and the fundamental scientific knowledge of how the world around them works.

	HT1	HT2	HT3	HT4	HT5	HT6	Threshold concepts
Year 10	Cell biology Organisation Infection and Response	Bioenergetics Atomic structure and the periodic table Bonding, structure and the properties of matter Quantitative chemistry	Chemical changes Energy changes	Energy Particle model Electricity - start	*PPEs – B1, C1* Electricity - finish	Atomic structure Homeostasis and response	• Describe the structures of various types of cells. • Explain how substances are transported into cells. • Describe the adaptations of animal tissues and organ systems and plant tissues organs and organ systems • Describe the process of photosynthesis and factors that affect it. • Describe the processes of aerobic and anaerobic respiration. • Describe atomic structure and how it can be linked to the periodic table • Describe chemical bonds, ionic, covalent and metallic, relating bonding and structure

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							to the properties of substances, structure and bonding of carbon • Perform calculations using conservation of mass and the quantitative interpretation of chemical equations, use of amount of substance in relation to masses of pure substances • Link reactivity of metals to their reactions with acids, electrolysis • Describe endothermic and exothermic reactions • Recognise energy changes and stores and how they are linked to conservation of energy. • Describe current, potential difference and resistance in series and parallel circuits, • Link changes of state and the particle model, internal energy and energy transfers • Describe how homeostasis is achieved in humans. • Describe the different types of reproduction and how that affects the nature of the offspring.
Year 11	Inheritance Variation and evolution Ecology	Rates of reactions Organic Chemistry Chemical analysis B1,C1,P1,B2 PPE'S	Chemistry of the atmosphere Using resources	Forces Waves	Magnetism and electromagnetism Revise		• Describe forces and their interactions, calculate work done and energy transfer. Use Newton's Laws of Motion of explain observations. • Link variation and evolution • Explain that living organisms are interdependent and show adaptations to their environment

Curriculum Intent

Year 7	Year 8	Year 9	Year 10	Year 11

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By the end of Year 7 students are able to …	By the end of Year 8 students are able to …	By the end of Year 9 students are able to …	Progression in year 10 can be identified by the increase in substantive knowledge about models and processes encountered in KS3. The key concepts of cells, matter and energy are revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles and apply those principles independently. Progress in the students' disciplinary knowledge increases as they are able to perform more complex experiments and procedures. The ability to manipulate and present data and perform calculations in integral to progress in science and students will be afforded multiple opportunities to revisit each skill.	Progression in year 11 can be identified by the increase in substantive knowledge about further models and processes, some building from KS3 and some which are new ideas. The key concepts of interdependence and forces are revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles (particularly energy) and apply those principles independently. Students should also be able to access scenarios which draw on more than one threshold concept. Progress in the students' disciplinary knowledge allows them to answer more multi-stage or multi-concept problems and they should be able to use each of the maths skills referenced in the AQA 8464 spec (pg. 171-172).
Begin to explain simple concepts in the world around them, normally within familiar situations and experiences. The particle model of solids, liquids and gasses will be explored, with students being able to form simple explanations of how this leads to different properties. Simple chemical reactions will be described, and students should be able to describe observations and introduce language such as products and reactants. Simple physics concepts such as forces and movement will be described and investigated, leading to students forming conclusions about the world around them. Students will be introduced to cells as the building blocks of life and that an organism may be made up of a single cell or many cells working together as tissues, organs and organ systems. They will explore the reproductive system in detail. Cells are made of molecules organised into membranes and other structures. Most cells are too small to be seen with the naked eye but can be seen using a light microscope. Students will learn that all organisms, including humans, depend on, interact with and affect the environments in which they live and other organisms that live there.	Extend their understanding of how the world around them works. Students begin to move into more detail, explaining more abstract concepts and ideas that are less familiar. Processes such as photosynthesis and respiration will be introduced and students should be able to describe them. Students will be introduced to sound and light waves, and be able to describe and compare both to a simple level. Chemical reactions will continue to be investigated, and students should be able to recall a range of reactions involving metals, along with an understanding of relative reactivity. Students will learn that acids and alkalis are solutions commonly used in chemical reactions, including the making of salts. Indicators can be used to identify a solution as an acid or alkali. Simple electrical circuits and measurements will be made and described. Students will learn about the rock cycle and the formation of sedimentary, metamorphic and igneous rocks. Students will learn that substances can move between Earth's atmosphere, hydrosphere, geosphere and biosphere as part of large-scale systems.	Students begin to build on the simpler ideas in years 7 and 8, bringing them together into bigger more comprehensive ideas. For example, understanding how the Earth and space systems interact, how they affect us, and how we affect them is vital for our survival. Students will explore the ideas behind how the periodic table is arranged i.e. when the elements are listed in order of their atomic number, elements with similar chemical properties recur at periodic intervals. Students will learn that each generation of organisms inherits characteristics from the one before, which arise from genetic information stored in the genome and are affected by the environment. The genome is stored in cells, and is made of a chemical substance called DNA. Human activities can have negative impacts on ecosystems that reduce biodiversity, including activities such as habitat destruction, pollution, overhunting and overfishing. Organisms must stay in good health to survive and thrive; the health of an individual organism results from interactions between the organism's body, behaviour, environment and other organisms.		

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Biology

Vision: This is a KS4 curriculum designed to stretch and challenge those students most committed to the study of science, particularly those with clear goals of further study in a scientific field. Whilst not directly covering A level concepts, students will get a detailed and clear understanding of the GCSE level foundations of their studies to bridge the gap into their more advanced work.

Year 10	Cell biology Organisation - start	Organisation - finish Infection and Response (start)	Infection and Response (finish) Bioenergetics	Homeostasis and Response	Homeostasis and response *PPEs – B1*	Homeostasis and response Start inheritance	• Describe the structures of various types of cell. • Explain how substances are transported into cells. • Describe the adaptations of animal tissues and organ systems and plant tissues organs and organ systems • Describe the process of photosynthesis and factors that affect it. • Describe the processes of aerobic and anaerobic respiration. • Describe how homeostasis is achieved in humans.
Year 11	Variation and Evolution	Ecology *PPEs – B1*	Ecology *PPEs – B2*	Ecology	Revise		• Describe the different types of reproduction and how that affects the nature of the offspring. • Explain that living organisms are interdependent and show adaptations to their environment

Curriculum Intent

Year 7	Year 8	Year 9	Year 10	Year 11
			Progression in year 10 can be identified by the increase in substantive knowledge about models and processes encountered in KS3. The key concepts of cells, matter and energy are revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles and apply those principles independently. Progress in the students' disciplinary knowledge increases as they are able to perform more complex experiments and procedures. The ability to manipulate and present data and perform calculations in integral to progress in science and students	Progression in year 11 can be identified by the increase in substantive knowledge about further models and processes, some building from KS3 and some which are new ideas. The key concept of interdependence is revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles (particularly energy) and apply those principles independently. Students should also be able to access scenarios which draw on more than one threshold concept. Progress in the students' disciplinary knowledge allows them to answer more multi-stage or multi-concept problems and they should be able to use each of the maths skills

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			will be afforded multiple opportunities to revisit each skill.	referenced in the AQA 8464 spec (pg. 171-172).

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Chemistry

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Year 10	Atomic structure and the periodic table Bonding, structure and the properties of matter	Quantitative chemistry	Chemical changes	Chemical changes	Energy changes *No PPE*	Rate and extent of chemical change	• Describe atomic structure and how it can be linked to the periodic table • Describe chemical bonds, ionic, covalent and metallic, relating bonding and structure to the properties of substances, structure and bonding of carbon • Perform calculations using conservation of mass and the quantitative interpretation of chemical equations, use of amount of substance in relation to masses of pure substances • Link reactivity of metals to their reactions with acids, electrolysis • Describe endothermic and exothermic reactions • Link the particle model to rate of reaction
Year 11	Organic chemistry	Chemical analysis *PPEs -C1*	Chemistry of the atmosphere *PPEs -C2*	Using resources	Revise		

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Physics

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Year 10	Energy Particle model	Atomic structure	Electricity	Electricity	Forces Revise PPEs – P1	Forces	• Recognise energy changes and stores and how they are linked to conservation of energy. • Describe current, potential difference and resistance in series and parallel circuits, • Link changes of state and the particle model, internal energy and energy transfers • Describe forces and their interactions, calculate work done and energy transfer. Use Newton's Laws of Motion of explain observations.
Year 11	Forces Waves	Waves finish *PPEs – P1*	Waves Revise *PPEs – P2*	Magnetism and space physics	Revise		

Curriculum Intent

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			Progression in year 10 can be identified by the increase in substantive knowledge about models and processes encountered in KS3. The key concepts of matter and energy are revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles and apply those principles independently. Progress in the students' disciplinary knowledge increases as they are able to perform more complex experiments and procedures. The ability to manipulate and present data and perform calculations in integral to progress in science and students	Progression in year 11 can be identified by the increase in substantive knowledge about further models and processes, some building from KS3 and some which are new ideas. The key concept of forces is revisited. As students gain a wider schema they are able to recognise more scenarios as being instances of those principles (particularly energy) and apply those principles independently. Students should also be able to access scenarios which draw on more than one threshold concept. Progress in the students' disciplinary knowledge allows them to answer more multi-stage or multi-concept problems and they should be able to use each of the maths skills

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