Programme of study for Year 10 Science

Autumn (1st half term)	Autumn (2nd half term)	Spring (1st half term)	Spring (2nd half term)	Summer (1st half term)	Summer (2nd half term)
Topics: • B5 Health and Disease • P8 Forces in balance • C1 Atomic Structure • C3 Structure and Bonding	Topics: • B8 Photosynthesis • B9 Respiration • P9 Motion • C5 and C6 Chemical changes/Electrolysis (with conservation of mass recap)	Topics: • B7 Non-communicable diseases • P10 Force and motion • C9 Crude Oil and Fuels • B10 The Nervous System	Topics: • P7 Radioactivity • B11 Hormonal Coordination • C7 Energy Changes • B15 Adaptations, interdependence, and competition	Topics: • B16 Organising an ecosystem • C8 Rates of and equilibrium	Topics: • B17 Biodiversity and ecosystems • P11 Waves • Time dependent – P12 Electromagnetic spectrum
Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgments and draw conclusions; develop and improve experimental procedures					
Key learning outcomes (Students should know): Health and disease: - Understand the definition and impact of health and disease on individuals and society. - Learn about the causes, transmission, and	Key learning outcomes (Students should know): Photosynthesis: - Understand the process of photosynthesis, including the reactants and products involved - Explain the role of chlorophyll in capturing light energy - Describe the factors that affect the rate of photosynthesis	Key learning outcomes (Students should know): Non-communicable diseases: - Understand the causes and risk factors of non-communicable diseases - Describe the impact of non-communicable diseases on individuals and societies - Explain the methods of prevention and treatment for non-communicable diseases	Key learning outcomes (Students should know): Radioactivity: - Understand the concept of radioactivity and the different types of radiation - Describe the uses and applications of radioisotopes - Explain the risks and safety precautions associated with radioactivity	Key learning outcomes (Students should know): Organising an ecosystem: - Understand how ecosystems are structured and the different components within ecosystems - Describe the processes of energy transfer and nutrient cycling in ecosystems - Explain the concept of	Key learning outcomes (Students should know): Biodiversity and ecosystems: - Understand the importance of biodiversity for ecosystem stability and resilience - Describe the factors that threaten biodiversity - Explain the methods used to conserve and

prevention of infectious diseases. - Explore the principles and benefits of vaccination. - Understand the importance of a balanced diet and the consequences of malnutrition. - Learn about the effects of lifestyle choices, such as smoking and substance abuse, on health. - Explore the importance of exercise and the impact of physical activity on health and well-being. - Understand the principles of first aid and the role of healthcare professionals in promoting and maintaining good health. Forces in balance: - Learn about different types of forces such as	Respiration: - Understand the process of respiration and the reactants and products involved - Explain the difference between aerobic and anaerobic respiration - Describe the importance of respiration in releasing energy Motion: - Understand the concept of motion and how it can be measured - Describe the factors affecting motion, such as force, mass, and acceleration - Explain the relationship between distance, time, and speed Chemical Changes: - Explain the difference between physical and chemical changes - Describe the factors influencing the rate of chemical reactions - Understand the concept of	Force and motion: - Understand the relationship between force, mass, and acceleration - Describe the different types of forces, such as gravitational, frictional, and magnetic - Explain how forces can change the motion of objects Crude oil and fuels: - Understand the structure and properties of organic compounds - Describe the process of fractional distillation to produce smaller mixtures of alkanes, and how this can be used to create other important products - Explain the importance of organic compounds in everyday life The Nervous System: - Understand the structure and functions of the nervous system, including neurons and synapses - Describe the pathway of nerve impulses - Explain the role of the nervous system in	Hormonal Coordination: - Understand the role of hormones in maintaining homeostasis - Describe the endocrine glands and their functions - Explain the feedback mechanisms involved in hormonal regulation Energy Changes: - Understand the different forms of energy and how they can be converted from one form to another - Explain the concept of energy efficiency - Describe the factors influencing energy transfer in systems Adaptations, interdependence, and competition: - Understand the concept of adaptation and how organisms adapt to their environments - Describe the interdependence of organisms in ecosystems - Explain the concept of competition and its role in natural selection	succession and the changes that occur in ecosystems over time Rates and equilibrium: - Understand the factors affecting reaction rates - Describe how reaction rates can be altered - Explain the concept of dynamic equilibrium in chemical reactions	protect biodiversity Waves: - Understand the characteristics of waves, including amplitude, frequency, and wavelength - Describe the properties of different types of waves, such as sound and electromagnetic waves - Explain how waves can be reflected, refracted, and diffracted Electromagnetic spectrum: - Understand the different types of electromagnetic radiation and their uses - Describe the properties and effects of different parts of the electromagnetic spectrum - Explain the principles of wave-particle duality

gravitational, electromagnetic, and nuclear forces. - Understand the concept of forces in balance, including equilibrium conditions and resultant forces. - Explore the effects of forces on motion, such as acceleration, deceleration, and changes in direction. - Learn about the factors affecting the speed and direction of moving objects. - Investigate the relationship between forces, mass, and acceleration using Newton's laws. - Understand the principles of moments and their applications, including simple levers and balancing objects. - Explore the	conservation of mass in chemical reactions Electrolysis: - Understand the process of electrolysis and the role of ions - Describe the products of electrolysis - Explain the factors affecting the rate of electrolysis	coordinating responses and maintaining homeostasis			

principles of pressure and the ways it can be applied and measured. Atomic structure: - Understand the historical development of atomic theory and the contributions of different scientists. - Learn about the structure of atoms, including subatomic particles and the arrangement of electrons within energy levels and orbitals. - Understand the different models of atomic structure, including the Bohr model and the quantum mechanical model. - Learn about isotopes and their uses in medicine, industry, and research.					

- Explore the composition and properties of elements and compounds. - Understand the concept of nuclear radiation and its applications and risks. - Investigate the principles of radioactive decay and the concept of half-life. Structure and bonding: - Explore different types of chemical bonds, including ionic, covalent, and metallic bonds. - Understand the relationship between the structure and properties of substances. - Learn about the importance of chemical bonding in determining the physical and chemical properties of					

materials. - Investigate the concept of electrostatic forces and their role in bonding. - Understand the periodic table and the patterns and trends in chemical properties of elements. - Explore the principles of chemical reactions, including the law of conservation of mass and balancing equations. - Investigate the role of catalysts in chemical reactions and the factors affecting reaction rates.					

Assessments: 2 linear assessments, 4 other assessed pieces of work which may be carried out in class or as home learning

Building understanding: Rationale / breakdown for your sequence of lessons:

The rotational basis of teaching biology, chemistry, and physics allows for distributed practice, which has been shown to enhance long-term retention and understanding of scientific concepts. By alternating between the three sciences, students can revisit and review previously learned topics, reinforcing their knowledge and building connections between different areas of science.

The sequencing of topics is designed to create cohesion between the three sciences, but also build the understanding of each discrete science. For example,

the topic "Health and Disease" in biology can be linked to chemistry through the understanding of chemical reactions that occur within the body and the study of organic compounds involved in physiological processes. Similarly, the topic "Photosynthesis" in biology is closely related to the topic "Energy changes" in chemistry, as it involves the conversion of light energy into chemical energy. However, we begin with the topics of Health and Disease in Biology as students will have a deep understanding of cells and their processes from KS3, and this will allow them to make connections about how specialised cells are used to fight disease.

In biology, the initial topics of "Health and Disease" and "Photosynthesis" lay the foundation for understanding the fundamental processes that occur within living organisms. These topics provide students with an understanding of the interactions between molecules, cells, and organ systems, as well as the importance of energy transfer in biological systems.

The subsequent topics of "Respiration" and "Non-communicable diseases" delve deeper into the processes of energy production and the impact of genetic and environmental factors on health. These topics highlight the relevance of chemistry and physics in understanding biological phenomena, such as the chemical reactions involved in cellular respiration and the physical forces at play in the development of diseases.

Moving on to "Hormonal coordination" and "Adaptations, interdependence and competition," students explore the role of hormones in regulating bodily functions and the evolutionary mechanisms that shape the relationships between organisms. These topics provide opportunities to integrate concepts from chemistry and physics, such as the chemical signals involved in hormonal coordination and the physical forces involved in competition for resources.

The final topics in biology, "Organizing an ecosystem" and "Biodiversity and ecosystems," emphasize the interconnectedness of living organisms in their environment. These topics allow students to apply their knowledge of biology, chemistry, and physics to understand the complex interactions within ecosystems, the impact of human activities on biodiversity, and the need for sustainable practices.

In chemistry, the sequencing of topics starts with "Atomic structure" and "Bonding," which lay the foundation for understanding the structure and properties of matter. These topics provide the necessary knowledge for further exploration of chemical reactions, energy changes, and rates of reaction. This also builds on students' understanding of atoms, molecules and compounds, as well as the periodic table, from KS3.

The topic "Chemical changes" focuses on the reactions that occur when different substances interact, including the study of acids and bases. This topic enables students to understand the transformation of matter and the role of chemistry in everyday life.

Moving on to "Organic chemistry," students explore the properties and reactions of carbon-based compounds, which are fundamental to the study of biology and biochemistry. This topic allows students to connect chemistry with biological concepts, such as the structure and function of biomolecules.

The topic "Energy changes" delves into the thermodynamics of reactions, providing students with an understanding of energy transfer and conservation. This topic has direct links to topics in biology, such as photosynthesis and cellular respiration, as both processes involve energy transformations.

The final topic in chemistry, "Rates of and equilibria," explores the factors that influence the speed at which chemical reactions occur. This topic provides students with a deeper understanding of reaction rates and allows for connections with physics concepts, such as the role of catalysts and the collision theory.

In physics, the topic sequence begins with "Forces in balance," which introduces students to the concept of forces and their equilibrium. This topic lays the foundation for understanding the principles of motion and force that follow. This builds on their knowledge from KS3 on the big idea of forces.

The subsequent topic, "Motion," allows students to explore the kinematics of objects, including the study of velocity, acceleration, and forces acting on moving objects. This topic provides a solid understanding of the fundamental concepts of physics.

Moving on to "Force and motion," students delve into Newton's laws of motion and the relationships between forces, mass, and acceleration. This topic allows students to apply their understanding of forces and motion to real-world scenarios.

The topic "Radioactivity" introduces students to the concept of nuclear physics, including the properties and behaviour of radioactive materials. This topic connects with chemistry through the study of nuclear reactions and their applications, such as in medicine and energy production.

The final topic in physics, "Waves" and "The electromagnetic spectrum," explores the behaviour and properties of waves, including light and sound waves. This topic allows students to make connections between physics and other disciplines, such as optics in biology and the use of electromagnetic waves in communication technology.

If time allows, the inclusion of "The electromagnetic spectrum" provides students with a broader understanding of the various types of electromagnetic waves and their applications in different areas of science and technology.

Overall, this topic sequence and the rotational basis of teaching biology, chemistry, and physics are designed to provide a comprehensive and cohesive science education. By linking concepts across the three sciences and allowing for distributed practice, students can develop a deeper understanding of scientific principles, make connections between different areas of science, and apply their knowledge to real-world contexts.

Home – Learning:
Teachers will set home learning using lesson materials. Some of these will be assessed. This will be indicated.

Reading / literacy:
Students are encouraged to prior reading on topics. In lessons students are taught how to construct answers through use of writing frames and exemplar answers where extended writing is required and command words and keywords that are relevant to the topic are consistently assessed in lessons through questioning and written question practice.

Numeracy:

- Recognise and use expressions in decimal form: Recognise and use expressions in standard form; Use ratios, fractions and percentages; Make estimates of the results of simple calculations
- Handling data: Use an appropriate number of significant figures; Find arithmetic means; Construct and interpret frequency tables and diagrams, bar charts and histograms; Make order of magnitude calculations

- Algebra: Understand and use the symbols: =, <>, >, ∝ , ~ ;Change the subject of an equation; Substitute numerical values into algebraic equations using appropriate units for physical quantities
- Graphs: Translate information between graphical and numeric form; Understand that y = mx + c represents a linear relationship; Plot two variables from experimental or other data; Determine the slope and intercept of a linear graph; Draw and use the slope of a tangent to a curve as a measure of rate of change
- Geometry and trigonometry: Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects; Calculate areas of triangles and rectangles, surface areas and volumes of cubes

Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):

- Trips during science week
- Science week
- Science club
- STEM club