

## SUBJECT: Y9 Foundation Science

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
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### What are we studying? The Big Ideas in Science (Harlen, 2010; Green 2021)

1. The cell is the basic structural and functional unit of life from which organisms emerge
2. Genetic information is passed down from one generation to another
3. Organisms compete with or depend on other organisms for the same basic materials and energy that cycle through ecosystems
4. The diversity of organisms, living or extinct, is the result of evolution by natural selection
5. Changing the movement of an object requires a net force to be acting on it
6. The movement of charge forms electrical current and causes magnetic fields
7. Every particle in our universe attracts every other particle with a gravitational force
8. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event
9. All matter in the Universe is made of very tiny particles called atoms
10. When substances react, atoms are rearranged and new substances form, but mass is always conserved
11. Substances are held together by electrostatic forces of attraction
12. The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate

In Y9 students build on their prior knowledge from Y7 and Y8 to further develop schemas in some of the key areas of the KS3 curriculum that will be further developed at KS4 – this serves as a transition between the two.

<p><b>BIOLOGY 1</b> (Organisms, Genes and Ecosystems)</p> <ul style="list-style-type: none"> <li>• Cells and specialised cells</li> <li>• Plant tissues</li> <li>• Photosynthesis</li> <li>• Types of reproduction</li> <li>• Variation and DNA structure</li> <li>• Inheritance</li> </ul>	<p><b>CHEMISTRY 1</b> (Matter, Reactions and Earth)</p> <ul style="list-style-type: none"> <li>• States of matter</li> <li>• Separating mixtures</li> <li>• Atoms and elements</li> <li>• Atomic and electronic structure</li> <li>• Relative Atomic Mass - RAM</li> <li>• Metallic bonding</li> <li>• Hydrocarbons, combustion and testing gases</li> </ul>	<p><b>PHYSICS 1</b> (Energy, Electromagnetism, Waves and Forces)</p> <ul style="list-style-type: none"> <li>• Contact forces</li> <li>• Newtons first law</li> <li>• Resultant force</li> <li>• Speed</li> <li>• Weight and mass</li> <li>• Density</li> <li>• Magnetism</li> <li>• Electromagnetism</li> <li>• Electromagnetic spectrum</li> </ul>	<p><b>BIOLOGY 2</b> (Organisms, Genes and Ecosystems)</p> <ul style="list-style-type: none"> <li>• Digestion</li> <li>• Circulatory system</li> <li>• Gas exchange</li> <li>• Aerobic respiration</li> <li>• Anaerobic respiration</li> <li>• Bacterial infection</li> <li>• Immune response</li> <li>• Vaccinations</li> </ul>	<p><b>CHEMISTRY 2</b> (Matter, Reactions and Earth)</p> <ul style="list-style-type: none"> <li>• Metals and Oxygen</li> <li>• pH</li> <li>• Making and naming salts</li> <li>• Rates of reaction</li> <li>• Metal extraction</li> <li>• Electrolysis</li> <li>• Early atmosphere</li> <li>• Green house gases and the changing atmosphere</li> </ul>	<p><b>PHYSICS 2</b> (Energy, Electromagnetism, Waves and Forces)</p> <ul style="list-style-type: none"> <li>• Mains electricity</li> <li>• Current in series/parallel</li> <li>• Power/Potential difference and Current</li> <li>• Power/work done/time</li> <li>• Efficiency</li> <li>• Energy resources</li> <li>• Radioactivity</li> </ul>
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## Why are we studying this? Sequencing and Rationale

<p>All lessons will feature retrieval practice to ensure that students have the necessary core content knowledge from Y7/Y8 to proceed.</p> <p>In this module we draw on knowledge from Y7 and Y8 to bring together the four big ideas in biology.</p> <p>Students revisit cell structure and may add to this knowledge by looking at additional organelles that are present in cells and some students are able to classify them as eukaryotic. We then focus in on plant cells and tissues before reviewing and extending knowledge of photosynthesis to include factors that affect the rate of reaction. Cell work continues with a look at how basic organisms reproduce asexually, we compare this to sexual reproduction and students can link this to variation (already encountered in Y7/8 Genes). A more detailed look at the structure of DNA follows and then the mechanisms of monohybrid inheritance and sex determination.</p>	<p>In this module we draw on knowledge from Y7 and Y8 to bring together the four big ideas in chemistry.</p> <p>Students revisit states of matters, atoms, elements, mixtures, and compounds building on their ideas to form more complex schemas. Students will take another look at methods of separation but with the expectation they can explain how they work. Building on atomic structure and use of the information in the periodic table about atomic mass and number, students will now learn the electronic configuration of the first 20 elements and calculate relative formulae mass. Building on from the periodic table, which is <math>\frac{3}{4}</math> metals, students take a closer look at metals, alloys and non-metals and how their properties are related to their structure. An introduction to hydrocarbons allows students to focus in on combustion reactions and then how to test for gases such as carbon dioxide (a product of combustion)</p>	<p>In this module we draw on knowledge from Y7 and Y8 to bring together the four big ideas in physics.</p> <p>We begin with a look at forces and how to calculate resultant force before moving on to speed. Students then learn to distinguish between weight and mass before moving onto density and how to calculate it.</p> <p>Students then focus on the force of magnetism and how to construct electromagnets and make them stronger. This leads into a deeper look at the electromagnetic spectrum which was introduced in Y8 Energy.</p>	<p>In this module we draw on knowledge from Y7 and Y8 to continue to bring together the four big ideas in biology.</p> <p>In this module we revisit organisation and build on schemas about some organ systems in the human body. This includes the digestive system, the circulatory system and the respiratory system. A more in-depth account of aerobic and anaerobic respiration follows and students are encouraged to compare the two and make the distinction between gas exchange and respiration. Continuing work on the organisation of the human body we then move onto the immune system looking more closely at bacterial infections and the white blood cell response. Students will then consider how this response is exploited in the use of vaccination.</p>	<p>In this module we draw on knowledge from Y7 and Y8 to bring together the four big ideas in chemistry.</p> <p>Students will continue to use their knowledge of matter and reactions to study the reactions of metals with oxygen, revisit the pH scale but now learn to name salts based on the metal and specific acid used in the reaction.</p> <p>Students will now take another look at rates of reaction but extending their knowledge to all factors. Students will also build on their knowledge of the reactivity series and extraction of metals before extending knowledge to look at electrolysis.</p> <p>Students will then describe the evolution of the atmosphere and by looking at greenhouse gases. Students will be able to compare and contrast the early atmosphere with the current atmosphere.</p>	<p>In this module we draw on knowledge from Y7 and Y8 to bring together the four big ideas in physics.</p> <p>We begin this module by looking at mains electricity and the dangers of using it. Students build on knowledge of circuits from Y7 Electromagnetism by considering how current is different in series and parallel circuits. Students will then combine their mathematical knowledge with science by learning to calculate power and energy transfer. Students will be expected to rearrange the equations to calculate all quantities involved. Once students can calculate energy transfer, they can look more closely at energy transfer pathways and revisit Sankey diagrams (Y7 Energy) and the law of energy conservation and will now incorporate ideas about efficiency. Finally, students will take a closer look at the advantages and disadvantages of renewable and non-renewable energy resources.</p>
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### How will this be assessed?

There will be frequent use of retrieval practice as well as peer, self and teacher assessment in lessons. Students will sit a checkpoint in each module which will be conducted as a 'walking talking test'. This is where we go through the questions with students and teach them key examination techniques to help them reach their potential and manage their time during assessments. This will also help improve key literacy skills. Teachers will not provide any answers or direction based on the content and so the assessments will be valid. There will be three main assessment points in the year to inform data collection in school and these assessments will be sat independently and in exam conditions.

There are also two checkpoint homework tasks for every module that staff can use to plan and inform teaching and early intervention.

<b>RWCM</b>	Disciplinary literacy: Keywords specific to the module content will be introduced in every lesson using a faculty slide to ensure that this stands out across all modules. Maths skills and the use of equations are featured in several modules along with other key skills such as presenting information, drawing conclusions and evaluating evidence. Opportunities for extended writing will be given in lessons in the form of 4–6 mark exam questions which may be supported with the use of structure strips.
<b>Extra-curricular experiences</b>	STEM club with STEM ambassadors (Weekly), RAF/BAE STEM roadshow (usually January). Y9 Oracy Competition.
<b>Careers Links</b>	Links to science careers will be explicitly taught through a series of biology/chemistry and physics career slides which are embedded into each lesson.
<b>Independent Learning</b>	Opportunities for extended learning are provided via MS teams where students have access to all module material. Students will be set independent learning through the digital platform century tech. Courses have been set up which follow our curriculum sequence.
<b>Essential Equipment</b>	Pen, pencil, ruler, rubber, pencil sharpener, green pen, pink, green and yellow highlighters, a Scientific calculator is also recommended.