

SUBJECT: Y7 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

<p>INDUCTION</p> <p>MATTER (BI9)</p> <ul style="list-style-type: none"> • Structure of the atom • States of matter • Separating mixtures <p>ENERGY (BI8)</p> <ul style="list-style-type: none"> • Energy stores and pathways • Energy transfers • Energy resources 	<p>REACTIONS (BI10)</p> <ul style="list-style-type: none"> • Recognising a chemical reaction • Word/symbol equations • Types of reaction <p>ORGANISMS (BI1)</p> <ul style="list-style-type: none"> • Cell structure and specialisation • Organisation • Cell transport 	<p>EARTH (BI12,BI7)</p> <ul style="list-style-type: none"> • Earth structure • Rock cycle • Earth in the solar system <p>ECOSYSTEMS (BI3)</p> <ul style="list-style-type: none"> • Interdependence • Bioaccumulation 	<p>ELECTROMAGNETISM (BI6)</p> <ul style="list-style-type: none"> • Magnetism • Electromagnetism • Electrical circuits <p>GENES (BI2,4)</p> <ul style="list-style-type: none"> • Animal reproduction • Plant reproduction • Variation 	<p>WAVES (BI8)</p> <ul style="list-style-type: none"> • Properties of waves • Properties of light <p>FORCES (BI5,7)</p> <ul style="list-style-type: none"> • Types of force • Measuring force • Speed 	<p>SCIENCE FAIR</p> <p>An independently chosen area of science that students show curiosity about and would like to deepen their understanding.</p>
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Why are we studying this? Sequencing and Rationale

<p>Induction An introduction to disciplinary knowledge. What is Science? How can we be safe in science labs? What new equipment will we use?</p> <p>(BI9) All materials in the Universe, both living and non-living (matter) are made up of atoms. The collective, structural arrangement and behaviour of the atoms explains the properties of different substances. All materials are made up of either a single substance (which can be solid, liquid or gas) or a mixture of substances which can be easily separated. This is a concept which is built up as students' progress through Y7 Matter.</p> <p>(BI8) Many processes or events involve changes and require energy to make them happen. Energy cannot be created or destroyed but instead is transferred from one energy store to another by an energy transfer pathway. Students build on this idea to develop an understanding of energy conservation and how to represent this with Sankey diagrams. Students also need to develop ideas about energy resources which we use to generate electricity. Calculating cost of the electrical energy we use is important for understanding the current energy crisis.</p>	<p>(BI10) During a chemical reaction a new substance or substances are formed. During a chemical reaction, atoms are rearranged. This is the reason that the products of a reaction have different properties to the reactants. Using a range of simple chemical reactions students will learn to represent them in word and symbol equations. Students will then begin to look at factors affecting reactions and energy changes during reactions. These new concepts require prior knowledge from Matter and Energy.</p> <p>(BI1) The cell is the basic unit of life but is also made of atoms (linking to BI9). Students start with cell structure and a basic idea of diffusion is introduced. Students will observe cells under a microscope and then look at how different cells are adapted to function. From this, students will look at tissues as aggregations of cells, followed by organs and systems. The skeletal, muscle and digestive systems are introduced here as examples. While studying a basic overview of the digestive system, students can link this to diet and nutrition.</p>	<p>(BI12) Students first look at the structure of the Earth and its atmosphere. A deeper look at the Earth's crust and its rock cycle follows and then finally a look at how Earth takes its place in the solar system.</p> <p>(BI3, BI8) Organisms compete with or depend on other organisms for the same basic materials and energy that cycle through ecosystems. We start with a look at habitats and how organisms are adapted to a specific niche and then move on to the interdependence of organisms in food chains and webs. Following on from this we look at the accumulation of toxic materials in food webs. We look at how different organisms release energy through aerobic, anaerobic respiration and fermentation. Students should have a good grasp of energy at this point after their introduction to BI8.</p>	<p>(BI6) The movement of charge causes electric current and produces magnetic fields. Students get to build on knowledge about magnetism from KS2 and we introduce them to magnetic fields. Students then build on simple knowledge of circuits from KS2 before looking at electromagnetics and what can make them stronger. This links onto a lesson about current (moving charges) and then electrostatic charge. Students can build on concepts they have looked at in BI8.</p> <p>BI2) Students look at reproductive systems which they can link to the sperm/egg cells they have encountered in BI1. From this we look at how a fertilised egg becomes a human and how puberty prepares the body for this event. Students can then compare this to reproduction in plants. Once we have looked at how life begins, we can appreciate variation in organisms and start to consider how this might happen.</p>	<p>(BI8) Energy can be transferred from one form to another. This has been introduced at the start of Y7. We now move onto looking at waves and how they carry energy. Focussing first on transverse waves we then begin to explore the properties of light which include reflection, refraction, dispersion, and white light. Finally students look at colour and filters. This concept is deliberately left until the end of year 7 when we feel that students will have enough prerequisite knowledge and experience to take on board these abstract ideas.</p> <p>(BI5) Changing the movement of an object requires a net force to be acting on it. We build on knowledge from KS2 to look at what forces do before describing forces and considering how they can be balanced or unbalanced. Next we take a closer look at friction. Students then link BI8 – that when a force makes a change, it transfers energy between different energy stores via a mechanical transfer pathway. Friction transfers energy mechanically into a thermal store. Reducing friction increases speed, students finally look at calculating and describing speed.</p>	<p>The Science fair enables our students to research in depth an area of science that intrigues them. They will utilise skills from studying topics throughout the year to produce a display and artefact that they will confidently articulate to an audience.</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 series of multichoice questions (MCQs) at the end of a unit. These have been carefully thought out to quickly check core content knowledge recall and some questions have a diagnostic element to test common misconceptions and levels of further understanding. Knowledge gaps will be addressed in intervention lessons. There will be three larger assessments undertaken in line with the academy assessment policy containing a range of questions of knowledge and application from the topics studied up to that point.

RWCM	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.
Extra-curricular experiences	STEM club (Weekly), Y7 Science fair – links with Design faculty, RAF/BAE STEM roadshow (usually January), Y7 girls engineering visit to Yorkshire water (half term 5).
Careers Links	Links to science careers will be explicitly taught through a series of biology/chemistry and physics career slides which are embedded into each lesson.
Independent Learning	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.
Essential Equipment	Pen, pencil, ruler, rubber, pencil sharpener, green pen, pink, green and yellow highlighters, a Scientific calculator is also recommended.