

# SUBJECT: Y8 Science

Autumn 1

Autumn 2

Spring 1

Spring 2

Summer 1

Summer 2

## 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

### INDUCTION

#### MATTER (BI9)

- Structure of the atom
- States of matter
- Separating mixtures

#### ENERGY (BI8)

- Energy stores and pathways
- Energy transfers
- Energy resources

### REACTIONS (BI10)

- Recognising a chemical reaction
- Word/symbol equations
- Types of reaction

### ORGANISMS (BI1)

- Cell structure and specialisation
- Organisation
- Cell transport

### EARTH (BI12,BI7)

- Earth structure
- Rock cycle
- Earth in the solar system

### ECOSYSTEMS (BI3)

- Interdependence
- Bioaccumulation

### ELECTROMAGNETISM (BI6)

- Magnetism
- Electromagnetism
- Electrical circuits

### GENES (BI2,4)

- Animal reproduction
- Plant reproduction
- Variation

### WAVES (BI8)

- Properties of waves
- Properties of light

### FORCES (BI5,7)

- Types of force
- Measuring force
- Speed

### SCIENCE FAIR

An independently chosen area of science that students show curiosity about and would like to deepen their understanding.

## Why are we studying this? Sequencing and Rationale

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| <p>Induction<br/>A refresh of health and safety in science in preparation for the teaching of disciplinary knowledge</p> <p>All modules now have an introduction lesson which involves checking prior knowledge from Y7 and plugging any gaps, tackling misconceptions to ensure that schema from Y7 can be built upon.</p> <p>(BI9) Following on from atoms and mixtures in Y7, students can now add elements and compounds to their repertoire before moving onto the periodic table which is a list of the 118 elements on the Earth. From this they can establish the key groups and divide the table into metals and non-metals before looking at properties and the reactivity of metals. During this module teacher will continue to embed core content knowledge such as summarising reactions in word/symbol equations as well as retrieving appropriate chemical reactions from Y7 so that links can be made.</p> <p>(BI8) After retrieving knowledge of energy stores and energy transfer pathways, students can now focus on heat energy stores and the difference between this and temperature. Students will then look at methods of heat energy transfer linking these to movement of atoms from Y7/8 Matter and Y7 Energy as they identify that conduction/convection are heating pathways and radiation is an energy transfer pathway. Students can apply this to energy transfer in the home and finally we look at the EMS in more detail (this was briefly introduced in Y7 Waves).</p> | <p>(BI10) Students should have a good knowledge of chemical reactions and how to represent them in both word/symbol equations which will help them to grasp the conservation of mass in chemical reactions. This can be further imbedded by looking at a range of different types of reactions and utilising their prior knowledge – there is plenty of opportunity for retrieval and developing schemas here. The final point of the module introduces the concept of reaction rates and this can also be linked to Y7 energy by further discussing heat energy stores and how this affects the movement of atoms and molecules.</p> <p>(BI1) From Y7 students know that the cell is the basic unit of life but is also made of atoms (linking to BI9). Prior knowledge of organisation is checked first before moving onto a series of specific organ systems and looking at the aggregations within them. Students also have an opportunity to retrieve and apply knowledge of specialised cells and the biological principle of how structure relates to function.</p> | <p>(BI3, BI8) Organisms compete with or depend on other organisms for the same basic materials and energy that cycle through ecosystems. After the introduction of aerobic, anaerobic respiration in Y7, students now begin to look at how green plants utilise energy from the sun during photosynthesis. Students will look at structure to function again and factors affecting photosynthesis. There are opportunities to link this to Y7 Energy and Y7/8 Reactions to further develop those schemas.</p> <p>(BI12) Building on knowledge of the Earth's structure, the students move onto the composition of the Earth's atmosphere and the impact of the carbon cycle/human activity. This can be linked to the previous module where students looked at photosynthesis and bring in their Y7 knowledge of respiration. There is an opportunity here to look beyond the atmosphere at the Sun and other stars.</p> | <p>(BI6) The movement of charge causes electric current. Students will build on core knowledge of circuits in Y7 by developing ideas about potential difference and resistance. Students then look at plugs and how dangerous flows of currents are prevented before looking at the dangers of static charge. Building on student coverage of magnetism in Y7, students observe at how a magnetic field can generate movement in a motor.</p> <p>BI2) Y7 Genes culminated in looking at variation – we now take a closer look at DNA structure and the mechanisms of inheritance that leads to variation. Students can then appreciate how natural selection drives evolution and where plant/animal adaptations come from. This will help them to understand why biodiversity is important and why it is important to conserve it.</p> | <p>(BI8) Students looked at how waves transfer energy in Y7. They now have knowledge of Y7/Y8 energy which they can link to radiation as an energy transfer pathway. Students have already studied light waves and we build on this schema now by introducing lenses and the eye. Students then focus on longitudinal waves using sound as specific examples to that they might understand how we hear and what ultrasound is.</p> <p>(BI5) In Y7 students looked at forces and this culminated in looking at speed. We revisit describing speed as it has been a whole year since this was looked at in depth, this will allow students to move onto representing motion of graph and being able to explain changing motion. Students can then look at key concepts in forces such as mass/weight, floating and sinking, pressure in fluids and turning effects.</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.

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| <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.<br>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.<br>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> | Y8 University of Leeds Medicine/Dentistry taster day.   |
| <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.  |