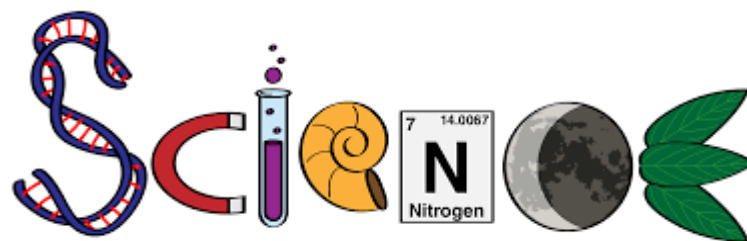


Science 5-year Curriculum Plan

Fairholme site

Author: K Johnson

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Ambition



Integrity



Inclusivity



Resilience



Endeavour

Our Vision

"Turning I can't into I can"

Our Values



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Curriculum Intent

"At The Beech Academy, we are committed to ensuring that all of our pupils engage in a curriculum that develops **interest, curiosity** and **creativity**, and **removes barriers**. There is a strong emphasis on developing fundamental skills in **literacy** and **numeracy** alongside developing **conceptual understanding** and **rich knowledge** across a broad range of subjects. The curriculum is enhanced by **high quality experiences** that aim to develop pupils' **cultural capital** and give them first hand experiences that otherwise might not be possible.

Every pupil is recognised as a unique individual and the **curriculum is designed to meet their individual needs**. All of our pupils will develop the skills to become contributing citizens to society and live out our **core values** of Ambition, Integrity, Inclusivity, Endeavour and Resilience on a daily basis. Our curriculum will enhance the social mobility chances of all our pupils to ensure they make lasting contributions to society and enable them to turn "I can't" into "I can".



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Curriculum Vision for the Science Curriculum Area

“Science at Beech is about providing students the opportunity to develop their knowledge and stimulate curiosity about how the world works along with the skills to solve problems and find answers to their questions through exploration and experimentation.”

Science at the Beech Academy is all about stimulating students' interest and curiosity about the world around them. We endeavour to build the students understanding, knowledge and cultural capital through the use of practical investigation and other high-quality experiences.

We firmly believe that lessons should be designed to minimise students' barriers to learning whilst providing every student the opportunity to access the same knowledge and develop the same skills regardless of ability or need - to develop a truly inclusive curriculum whilst stimulating their curiosity about the wider world and developing their skills to find out answers to their questions. As students move through the curriculum, developing their investigative and problem-solving skills, the aim is for students to be able to apply some of these skills to everyday issues and problems that they will face as they move on to further education and adulthood.



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At Beech Academy, we are committed to ensuring that all of our pupils engage in a curriculum that develops interest, curiosity and creativity, and removes barriers. We make sure that we turn "I can't" into "I can".

At the end of Year 11 students in **Science** will...

Know and understand...

Biology

- The difference between eukaryotes (plant and animal) and prokaryotes (bacteria) - their cell structure and organelle functions
- What the human body and plants are made of; from cells through to tissues, organs and key organ systems
- How cells differentiate to become specialised for their specific function
- How to observe, interpret and record cell structure using a light microscope
- The different forms of microscopy and how to calculate the real size of a cell (GCSE)
- How eukaryotic and prokaryotic cells divide (GCSE)
- The different methods of transport in cells including diffusion and osmosis (GCSE)
- The function of the different organs and organ systems including enzymes, bacteria and blood and the skeletomuscular systems
- How the body works and stays healthy in terms of digestion, metabolism, exercise and diet, including the role of respiration and lifestyle choices
- How the human body and plants fight disease, both naturally and through the use of medical technology
- The role of the endocrine and nervous system is coordinating and maintaining the internal body environment
- The structure and role of organs and organ systems in plants including the processes of photosynthesis and reproduction



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- The feeding relationships between organisms including the role and importance of plants (and decomposers – GCSE)
- The levels of organisation in an ecosystem from an individual organism to the whole ecosystem (GCSE)
- The factors that determine where a particular species live
- How life has developed on Earth over time through the processes of natural selection, evolution (and speciation – GCSE)
- How characteristics are passed from parents to offspring
- How our understanding of genetics has developed and can be used in a variety of industries (GCSE)
- How our understanding of organisms has changed over time and how this has impacted on the classification of organisms
- The impact of human activities on an ecosystem and its biodiversity including farming techniques, bioaccumulation and deforestation (GCSE)

Chemistry

- The different ways in which materials can be grouped according to their structure and properties
- How the structure of a material affects its properties
- How and why mixtures can be made and separated
- How metals can be extracted and used according to their properties
- How metals have been made more useful through the development of alloys
- The uses and problems associated with polymers
- The reactions of acids with metals, alkalis and carbonates to produce salts and different gases
- How these different gases can be tested/identified
- How to represent chemical reactions using formulae and equations including combustion, thermal decomposition, oxidation (and reduction – GCSE), displacements and neutralisation
- How mass is conserved during reactions
- Different reactions that cause an energy change in their surroundings
- How and why the rates of reactions can be increased
- The structure and composition of the Earth including the rock cycle



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- How and why the Earth's atmosphere has changed over time and the impact of human's activities on the current atmosphere, including the carbon cycle
- The use of fossil fuels and the fractions produced from crude oil
- The need for, and production of, clean drinking water
- The structure of the atom and how this relates to the Periodic Table (BTEC)
- Ionic compounds – their properties and how they are formed (BTEC)
- How scientists use symbols and formulae to represent materials and their reactions

Physics

- The different forms of energy, their measurement and how they can be transferred in different situations including heat energy transfers
- How to calculate the efficiency of different energy transfers including power ratings and work done
- The types of non-renewable and renewable energy resources available to us
- Forces (contact and non-contact) and their effect on objects including Hooke's Law
- How to calculate the speed of an object and the factors that can affect its stopping distance
- Using distance-time graphs to interpret speed and journeys
- The meaning of current, voltage and resistance in relation to electrical circuits
- How to build circuits and measure current and voltage in order to calculate resistance
- The difference between alternating current (a.c.) and direct current (d.c.) and how it is produced
- The components of a plug, including their function
- How to calculate the energy used by electrical appliances and therefore the cost of electricity
- How static electricity is formed and works (simply)
- The features and behaviour of magnets and electromagnets
- How magnetic fields are formed and used
- The different wave types and their features including how they travel
- How the different wave types behave around objects and materials



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- How wave changes lead to changes in sounds
- How waves are reflected and refracted (light & sound) including specific applications such as sight and cameras
- How to calculate the speed of different waves
- The different sections of the electromagnetic (EM) spectrum, their uses and dangers
- Radioactive decay – how it occurs and the different forms it can take, including their uses and dangers
- How we use physics in everyday activities such as predicting weather and monitoring changes in our environment (BTEC)
- The structure and composition of the Solar system and the Universe
- How and why the Earth experiences days, nights, years and seasons
- The effect of gravity on Earth and across the Solar System

Be able to...

- Use scientific vocabulary, terminology and definitions
- Use SI units and IUPAC chemical nomenclature unless inappropriate
- Use and derive simple equations and carry out appropriate calculations
- Interconvert units
- Use an appropriate number of significant figures in calculations

Demonstrate the ability to design an investigation, take measurements, present data and identify patterns and relationships. Students should be able to:

- Plan a simple investigation, identifying the techniques or equipment needed and the method to be followed
- Evaluate risks present in practical investigations
- Make a simple prediction about the outcome of the investigation
- Use appropriate techniques, equipment and materials safely to take simple measurements or observations that are meaningful and valid
- Make and record observations and measurements in an appropriate and safe way
- Display observations and data using an appropriate method
- Carry out and present mathematical and statistical analysis



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- State what has been found out during the investigation (drawing a conclusion) and use scientific explanations to develop hypotheses
- Evaluate the investigation and data in terms of accuracy, precision, repeatability and reproducibility as well as for its success in justifying the initial prediction.
- Evaluate methods and suggest possible improvements and further investigations



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5 Year Curriculum Plan - Fairholme	Autumn Term	Spring Term	Summer Term
Year 7 Novel Study	The Great Kapok Tree – Lynne Cherry Introduction to Science Cells Feeding relationships Reproduction	The Lion, The Witch and The Wardrobe – C.S. Lewis Substances & particles Energy Our planet	The Street Beneath My Feet – Charlotte Guillain & Yuval Zommer Holes – Louis Sachar The Earth Microbes Light
Year 8 Novel Study	When The Mountains Roar – Jess Butterworth Sound Elements, compounds & mixtures Acids & alkalis	Titanic: Death on the Water – Tom and Tony Bradman Forces Moving & turning Electricity & magnetism	Hidden Figures – Margot Lee Shetterly Structure & function of body systems Reactants & products Space
Year 9 Novel Study	The Arrival – Shaun Tan ELC Component 5 – Energy, forces & matter	The Edge – Alan Gibbons ELC Component 1 – The Human Body	Shackleton's Journey – William Grill ELC Component 2 – Environment, evolution & inheritance
Year 10	ELC Component 3 – Elements, mixtures & compounds	ELC Component 6 – Electricity, magnetism & waves	ELC Component 4 – Chemistry in our world
Year 11 – Pathway 1	GCSE Biology 4.1. Cell biology 4.2. Organisation 4.3. Infection & response	GCSE Biology 4.4. Bioenergetics 4.5. Homeostasis & response	GCSE Biology 4.6. Inheritance, variation & evolution 4.7. Ecology
Year 11 – Pathway 2	BTEC L1 in Applied Science ASc14: Exploring Chemistry	BTEC L1 in Applied Science ASc6: Carrying out a scientific experiment	BTEC L1 in Applied Science ASc15: Exploring Biology OR ASc15: Exploring Physics



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5 Year Curriculum Plan – the rationale

Year 7 Science at Beech Academy - Fairholme

The Beech Academy Year 7 Science curriculum prepares all pupils to consolidate and complete their knowledge from KS2. It develops the knowledge of:

- **Particles** – the study of materials and how they behave
- **Microbes** – microscopic organisms, both useful and harmful
- **Energy** – the different forms energy takes and how it is transferred
- **Cells** – the building blocks of life and how they look
- **Our planet** – the Earth as a planet
- **Earth** – the structure of the Earth and rock cycle
- **Feeding relationships** – how organisms interact with each other & the environment
- **Sound** – how sounds are produced and heard
- **Reproduction** – how humans and plants reproduce

The skills it focuses on:

- Using basic scientific equipment
- Using Bunsen burners safely
- Measuring using different equipment
- Health & Safety in the lab

Our pupils are studying these topics because it provides the foundations in some of the key scientific concepts that run through the Science curriculum at Beech. Student historically come from KS2 having not spent much time in Science lessons often due to working 1:1 or separately from their normal classes.

The topics are therefore studied in this order because it allows concepts to be revisited and linked together to build up the students' schema as well as fill in any gaps as a result of their experiences at primary.

Year 8 Science at Beech Academy - Fairholme

The Beech Academy Year 8 Science curriculum continues to consolidate and complete their knowledge from KS2 whilst at the same time building on the topics taught in Year 7. It develops knowledge of:

- **Forces** – the different types & how they affect objects
- **Elements, compounds & mixtures** – the classification of materials & substances
- **Electricity & magnetism** – circuits, magnets and how they interact
- **Reactants & products** – the foundation for building up an understanding of chemical reaction
- **Acids & Alkalis** – how we use, identify and neutralise them
- **Light** – the behaviour of light around objects & how we use light to see



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It further develops knowledge of:

- **Forces (motion & pressure)** – how forces affect the movement of objects & cause pressure
- **Space** – looking at the Solar system and beyond
- **Structure and function of body systems** – looking at the function of different organ systems in the body

The skills it focuses on:

- Using scientific equipment accurately
- Measuring using different equipment
- Evaluating risks
- Making simple predictions
- Drawing conclusions from observations

Our pupils are studying these topics because it provides further foundations in other key scientific concepts not covered in Year 7 and begins to spiral and build on those that were. Any gaps still present from KS2 continue to be filled to prepare students for the Entry Level course where they can build on their knowledge further.

The topics are studied in this order because, again, it allows concepts to be revisited both from Year 7 and earlier in the year as well as making further links to develop the students' schema further. The skills learnt in Year 7 continue to be built upon and developed further in preparation for Entry Level.

Year 9 Science at Beech Academy - Fairholme

The Beech Academy Year 9 Science curriculum builds on the work done in Years 7 and 8 and starts on the delivery of Entry Level Science which falls between KS3 and Level 1 in terms of the level of the content. The knowledge covered in Year 9 includes:

- Component 1 – The Human Body
- Component 5 – Energy, Forces and Matter
- Component 2 – Environment, evolution and inheritance

The skills it focuses on:

- Planning an investigation including choosing equipment and designing a method
- Evaluating risks in practical work
- Making simple predictions
- Taking simple measurements
- Recording and analysing data in appropriate formats
- Drawing simple conclusions from data
- Evaluating the data in terms of accuracy and reliability

Our pupils are studying these topics as they form 3 of the 6 components required to achieve the Double Award Entry Level Certificate.



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The topics are studied in this order because students study GCSE Biology in Year 11. Therefore, any additions to the group in KS4 provides the opportunity to co-teach and fill in this gap, enabling new students to potentially achieve the double award Entry Level Certificate by the end of Year 11, alongside the opportunity to take exams for the GCSE. Component 5 on Energy, Forces and Matter provides the development of the foundational knowledge in Physics from KS3 and supports the remaining units to be studied in Year 10. Component 2 is specifically taught in the Summer Term as it involves the study of plants and photosynthesis which is best taught at this time of year to be able to get meaningful results from any practical work carried out.

Year 10 *Science* at Beech Academy - Fairholme

The Beech Academy Year 10 Science curriculum consists of the last three components required to achieve the Double Award Entry Level Certificate. The knowledge covered in Year 10 includes:

- Component 3 – Elements, Compounds & Mixtures
- Component 6 – Electricity, Magnetism & Waves
- Component 4 – Chemistry in our World

The skills it continues to focus on:

- Planning an investigation including choosing equipment and designing a method
- Evaluating risks in practical work
- Making simple predictions
- Taking simple measurements
- Recording and analysing data in appropriate formats
- Drawing simple conclusions from data
- Evaluating the data in terms of accuracy and reliability

Our pupils are studying these topics to complete delivery of the Double Award Entry Level Certificate and to ensure that KS4 curriculum content is covered at a foundational level.

The topics are studied in this order as Component 4 builds somewhat on the Chemistry content covered in Component 3 earlier in the year and Component 6 builds on part of Component 5 taught in Year 9 as well as the Physics topics taught at KS3. The assessment methods used in this course also allow staff to judge whether students are better suited to move on to either GCSE Biology with its terminal exams or BTEC Level 1 Introductory Award/Certificate in Applied Science which is completely coursework based.

Year 11 *Science* at Beech Academy - Fairholme

The Beech Academy Year 11 Science curriculum prepares students to either sit the GCSE Biology exams or complete the BTEC Level 1 Introductory Award or Certificate in Applied Science.

The knowledge covered in GCSE Biology includes:



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- Cell biology
- Levels of organisation in humans and plants
- Infection and response
- Bioenergetics (photosynthesis & respiration)
- Homeostasis and response (controlling an organism's internal environment using hormones)
- Inheritance, variation and evolution (the study of genetics & how species change)
- Ecology (the study of the environment & human's impact)

The knowledge covered in BTEC Level 1 Introductory Award/Certificate in Applied Science includes:

- ASc 13: Exploring Biology (classifying & identifying organisms)
- ASc 14: Exploring Chemistry (chemical reactions used in making soap)
- ASc 15: Exploring Physics (researching Physics topics & making circuits)
- ASc6: Carrying out a scientific experiment (additional or alternative to ASc15)

The skills both courses focus on are:

- Planning an investigation including choosing equipment and designing a method
- Evaluating risks in practical work
- Making simple predictions
- Taking simple measurements
- Recording and analysing data in appropriate formats
- Carrying out and presenting mathematical and statistical analysis
- Stating what has been found out during the investigation (drawing a conclusion) and using scientific explanations to develop hypotheses
- Evaluating the investigation and data in terms of accuracy, precision, repeatability, and reproducibility as well as for its success in justifying the initial prediction.

Our students study GCSE Biology to allow students the opportunity to achieve a GCSE in Science where the cohort is judged able to cope with the stress of terminal exams and/or potentially achieve a Level 2 grade. If students are judged not able to access exams and are more suited to hands-on, practical work then the cohort will complete units for BTEC Level 1 which is 100% coursework based.

The units selected from the BTEC Level 1 Introductory course allow for all three disciplines to potentially be covered at the KS4 level as well as allows some flexibility to study units of particular interest to the students.

Providing these options give students the opportunity to achieve qualifications and provides two possible pathways into further education and training whilst taking into account their needs and/or abilities that might otherwise present a barrier.



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