



# Hailey Hall School Science Curriculum Booklet

## Science Curriculum - Intent

### **Introduction:**

The new Education Inspection Framework (EIF 2019) includes an enhanced focus on curriculum. This is structured around three pillars:

### **Curriculum Intent**

### **Curriculum Implementation**

### **Curriculum impact**

**Curriculum Intent Science:** The National Curriculum for Science aims to ensure that all children: develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics develop an understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them are equipped with the scientific skills required to understand the uses and implications of science, today and for the future.

We understand that it is important for lessons to have a skills-based focus, and that the knowledge can be taught through this.

**Purpose of Study:** -To encourage a lifelong passion for Science by engaging pupils in practical activities and discussions. -To encourage curiosity and an awareness of the world around them. - To give pupils a solid conceptual understanding of Biology, Chemistry and

Physics as detailed in the National Curriculum for Key Stages 3 and 4. - To ensure all pupils make progress to the best of their ability with support and challenge where needed to achieve at ks4 and provide a foundation for further study after Hailey Hall.

The Science subject area aims to inspire discussion, hypothesizing, planning, investigating, implementation and evaluation. We aim to have all pupils working towards developing a deeper understanding of the modern world around us.

We aim to, wherever possible, link work to other disciplines such as mathematics, D&T, computing, PE and art. The pupils are also given opportunities to reflect upon and evaluate their practical work with specific regard to health & safety, reliability and accuracy

The Science curriculum is planned to enable all pupils to develop skills in the following areas:

1. To develop an understanding of health and safety
2. To gain a range of practical science skills
3. To understand the impact humans and natural factors have on the environment.
4. To gain a wider understanding of the world around us, to understand the science behind modern living.
5. Nurture and develop pupils' passions and interests to help them understand the science around them.

Throughout our programs of study, every attempt is made to make explicit links to careers and the world of work. In addition to subject-specific links, we aim to explicitly reinforce the skills and aptitudes which support what employers say are important in the workplace;

1. This is especially prevalent in the KS4 BTEC Applied Science program of study.
2. Aiming high, staying positive and resilience
3. Communication skills (listening, speaking, presenting)
4. Teamwork and problem solving,
5. Creativity and thinking skills.
6. Self-management and leadership
7. The British values of democracy, the rule of law, individual liberty, and mutual respect of those with different faiths and beliefs are taught explicitly and reinforced in the way in which the school operates.

Underpinning all the learning aims is the school ethos is the understanding and development of pupils social, emotional, and behavioural needs. Every lesson has a strong focus on the four target areas for a specific focus. – see behaviour policy for full details.

In addition to this, through the schools' soft skills data capture, specific targets are developed for each pupil. All teaching staff are made aware of these and each lesson is an opportunity to work on and focus on these individual targets, ensuring realistic learning and progression.

## Year 7 Science

### Why this subject is important:

The study of science fires pupils' curiosity about the world and helps them to find explanations. It links practical experience with scientific ideas. Pupils learn that science enhances knowledge and

understanding in science is rooted in evidence. Pupils discover how science and technology affects industry, business and medicine and how science improves the quality of life. Pupils appreciate science worldwide and discover how it relates to their own culture.

Pupils also gain confidence to question and discuss issues that may affect their own lives, their immediate community and the world.

### What you will learn:

Unit name	Topics	Skills and understanding	Skills and curriculum links
Structure and function of body systems	Levels of organisation.	Define and state examples of tissues, organs, and organ systems.	Links to Adaptation & inheritance. Health and lifestyle (year 8).
		Explain the hierarchy of organisation in a multicellular organism.	Links to survival in the genes, KS4 Biology.
	Gaseous Exchange.	Interpret information provided to decide on the function of the individual organs and of the organ system.	Links to data analysis – Maths Curriculum.
		Describe the structure of the gas exchange system.	Links to year 8 Healthy Lifestyles.
Breathing.	Describe how parts of the gas exchange system are adapted to their function.	Links to Year 9 BTEC Unit 1: Principles of Applied Science.	
	Interpret data given to compare the difference in the composition of inhaled and exhaled air.		

		<p>Describe the processes of inhaling and exhaling.</p> <p>Describe how a bell jar can be used to model what happens during breathing.</p> <p>Explain how to measure lung volume.</p> <p>Use appropriately calibrated apparatus to obtain a lung volume. Describe the structure of the skeleton.</p> <p>Describe the functions of the skeletal system.</p> <p>Describe the role of joints in movement.</p> <p>Explain how to measure the force exerted by different muscles.</p> <p>Carry out an experiment to make and record measurements of forces using the correct units.</p> <p>Describe the function of major muscle groups.</p> <p>Explain how antagonistic muscles cause movement.</p> <p>Interpret data collected in an experiment, to identify a pattern between muscle fatigue and repetitive muscle contraction.</p>	<p>Links to PE KS3&amp;4 curriculum.</p>
Reproduction	Adolescence	<p>State the difference between adolescence and puberty.</p> <p>Describe the main changes that take place during puberty.</p> <p>Interpret observations, to categorise the changes during adolescence.</p> <p>Describe the main structures in the male and female reproductive systems.</p> <p>Describe the function of the main structures in the male and female reproductive systems.</p>	<p>Links to health and lifestyle (year 8)</p> <p>Links to year 9 unit 1: Biology, Principles of applied science.</p> <p>Links to KS4 Unit 4: Biology and our environment.</p>
	The skeleton.		
	Movement: joints.		
	Movement: muscles.		

		Extract information from text to describe structures and functions of the key parts of the reproductive systems in a table.	Links to literacy curriculum KS3&4
	Fertilisation and implantation	Describe the structure and function of gametes. Describe the processes of fertilisation.	
	Development of a foetus	Describe what happens during gestation. Describe what happens during birth.	
	The menstrual cycle	State what the menstrual cycle is. Describe the main stages in the menstrual cycle. Present information in the form of a graphical timeline.	
	Flowers and pollination	Identify the main structures of a flower. Describe the process of pollination. Describe the differences between wind-pollinated and insect-pollinated plants. Use appropriate techniques to dissect a flower into its main parts.	
	Fertilisation and germination	Describe the process of fertilisation in plants. Describe how seeds and fruits are formed.	
	Seed dispersal	Make and record observations in a table with clear headings and units, using data to calculate percentage germination. State the ways seeds can be dispersed. Describe how a seed is adapted to its method of dispersal.	Links to Year 8 Adaptation.

		- Plan a simple experiment to test one hypothesis about seed dispersal, identifying a range of variables.	Links to BTEC is survival in the Genes.
Particles and their behaviour	The particle model	Describe how materials are made up of particles.	Separation techniques Year 8
		Use the particle model to explain why different materials have different properties.	Links to Useful chemical products, KS4
		Use the particle model to explain how building brick models are representing common substances.	How polluted is the environment, KS4
		Describe the properties of a substance in its three states.	Principles of applied science. Unit 1
	States of matter	Use ideas about particles to explain the properties of a substance in its three states.	
		Use observations to decide if substances are solids, liquids, or gases.	
	Melting and freezing	Use the particle model to explain changes of state involving solids and liquids.	
		Interpret data about melting points.	
		Use cooling data to decide the melting point of stearic acid.	
	Boiling	Use the particle model to explain boiling.	
		Interpret data about changes of state.	
		Select data and information about boiling points and use them to contribute to conclusions.	
		Describe changes of state involving gases.	
	More changes of state	Use the particle model to explain evaporation, condensation, and sublimation.	

	<p>Diffusion</p> <p>Gas pressure</p>	<p>Explain how the practical procedure can be kept fair to ensure valid results.</p> <p>Use the particle model to explain diffusion.</p> <p>Describe the evidence for diffusion.</p> <p>Identify variables that need to be kept constant when investigating the rates of diffusion of <math>\text{KMnO}_4</math>.</p> <p>Use the particle model to explain gas pressure.</p> <p>Describe the factors that affect gas pressure.</p> <p>Collect, analyse, and interpret primary data to provide evidence for gas pressure.</p>	
Chemical Reactions	<p>Chemical reactions</p> <p>Word equations</p> <p>Burning fuels</p>	<p>Describe what happens to atoms in chemical reactions.</p> <p>Explain why chemical reactions are useful.</p> <p>Compare chemical reactions to physical changes.</p> <p>Identify chemical and physical reactions from practical observations.</p> <p>Identify reactants and products in word equations.</p> <p>Write word equations to represent chemical reactions.</p> <p>Represent practical observations using word equations.</p> <p>Predict products of combustion reactions.</p> <p>Categorise oxidation reactions as useful or not.</p> <p>Suggest an improvement to the practical procedure to improve the accuracy of the results obtained.</p>	<p>Separation technique, Metals and Acids. Year 8</p> <p>Links to Useful chemical products, KS4.</p> <p>How polluted is the environment, KS4</p> <p>Principles of applied science. Unit 1</p> <p>Links to Unit 2: BTEC KS4 Chemistry and our Earth.</p>

	<p>Thermal decomposition</p> <p>Conservation of mass</p> <p>Exothermic and endothermic</p>	<p>Identify decomposition reactions from word equations.</p> <p>Use a pattern to predict products of decomposition reactions.</p> <p>Use practical results to decide which compound decomposes most readily.</p> <p>Explain the conservation of mass in chemical reactions.</p> <p>Calculate masses of reactants and products.</p> <p>Make conclusions from data based on the idea of conservation of mass.</p> <p>Describe the characteristics of exothermic and endothermic changes.</p> <p>Classify changes as exothermic or endothermic.</p> <p>- Calculate the temperature change and make a conclusion in a range of familiar exothermic and endothermic changes.</p>	
Forces	<p>Introduction to forces</p> <p>Squashing and stretching</p> <p>Drag forces and friction</p>	<p>Explain what forces do.</p> <p>Describe what is meant by an interaction pair</p> <p>Make predictions about forces in familiar situations.</p> <p>Describe how forces deform objects.</p> <p>Explain how solid surfaces provide a support force.</p> <p>Use Hooke's Law.</p> <p>Present data on a graph and identify a quantitative relationship in the pattern.</p> <p>Describe the effect of drag forces and friction.</p>	<p>Electricity and magnetism, Motion and Pressure Year 8</p> <p>Links to green electricity year KS4 Unit 3:</p> <p>Principles of applied science. Unit 1</p> <p>Links to Maths curriculum ks3&amp;4 Using data, using equations.</p>



	<p>Forces at a distance</p> <p>Balanced and unbalanced</p>	<p>Explain why drag forces and friction arise.</p> <p>Plan and carry out an experiment to investigate friction, selecting suitable equipment.</p> <p>Describe the effects of a field.</p> <p>Describe the effect of gravitational forces on Earth and in space.</p> <p>Present results in a simple table.</p> <p>Describe the difference between balanced and unbalanced forces. Describe situations that are in equilibrium.</p> <p>Explain why the speed or direction of motion of objects can change.</p> <p>Present observations in a table including force arrow drawings.</p>	
<p>Waves and Sound</p>	<p>Waves</p> <p>Sound and energy transfer</p> <p>Loudness and pitch</p>	<p>Describe the different types of waves and their features.</p> <p>Describe what happens when water waves hit a barrier.</p> <p>Describe what happens when waves superpose.</p> <p>Identify patterns in observations from wave experiments.</p> <p>Describe how sound is produced and travels.</p> <p>Explain why the speed of sound is different in different materials.</p> <p>Contrast the speed of sound and the speed of light.</p> <p>Compare the time for sound to travel in different materials using the data given.</p> <p>Describe the link between loudness and amplitude.</p> <p>Describe the link between frequency and pitch.</p>	<p>Energy, Year 8. Unit 1 principles of applied science Year 9 &amp; Ks4, Final frontier KS4</p>

	<p>Detecting sound</p>	<p>State the range of human hearing and describe how it differs from the ranges of hearing in animals.</p> <p>Explain how sounds will differ in different situations.</p> <p>Describe how the ear works.</p> <p>Describe how your hearing can be damaged.</p> <p>Describe how a microphone detects sound.</p>	
	<p>Echoes and ultrasound</p>	<p>Explain some risks of loud music.</p> <p>Describe what ultrasound is.</p> <p>Describe some uses of ultrasound.</p> <p>Explain, with reasons, why animals use echolocation.</p>	
	<p>Light</p>	<p>Describe what happens when light interacts with materials.</p> <p>State the speed of light.</p> <p>Compare results with other groups, suggesting reasons for differences.</p>	
	<p>Reflection</p>	<p>Explain how images are formed in a plane mirror.</p>	
	<p>Refraction</p>	<p>Explain the difference between specular reflection and diffuse scattering.</p> <p>Use appropriate equipment and take readings safely without help.</p> <p>Describe and explain what happens when light is refracted.</p> <p>Describe what happens when light travels through a lens.</p> <p>Record observation using a labelled diagram.</p>	
	<p>The eye and the camera</p>	<p>Describe how the eye works.</p> <p>Describe how a simple camera forms an image.</p>	

	Colour	<p>Choose suitable materials to make models of the eye and the camera.</p> <p>Explain what happens when light passes through a prism.</p> <p>Describe how primary colours add to make secondary colours.</p> <p>Explain how filters and coloured materials subtract light.</p> <p>Predict the colour of an object in red light and the colour of light through different filters.</p>	
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### How you will be assessed:

You will be constantly assessed throughout the year with regular verbal and written feedback.

Each unit will end with a summative assessment in the form of a test, to assess knowledge or a practical task to assess knowledge and skills.

### How parents/carers can help:

Provide your child with a quiet place to do home learning and revision

### Useful website and details of course books:

<http://www.bbc.co.uk/education/subjects/zng4d2p>

### Progression routes and career opportunities: BTEC Principles of Applied Science

### Who to contact and how if you have a query regarding your child:

Name	Position	Email Address	Telephone
Mr Sean O'Sullivan	Science Co-ordinator	sosullivan@haileyhall.herts.sch.uk	01992 465208
Mr B.Aldiss	Deputy head	baldiss@haileyhall.herts.sch.uk	01992 465208

**Why this subject is important:**

The study of science fires pupils' curiosity about the world and helps them to find explanations. It links practical experience with scientific ideas. Pupils learn that science enhances knowledge and understanding in science is rooted in evidence. Pupils discover how science and technology affects industry, business and medicine and how science improves the quality of life. Pupils appreciate science worldwide and discover how it relates to their own culture. Pupils also gain confidence to question and discuss issues that may affect their own lives, their immediate community and the world.

**Intent: What you will learn:**

Unit name	Topics	Skills and understanding	Curriculum links
Adaptation and inheritance	Competition and adaptation	Describe some resources that plants and animals compete for.  Describe how organisms are adapted to their environments.  Describe how organisms adapt to environmental changes.	Links to Principle of applied science unit 1, Year9 & KS4. Survival in the genes. BTEC Unit 4.      Maths curriculum – data handling and analysis.
	Adapting to change	Describe how competition can lead to adaptation.  Interpret secondary data to describe trends and draw simple conclusions about predator-prey relationships.	
	Variation	Describe how variation in species occurs.  Describe the difference between environmental and inherited variation.  Record and categorise observations of variations between different species of gull.	
	Continuous and discontinuous variation	Describe the difference between continuous and discontinuous variation.  Represent variation within a species using graphs.  Record results in a table and plot a histogram.	



	<p>Plant minerals</p>	<p>Describe how a plant uses minerals for healthy growth.</p> <p>Explain the role of nitrates in plant growth.</p> <p>Record measurements in a table, and calculate arithmetic means of results.</p>	
	<p>Chemosynthesis</p>	<p>Describe where chemosynthesis takes place.</p> <p>Describe the process of chemosynthesis.</p> <p>Describe how the view of chemosynthesis by the scientific community changed with time.</p>	
	<p>Aerobic respiration</p>	<p>State the word equation for aerobic respiration.</p> <p>Describe the process of respiration.</p> <p>Plan an investigation to measure the effect of exercise on breathing rates.</p>	
	<p>Anaerobic respiration</p>	<p>State the word equation for anaerobic respiration.</p> <p>Describe the differences between aerobic and anaerobic respiration.</p> <p>Evaluate data collected, suggesting possible sources of error.</p>	
	<p>Food chains and webs</p>	<p>Describe what food chains show.</p> <p>Describe what food webs show.</p> <p>Describe the interdependence of organisms.</p> <p>Describe how toxic materials can accumulate in a food web.</p>	

	<p>Disruption to food chains and webs</p> <p>Ecosystems</p>	<p>Present population data as a graph to describe trends and draw conclusions.</p> <p>Describe how different organisms co-exist within an ecosystem.</p> <p>Identify niches within an ecosystem.</p> <p>Use quadrats to take measurements in an ecosystem, describing trends observed.</p>	
Health and lifestyle	<p>Nutrients</p> <p>Food tests</p> <p>Unhealthy diet</p> <p>Digestive system</p>	<p>Describe the components of a healthy diet.</p> <p>Explain the role of each nutrient in the body.</p> <p>Interpret nutritional information on food packaging to identify healthy food.</p> <p>Describe how to test foods for starch, lipids, sugar, and protein.</p> <p>Describe the positive result for each food test.</p> <p>Use appropriate techniques to carry out a range of food tests safely.</p> <p>Describe some health issues caused by an unhealthy diet.</p> <p>Calculate the energy requirements of different people.</p> <p>Collect experimental data and draw conclusions from results obtained.</p> <p>Describe the structure and function of the main parts of the digestive system.</p> <p>Describe the process of digestion.</p>	<p>Links to BTEC unit 1 principles of applied science.</p> <p>Prevention and cure year KS4.</p> <p>Maths curriculum – data handling and analysis.</p>

	<p>Bacteria and enzymes indigestion</p> <p>Drugs</p> <p>Alcohol</p> <p>Smoking</p>	<p>Give a structured account of digestion using information gathered by research.</p> <p>Describe the role of enzymes in digestion.</p> <p>Describe the role of bacteria indigestion.</p> <p>Record experimental data using a suitable results table.</p> <p>Describe the difference between recreational and medicinal drugs.</p> <p>Describe the effects of drugs on health and behaviour.</p> <p>Interpret experimental observations to draw simple conclusions.</p> <p>Describe the effect of alcohol on health and behaviour.</p> <p>Describe the effect alcohol has on conception and pregnancy.</p> <p>Design a results table and plot subsequent experimental data on an appropriate graph.</p> <p>Describe the effects of tobacco smoke on health.</p> <p>Describe the effects of tobacco smoke on pregnancy.</p> <p>Present secondary data using an appropriate method, interpreting this data to draw conclusions.</p>	
Separation techniques	Mixtures	<p>Describe particle arrangements in mixtures.</p> <p>Explain how to identify pure substances.</p> <p>Select appropriate separation techniques for different mixtures.</p>	<p>Links to BTEC unit 1 principles of applied science, Year 9, chemical reactivity and bonding, controlling industrial reactions, useful</p>



	<p>Solutions</p> <p>Solubility</p> <p>Filtration</p> <p>Evaporation and distillation</p> <p>Chromatography</p>	<p>Describe solutions using keywords.</p> <p>Use the particle model to explain dissolving.</p> <p>Use data to predict how much solute is dissolved in a solution or the mass of a solution.</p> <p>Explain what a saturated solution is.</p> <p>Explain the meaning of solubility.</p> <p>Plan an investigation to compare solubility with temperature, considering variables.</p> <p>Explain how filtration works. Describe how to filter a mixture.</p> <p>Label a diagram of the apparatus used for filtration to show where the filtrate and residue are found.</p> <p>Explain how to use evaporation to separate mixtures.</p> <p>Explain how distillation works.</p> <p>Explain observations made during the distillation of inky water.</p> <p>Explain how chromatography separates mixtures.</p> <p>Analyse chromatograms to identify substances in mixtures.</p> <p>Explain how a chromatogram can be used to identify a suspect's pen.</p>	<p>chemical products.KS4.</p>
Metals and Acids	Acids and metals	<p>Compare the reactions of different metals with dilute acids.</p> <p>Explain the test for hydrogen gas.</p>	<p>Links to BTEC, Useful chemical products. Principles of applied science. Chemical</p>

		Decide which metals react more vigorously from practical observations.	reactivity and bonding year 9. useful chemical products. KS4.
	Metals and oxygen	Compare the reactions of different metals with oxygen.  Use state symbols in balanced formula equations.  Rank metals in order of how vigorously they react with oxygen.	
	Metals and water	Compare the reactions of metals with water.  Use the reactivity series to predict reactions.  Plan a practical to compare the reactivity of three metals.  Predict if a given pair of substances will undergo displacement.	
	Metal displacement reactions	Use the reactivity series to explain displacement reactions.  Predict which combinations of metals and metal compounds will lead to displacement reactions.	
	Extracting metals	Use the reactivity series to decide which metals can be extracted from their ores by heating with carbon.  Calculate the amounts of metals in ores.  Link an example of metal extraction to the knowledge of the reactivity series.	
	Ceramics	Explain ceramic properties.  Explain why the properties of ceramics make them suitable for their uses.	

	<p>Polymers</p> <p>Composites</p>	<p>Plan a method for comparing the strength of ceramic materials, identifying the variables that need to be controlled.</p> <p>Describe polymer properties.</p> <p>Explain how polymer properties make them suitable for their uses.</p> <p>Interpret data on polymers to decide on the best polymer for a given purpose, justifying the choice.</p> <p>Describe composite properties.</p> <p>Explain why composite properties make them suitable for their uses.</p> <p>State the relationship shown on a graph of composite strengths.</p>	
The Earth	<p>The Earth and its atmosphere</p> <p>Sedimentary rocks</p> <p>Igneous and metamorphic rocks</p>	<p>Describe properties of the different layers of the Earth's structure</p> <p>Describe the composition of the atmosphere</p> <p>Describe the advantages and disadvantages of a given model of the Earth's structure</p> <p>Explain two properties of sedimentary rocks</p> <p>Explain how sedimentary rocks are made</p> <p>Describe how models are representing sedimentary rock formation processes</p> <p>Compare the ways that igneous and metamorphic rocks form</p> <p>Explain how igneous and metamorphic rocks form</p>	<p>Link to BTEC, Affecting the environment. Green electrical. How polluted is the environment</p> <p>KS4</p>

	<p>The rock cycle</p> <p>The carbon cycle</p> <p>Climate change</p> <p>Recycling</p>	<p>Predict observations when a substance representing lava is cooled at different temperatures</p> <p>Use the rock cycle to explain how the material in rocks is recycled</p> <p>Describe how changes in the wax used to represent a rock represent the real rock cycle</p> <p>Explain why the concentration of carbon dioxide in the atmosphere did not change for many years</p> <p>Use the carbon cycle to identify reservoirs of carbon</p> <p>Explain why global warming happens</p> <p>Explain some impacts of global warming</p> <p>Design a model to represent global warming, and describe how it represents the real situation</p> <p>Explain how aluminium is recycled</p> <p>Analyse the advantages and disadvantages of recycling</p> <p>Plot a bar chart of recycling rates for two towns</p>	
<p>Electricity and magnetism</p>	<p>Charging up</p> <p>Circuits and current</p>	<p>Explain how objects can become charged.</p> <p>Describe how charged objects interact.</p> <p>Describe what is meant by an electric field.</p> <p>Interpret observations, identifying patterns linked to charge.</p> <p>Describe what is meant by current.</p>	<p>Links to BTEC, Principles of applied science. Year 9 Green Electricity, Ionising radiation KS4.</p>

	<p>Potential difference</p>	<p>Describe how to measure current.</p> <p>Set up a circuit including an ammeter to measure current.</p> <p>Describe what is meant by potential difference.</p> <p>Describe how to measure potential difference.</p> <p>Describe what is meant by the rating of a battery or bulb.</p>	
	<p>Series and parallel</p>	<p>Set up a simple circuit and use appropriate equipment to measure potential difference.</p> <p>Describe the difference between series and parallel circuits.</p> <p>Describe how current and potential differences vary in series and parallel circuits.</p> <p>Identify the pattern of current and potential difference in series and parallel circuits.</p>	
	<p>Resistance</p>	<p>Describe what is meant by resistance.</p> <p>Calculate the resistance of a component and a circuit.</p> <p>Describe the difference between conductors and insulators in terms of resistance.</p> <p>Identify independent, dependent, and control variables.</p>	
	<p>Magnets and magnetic fields</p>	<p>Describe how magnets interact.</p> <p>Describe how to represent magnetic fields.</p> <p>Describe the Earth's magnetic field.</p>	

	<p>Electromagnets</p> <p>Using electromagnets</p>	<p>Draw field lines around a magnet in detail.</p> <p>Describe how to make an electromagnet.</p> <p>Describe how to change the strength of an electromagnet.</p> <p>Predict and test the effect of changes to an electromagnet.</p> <p>Describe some uses of electromagnets.</p> <p>Describe how a simple motor works.</p> <p>From your experiment, pose scientific questions to be investigated.</p>	
Energy	<p>Food and fuels</p> <p>Energy adds up</p> <p>Energy and temperature</p>	<p>Compare the energy values of food and fuels.</p> <p>Compare the energy in food and fuels with the energy needed for different activities.</p> <p>Explain data on food intake and energy requirements for a range of activities.</p> <p>Describe energy before and after a change.</p> <p>Explain what brings about transfers in energy.</p> <p>Present observations of energy transfers in a table.</p> <p>State the difference between energy and temperature.</p> <p>Describe what happens when you heat solids, liquids, and gases.</p> <p>Explain what is meant by equilibrium.</p> <p>Describe how to reduce error in experimental apparatus.</p>	<p>Links to BTEC Unit 1 principles of science.</p> <p>Green electricity year 10. Ionising radiation year 11.</p>

	Energy transfer: particles	Describe how energy is transferred by particles in conduction and convection.  Describe how an insulator can reduce energy transfer.  Describe the pattern in conduction shown by results, using numerical data to inform a conclusion.  Describe some sources of infrared radiation.	
	Energy transfer: radiation	Explain how energy is transferred by radiation.  Identify risks and explain why it is important to reduce them.	
	Energy resources	Describe the difference between a renewable and a non-renewable energy resource.  Describe how electricity is generated in a power station.  Choose an appropriate source of secondary information.	
	Energy and power	Explain the difference between energy and power.  Describe the link between power, fuel use, and the cost of using domestic appliances.  Predict the power requirements of different equipment and how much it costs to use.	
	Work, energy, and machines	Calculate work done.  Apply the conservation of energy to simple machines.  Evaluate results from the practical.	
Motion and Pressure	Speed	Calculate speed using the speed equation.  Describe relative motion.	Links to BTEC Unit 1 principles of science. Chemical reactivity and

		Choose equipment to make appropriate measurements for time and distance to calculate speed.	bonding, controlling industrial reactions, year 9 & KS4.
	Motion graphs	Interpret distance-time graphs. Calculate speed from a distance-time graph. Plot data on a distance-time graph accurately.	
	Pressure in gases	Describe the factors that affect gas pressure. Describe how atmospheric pressure changes with height. Interpret observations of atmospheric pressure.	
	Pressure in liquids	Describe how liquid pressure changes with depth. Explain why some things float and some things sink, using force diagrams. Predict how water pressure changes in a familiar context, using scientific knowledge and understanding.	
	Pressure on solids	Calculate pressure. Apply ideas of pressure to different situations.	
	Turning forces	Predict quantitatively the effect of changing area and/or force on pressure. Describe what is meant by 'moments'. Calculate the moment of a force. Independently identify scientific questions from results.	

**How you will be assessed:**



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Provide your child with a quiet place to do home learning and revision

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**Progression routes and career opportunities:  
BTEC Principles of Applied Science**

**Who to contact and how if you have a query regarding your child:**

<b>Name</b>	<b>Position</b>	<b>Email Address</b>	<b>Telephone</b>
<b>Mr Sean O'Sullivan</b>	<b>Science Co-ordinator</b>	sosullivan@ <a href="mailto:sosullivan@haileyhall.herts.sch.uk">haileyhall.herts.sch.uk</a>	01992 465208

**Year 9 Science**

**Why this subject is important:**

The study of science fires pupils' curiosity about the world and helps them to find explanations. It links practical experience with scientific ideas. Pupils learn that science enhances knowledge and understanding in science is rooted in evidence. Pupils discover how science



Principles of Applied Science Unit 1: Chemistry	Homeostasis.	Be able to describe monohybrid inheritance patterns.  Be able to describe how the body maintains a constant internal environment. Give specific examples of how water, sugar and temperature are controlled in the body.	Links to the BTEC sports curriculum. PE curriculum
	Nerves and the nervous system.	Be able to state the structures and functions of the structures involved in the nervous system.  Voluntary and involuntary impulse control.	
	Atomic Structure.	The reflex arc. Conditioned and learned responses.	Links to Unit 2: Chemistry and our Earth. (ks4)
	Isotopes and RAM.	Understand elements as metals or non-metals according to their position in the periodic table.	
	The Periodic table.	Be able to define the term isotope in relation to subatomic particles. Relate the term isotope to the existence of non-whole numbers in the periodic table / relative atomic mass.	
	Electron structure.	Know the rules of electron structure and the first 4 electron shells. Relate the electron structure to reactivity. Be able to describe the reactions of group 1 & 7 elements.	
	Elements, compounds, mixtures.	Be able to state, explain and define elements, compounds and	

Principles of Applied Science Unit 1: Physics		mixtures – with examples.	
	Neutralisation reactions.	Understand the reactions between acidic and alkali substances.	
	Acids & salts.	Be able to use the general equation for the production of salts through the reactions of acids and bases.	
	Acids, metals, carbonates.	Understand and describe the reactions between acids and carbonates.	
	Energy and its uses.	Understand and describe the reaction between acids and metals.	
	Energy transformations and transfers.	Understand the 9 forms of energy and give examples of their uses.  Be able to describe the energy transformations in given examples. Be able to highlight the useful and wasted energy transformations. Be able to use the equation for efficiency.	Links to Unit 3: Energy and our Universe.
	Thermal energy transfer.	Be able to describe and explain the way thermal energy is transferred. Be able to use, describe and explain the terms: radiation, convection and conduction.	
	Measuring energy.	Be able to use the joule (J) as the unit of energy. Understand the principle of the conservation of energy. Be able to use diagrams to represent energy transfers and energy dissipation. Be	Links to KS3 & 4 Maths curriculum – Using/rearranging equations.

	Renewable energy.	able to use the watt (W) as the unit of power. Be able to use power calculations.  Be able to describe and discuss the sources & storage of energy: a. renewable (solar, wind, biofuels, hydroelectric, wave, tidal, geothermal) b. non-renewable (fossil fuels, nuclear). Be able to discuss using energy stores effectively including the storage of energy using batteries and fuel cells.	Links to KS3 & 4 Maths curriculum – Using/rearranging equations.
	Wave characteristics.	Be able to describe waves as transverse and longitudinal.  Be able to describe waves using the terms wavelength, amplitude, frequency and wave speed.  Be able to use calculations to work out wave speed, wavelength and frequency.	Links to KS3 & 4 Maths curriculum – Using/rearranging equations.
	The EM spectrum.	Be able to discuss, describe and state the uses of the EM spectrum.	Links to KS3 & 4 Maths curriculum – Using/rearranging equations.

**How you will be assessed:**

Your coursework will be continually assessed against the criteria throughout the year.

**The final (BTEC) grade is calculated in the following way:**

75% of the course is assessed by the submission of a portfolio of evidence of work carried out over a period of time. The course is continuously assessed by the external completion of assignments throughout the year.

25% of the course is assessed with an external examination.

### **How parents/carers can help:**

Provide them with a quiet place to do home learning and revision

### **Useful website and details of course books:**

<http://www.bbc.co.uk/schools/gcsebitesize/science/aqa>  
[www.samlearning.com](http://www.samlearning.com)

### **Progression routes and career opportunities**

Astrophysicist  
Environmental chemist

### **Who to contact and how if you have a query regarding your child:**

<b>Name</b>	<b>Position</b>	<b>Email Address</b>	<b>Telephone</b>
<b>Mr Sean O'Sullivan</b>	<b>Science Co-ordinator</b>	sosullivan@ <a href="mailto:sosullivan@haileyhall.herts.sch.uk">haileyhall.herts.sch.uk</a>	01992 465208

### **Year 10 & 11 Science**

#### **Why this subject is important:**

The study of science fires pupils' curiosity about the world and helps them to find explanations. It links practical experience with scientific ideas. Pupils learn that science enhances knowledge and understanding in science is rooted in evidence. Pupils discover how science

and technology affects industry, business and medicine and how science improves the quality of life. Pupils appreciate science worldwide and discover how it relates to their own culture. Pupils also gain confidence to question and discuss issues that may affect their own lives, their immediate community and the world.

**What you will learn:**

Unit name	Topics	Skills and understanding	Skills Curriculum links
Unit 2: Chemistry and our Earth.	Controlling Industrial Reactions.	<p>Analyse how different factors affect the rate and yield of an industrial reaction.</p> <p>Explain how different factors affect the rate of industrial reactions.</p> <p>Explain the terms 'yield' and 'atom economy' in relation to specific chemical reactions.</p> <p>Describe the factors that can affect the rates of chemical reactions.</p> <p>Identify the number and types of atoms in balanced chemical equations.</p>	<p>Progression into A-Level Sciences or level 3 BTEC Science. Links to Unit 1 principles of Science.</p> <p>Links to Unit 1: Principles of Applied Science.</p>
	Useful Chemical Products.	<p>Describe how chemical substances are used based on their physical properties.</p> <p>Explain how the physical and chemical properties of chemical substances make them suitable for their uses.</p> <p>Assess the suitability of different types of substances for a specified use.</p>	<p>Links to Unit 1: Principles of Applied Science.</p>
	Chemical Reactivity and Bonding.	<p>Explain the trends in chemical properties of group 1 and 7 elements in terms of electronic structure.</p> <p>Describe trends in the physical and chemical properties of group 1 and 7 elements.</p>	

<p>Unit 3: Energy and our Universe.</p>	<p>Affecting the Environment</p>	<p>Describe the physical and chemical properties of group 1 and 7 elements. Relate applications of compounds to their properties and their bonding and structure. Explain the properties of ionic and covalent substances. Describe the formation of ionic and covalent substances. Compare properties of ionic and covalent substances. Draw dot-and-cross diagrams of simple ionic and covalent substances.</p>	<p>Links to Unit 1: Principles of Applied Science.</p>
	<p>.</p>	<p>Describe natural factors that have changed the surface and atmosphere of the Earth. Be able to describe the impact of earthquakes, volcanoes and tsunamis on the Earth. Describe the human activities that affect the Earth and its environment including transportation, carbon dioxide and population increase. Discuss the extent to which human activity has changed the environment, in comparison to natural activity. Evaluate possible solutions to changes in the environment, occurring from natural or human activity.</p>	<p>Links to Unit 1: Principles of Applied Science.</p>
	<p>Ionising Radiation.</p>	<p>Describe half-life in terms of radioactive decay. Describe the different types of ionising radiation. Use graphs to explain radioactive decay and half-life.</p>	



	<p>Green Electricity.</p>	<p>Calculate the half-life of radioactive isotopes. Describe the problems associated with the use of radioactive isotopes. Compare the benefits and drawbacks of using radioactive isotopes in the home or workplace. Justify the selection of a radioactive isotope for a given use within the home or workplace.</p> <p>Assess the suitability of different types of substances for a specified use.</p> <p>Use <math>V = IR</math> to predict values in electric circuit investigations. Describe methods of producing a.c. and d.c. electricity. Compare the efficiency and environmental impact of electricity generated by different sources. Describe how electricity is transmitted to the home or industry. Describe methods of producing AC And DC. electricity. Assess, in qualitative terms, ways to minimise energy losses when transmitting electricity. Assess, in quantitative terms, ways to minimise energy losses either when transmitting electricity or when transforming electricity into other forms for consumer applications.</p>	<p>Links to Useful Chemical Products, Green Electricity, Survival in the gene.</p> <p>Links to Unit 1: Principles of Applied Science.</p> <p>Links to Maths Curriculum ks3&amp;4 – using equations / rearranging equations.</p> <p>Links to Useful Chemical Products, Green Electricity, Survival in the gene.</p> <p>Links to Unit 1: Principles of Applied Science.</p> <p>Links to Maths Curriculum ks3&amp;4 – using equations / rearranging equations.</p>
	<p>The Final Frontier.</p>	<p>Describe how the Universe and the Solar System were formed.</p>	

<p>Unit 4: Biology and our Environment.</p>	<p>Is Survival In The Genes?</p>	<p>Describe the suitability of different methods for observing the Universe. Describe the structure of the Universe and our Solar System. Evaluate the evidence leading to the Big Bang theory of how the Universe was formed. Explain how evidence shows that the Universe is changing. Identify evidence that shows the dynamic nature of the Universe.</p> <p>Describe how characteristics are used to classify organisms. Describe the different ways in which organisms show interdependence. Discuss the factors that affect the relationship between different organisms. Describe the role of genes and the environment in variation. Explain the role of genes and the environment in evolution. Evaluate the impact of genes and the environment on the survival or extinction of organisms.</p>	<p>Links to Unit 1: Principles of Applied Science.</p> <p>Links to Unit 1: Principles of Applied Science.</p>
	<p>How Polluted Is The Enviro nment?</p>	<p>Describe how living and non-living indicators can be used to measure levels of pollutants. Describe the impact that different human activities have on ecosystems. Analyse the effects of pollutants on ecosystems. Explain the long-term effects of pollutants on living organisms and ecosystems.</p>	





<http://www.bbc.co.uk/schools/gcsebitesize/science/aqa>  
[www.samlearning.com](http://www.samlearning.com)

**Progression routes and career opportunities:**

BTEC levels 2 Applied Science progresses to BTEC Level 3 Science / A Level Sciences.

Electrician  
Geneticist  
Construction  
Environmentalist  
Medical sciences  
Lab technicians  
Life sciences  
Sports Science

**Who to contact and how if you have a query regarding your child:**

<b>Name</b>	<b>Position</b>	<b>Email Address</b>	<b>Telephone</b>
<b>Mr Sean O'Sullivan</b>	<b>Science Co-ordinator</b>	<b>sosullivan@haileyhall.herts.sch.uk</b>	<b>01992 465208</b>