

Primary Phase Long Term Plan

Science



William Hulme's Grammar School
The best in everyone™
Part of United Learning

Overview

Science at William Hulme's is about developing children's ideas and ways of working that enable them to make sense of an ever-changing and developing world: we aim to give all pupils memorable life and learning experiences through a broad and balanced curriculum. We also aim to ensure that all pupils see themselves in our curriculum, and our curriculum takes all pupils beyond their immediate experience of the world. Children who feel confident in their science knowledge and enquiry skills will be excited about science, show that they are actively curious to learn more and will see the relevance of what they learn in science lessons to real-life situations and the importance of science in the real world.

Our high-quality Science curriculum provides the foundations for understanding the world. Throughout the curriculum, children are made aware of how Science has changed our lives and understand how it is vital for the world's future success.

There are **six key principles** that shape our curriculum intent in science, these are:

Entitlement- every pupil has the right to learn all aspects of the curriculum.

Coherence- learning is built upon term by term, as well as year-on-year.

Adaptability- our curriculum is adapted, where necessary, to suit the needs or interests of our pupils.

Representation- a diverse and inclusive curriculum is provided, in which pupils see themselves.

Mastery- providing depth to learning.

Education with Character- opportunities to nurture pupils Spiritual, Moral, Social, Cultural (SMSC) needs are created- where possible.

All pupils, regardless of their starting point, are given equal opportunities to develop their knowledge and love for Science, and are taught the essential aspects of the knowledge, methods, processes and uses of Science. Children are immersed in Scientific vocabulary and they are encouraged to make connections between other topics, other subjects, their local area and the world around them, in order to ensure high retention of the knowledge they acquire. Teachers, equipped with a good knowledge of Rosenshine's Principles of Instruction, help to guide and excite pupils through their effective planning and teaching, while the growth mindset culture throughout school, which teaches children to be independent and curious, encourages pupils to take responsibility for their learning and follow their own lines of enquiry. Our Forest Schools programme also allows children to deepen their knowledge of the world and develop an excitement for natural phenomena through practical learning.

Vertical Concept Overview

Vertical Concept	Key Questions/Definition	Units
Biology	The study of life and living organisms.	Year 1: Plants, Seasonal Changes, Animals and Humans Year 2: Plant Growth, Needs of Animals and Livings Things & Habitats Year 3: Organisms and Plants Year 4: Classifying Organisms and Food & Digestion Year 5: Energy, Life Cycles and Human Development Year 6: Evolution, Further Classification and Functions of the Human Body
Chemistry	The study of the properties and characteristics of matter. Including physical and chemical changes.	Year 1: Everyday Materials Year 2: Uses of Materials, Solids, Liquids & Gases Year 3: Rocks Year 4: Particle Model & States of Matter and Properties of Materials

		Year 5: Separating Mixtures and Energy Year 6: Physical and Chemical Changes
Physics	The study of the properties of matter and energy, including the relationships between them.	Year 1: Seasonal Changes Year 2: N/A Year 3: Light, Forces & Motion and Magnetism Year 4: Sounds and Electricity Year 5: Energy, Forces and Earth & Space Year 6: Light

Early Years

	Nursery	Reception	Assessment
Autumn Term 1	Unit: Seasonal Changes Vertical Concept: Biology and Physics Overview: <ul style="list-style-type: none"> identify appropriate clothes to go outside in different types of weather we see puddles when it's rainy, shadows during the day and rainbows when there is sunshine and rain some animals, like hedgehogs, hibernate in the winter Types of weather include sunny, rainy, windy, snowy habitats are the places that living things live different animals live in different habitats 	Unit: Everyday Materials Vertical Concept: Biology and Physics Overview: <ul style="list-style-type: none"> explore natural and man-made materials some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, and some are dull whilst others are shiny comparing things that float and sink 	Formative assessment through observations and follow-up activities
Autumn Term 2	Unit: Everyday Materials Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> explore natural and man-made materials some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, and some are dull whilst others are shiny 	Unit: Light Vertical Concept: Physics Overview: <ul style="list-style-type: none"> sources of light/light and dark 	

	Nursery	Reception	Assessment
Spring Term 1	Unit: States of Matter Vertical Concepts: Physics Overview: <ul style="list-style-type: none"> melting and freezing can be observed in the world around us 	Unit: Seasonal Changes Vertical Concept: Biology and Physics Overview: <ul style="list-style-type: none"> identify appropriate clothes to go outside in different types of weather different animals live in different habitats observing the changes of the seasons and the effects of wind observing the properties of water and ice 	Formative assessment through observations and follow-up activities

Spring Term 2	Unit: Forces Vertical Concepts: Physics Overview: <ul style="list-style-type: none">• how slow/fast a vehicle moves along a track depends on how hard/gently it is pushed/pulled, how steep the slope is, or whether there is an obstacle in its way.	Unit: Life Cycles Vertical Concepts: Biology Overview: <ul style="list-style-type: none">• animals look different when they age• parents and their young animals look similar and different.• life cycle of a Frog	
	Unit: Lifecycles Vertical Concepts: Biology Overview: <ul style="list-style-type: none">• animals look different when they age• parents and their young animals look similar and different.	Unit: Plants Overview: Biology <ul style="list-style-type: none">• plants need water and light to grow• growing Sunflowers	
	Unit: Plant Growth Vertical Concept: Biology Overview: <ul style="list-style-type: none">• plants need water and light to grow	Unit: Everyday Materials Vertical Concept: Chemistry Overview: <ul style="list-style-type: none">• explore natural and man-made materials• some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, and some are dull whilst others are shiny• comparing things that float and sink• making Pancakes – observing changes in materials	
	Unit: Living Things and their Habitats Vertical Concept: Biology Overview: <ul style="list-style-type: none">• the Serengeti is a grassland, with habitats home to animals		
	Unit: Humans Vertical Concept: Biology Overview: <ul style="list-style-type: none">• healthy eating		

	Nursery	Reception	Assessment
Summer Term 1	Unit: Everyday Materials Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> some materials will dissolve in water – making playdough 	Unit: Humans Vertical Concept: Biology Overview: <ul style="list-style-type: none"> healthy eating our bodies – understanding why we have a skeleton 	Formative assessment through observations and follow-up activities
Summer Term 2	Unit: Lifecycles Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> planting seeds – observing the lifecycle of a plant from the seed/seedling/plant life-cycle of butterfly insects and their habitats 	Unit: Living things and their habitats Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> many animals live in water, like turtles, orcas, dolphins, manta rays, sharks, seahorses and jellyfish 	

Key Stage One

	Year 1	Year 2	Assessment
Autumn Term 1	Unit: Plants Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> identify and name a variety of common wild and garden plants, including deciduous and evergreen trees identify and describe the basic structure of a variety of common flowering plants, including trees 	Unit: Plant Growth Vertical Concept: Biology Overview: <ul style="list-style-type: none"> observe and describe how seeds and bulbs grow into mature plants find out and describe how plants need water, light and a suitable temperature to grow and stay healthy 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Autumn Term 2	Unit: Everyday Materials Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> distinguish between an object and the material from which it is made identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock describe the simple physical properties of a variety of everyday materials 	Unit: Needs of Animals Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> notice that animals, including humans, have offspring which grow into adults find out about and describe the basic needs of animals, including humans, for survival (water, food and air) describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene 	

	Year 1	Year 2	Assessment
Spring Term 1	Unit: Seasonal Changes (Autumn to Winter) Vertical Concepts: Biology and Physics Overview: <ul style="list-style-type: none"> observe changes across the four seasons observe and describe weather associated with the seasons and how day length varies 	Unit: Uses of Everyday Materials Vertical Concepts: Chemistry Overview: <ul style="list-style-type: none"> identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks.

Spring Term 2	Unit: Seasonal Changes (Spring to Summer) Vertical Concepts: Biology and Physics Overview: <ul style="list-style-type: none"> observe changes across the four seasons observe and describe weather associated with the seasons and how day length varies 	Unit: Living things and their Habitats Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> basic introduction to habitats and micro-habitats, and simple food chains everything in the world can be categorised as either alive, used to be alive or has never been alive. living things move, reproduce, are sensitive to their surroundings, grow, need oxygen, get rid of their waste, and need nutrition animals and plants move 	<ul style="list-style-type: none"> Opportunities for practical lessons
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	Year 1	Year 2	Assessment
Summer Term 1	Unit: Animals Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> Naming reptiles, fish, amphibians, birds and mammals; carnivores, herbivores, omnivores 	Unit: Solids, Liquids and Gases Vertical Concepts: Chemistry Overview: <ul style="list-style-type: none"> all materials are made of a single substance or a mixture of substances there are three states of matter substances can exist as solids, liquids and gases the three states of matter have different properties 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Summer Term 2	Unit: Humans Vertical Concept: Biology Overview: <ul style="list-style-type: none"> human body parts and senses 	Unit: Solids, Liquids and Gases Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> we can decide if a substance is in its solid, liquid or gaseous state by looking at its properties one substance can exist in the different states, when the substance is in a different state it is still the same substance 	

Lower Key Stage Two

	Year 3	Year 4	Assessment
Autumn Term 1	Unit: Rocks Vertical Concepts: Rocks Overview: <ul style="list-style-type: none"> compare and group together different kinds of rocks on the basis of their appearance and simple physical properties describe in simple terms how fossils are formed when things that have lived are trapped within rock recognise that soils are made from rocks and organic matter Understand who Inge Lehmann was. 	Unit: Classifying Organisms Vertical Concept: Biology Overview: <ul style="list-style-type: none"> recognise that living things can be grouped in a variety of ways explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment recognise that environments can change and that this can sometimes pose dangers to living things. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Autumn Term 2	Unit: Light Vertical Concepts: Physics Overview: <ul style="list-style-type: none"> recognise that they need light in order to see things and that dark is the absence of light notice that light is reflected from surfaces recognise that light from the sun can be dangerous and that there are ways to protect their eyes recognise that shadows are formed when the light from a light source is blocked by a solid object find patterns in the way that the size of shadows change 	Unit: Food and Digestion Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> describe the simple functions of the basic parts of the digestive system in humans identify the different types of teeth in humans and their simple functions construct and interpret a variety of food chains, identifying producers, predators and prey. 	

	Year 3	Year 4	Assessment
Spring Term 1	Unit: Animals including Humans Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat identify that humans and some other animals have skeletons and muscles for support, protection and movement. 	Unit: Particle Model and States of Matter Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> the different substances in their different forms (solids, liquids and gases) are all made of particles the particles in the different states of matter are arranged differently investigate the effect of temperature on the rate of evaporation observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons

Spring Term 2	Unit: Plants Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant investigate the way in which water is transported within plants explore the part that flowers play in the life cycle of flowering plants, including pollination, seed 	Unit: Sound Vertical Concept: Physics Overview: <ul style="list-style-type: none"> identify how sounds are made, associating some of them with something vibrating recognise that vibrations from sounds travel through a medium to the ear find patterns between the pitch of a sound and features of the object that produced it find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that sounds get fainter as the distance from the sound source increases. 	

	Year 3	Year 4	Assessment
Summer Term 1	Unit: Forces and Motions Vertical Concepts: Physics Overview: <ul style="list-style-type: none"> introducing pushes and pulls; opposing forces, and balanced forces forces are pushes or pulls forces arise when objects interact with each other forces can cause a change in speed, direction or shape of an object forces that act in opposite directions are called opposing forces. we use arrows to show the size of the force and the direction it acts in. forces that are equal and act in opposite directions are described as balanced forces, when forces are balanced, an object will move at a constant speed in the same direction. unbalanced forces can change the shape of an object. 	Unit: Electricity Vertical Concept: Physics Overview: <ul style="list-style-type: none"> identify common appliances that run on electricity construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit recognise some common conductors and insulators, and associate metals with being good conductors. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons

<p>Summer Term 2</p>	<p>Unit: Forces and Magnetism</p> <p>Vertical Concepts: Physics</p> <p>Overview:</p> <ul style="list-style-type: none"> • compare how things move on different surfaces • notice that some forces need contact between two objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having two poles • predict whether two magnets will attract or repel each other, depending on which poles are facing. 	<p>Unit: Properties of Materials</p> <p>Vertical Concepts: Chemistry</p> <p>Overview:</p> <ul style="list-style-type: none"> • physical properties are properties that we can measure or observe in the classroom • physical properties include electrical conductivity; melting and boiling points; thermal conductivity; being malleable; windproof; hard/soft; and magnetic • energy will be transferred from places with a higher temperature to places with a lower temperature. • elasticity is a physical property. • elastic materials can stretch and then return to its original form. • chemical properties are properties that scientists need specialist equipment to measure • chemical properties include how easy a substance is to set on fire (flammability) or how poisonous something is (toxicity) 	
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Upper Key Stage Two

	Year 5	Year 6	Assessment
Autumn Term 1	Unit: Separating Mixtures Vertical Concepts: Chemistry Overview: <ul style="list-style-type: none"> compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic demonstrate that dissolving, mixing and changes of state are reversible changes explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. 	Unit: Electricity Vertical Concept: Physics Overview: <ul style="list-style-type: none"> associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches use recognised symbols when representing a simple circuit in a diagram. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Autumn Term 2	Unit: Energy Vertical concepts: Biology, Chemistry and Physics Overview: <ul style="list-style-type: none"> energy is needed by both living and non-living things. energy can be transferred from one store to another store fossil fuels and batteries are examples of chemical energy stores energy resources such as oil, gas and coal can be depleted. energy stores are needed for something to happen when energy is removed from one store and is transferred to another store, the amount of energy in the first store goes down and the amount of energy in the second store goes up energy is not used up it is just moved around from store to store. energy can be stored thermally in the surroundings 	Unit: Evolution and Inheritance Vertical concepts: Biology Overview: <ul style="list-style-type: none"> recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. 	

	Year 5	Year 6	Assessment
Spring Term 1	Unit: Lifecycles Vertical Concept: Biology Overview: <ul style="list-style-type: none"> describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird describe the life process of reproduction in some plants and animals 	Unit: Light Vertical Concept: Physics Overview: <ul style="list-style-type: none"> recognise that light appears to travel in straight lines use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Spring Term 2	Unit: Animals including Humans Vertical concepts: Biology Overview: <ul style="list-style-type: none"> describe the changes as humans develop to old age. the human life cycle goes through the same stages as those for other animals: fertilisation, gestation, growth fertilisation in most humans is internal, but it can happen externally (in vitro fertilisation - IVF - which means 'in glass' fertilisation) the human life cycle: embryo, foetus, infant, child, adolescent, adult, senior human are viviparous and a foetus develops inside the mother (or surrogate mother) the bigger the animal, the longer the gestation period a foetus is considered a baby when it is born cognitive, physical and social and emotional development takes place at the greatest rate during infancy 	Unit: Further Classification Vertical concept: Biology Overview: <ul style="list-style-type: none"> describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals give reasons for classifying plants and animals based on specific characteristics. 	

	Year 5	Year 6	Assessment
Summer Term 1	Unit: Forces Vertical Concepts: Physics Overview: <ul style="list-style-type: none"> explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object identify the effects of air resistance, water resistance and friction, that act between moving surfaces recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. 	Unit: Functions of the Human Body Vertical Concepts: Biology Overview: <ul style="list-style-type: none"> identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function describe the ways in which nutrients and water are transported within animals, including humans. 	<ul style="list-style-type: none"> Low stakes pre and post learning quiz via Microsoft Forms. Formative assessments during every lesson include: a review, verbal feedback, a range of questioning techniques and mini whiteboard tasks. Opportunities for practical lessons
Summer Term 2	Unit: Earth and Space Vertical Concepts: Physics Overview: <ul style="list-style-type: none"> describe the movement of the Earth, and other planets, relative to the Sun in the solar system describe the movement of the Moon relative to the Earth describe the Sun, Earth and Moon as approximately spherical bodies use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. 	Unit: Physical and Chemical Changes Vertical Concept: Chemistry Overview: <ul style="list-style-type: none"> identifying physical and chemical changes a mixture is two or more substances that are mixed but not chemically joined together distillation is a separating technique that can separate a solvent from a solution. It relies on evaporation and condensation. chromatography is a separation technique in which a mixture is dissolved into a solvent, and the components of the mixture are carried by the solvents at different rates. a chemical change is a change where a new substance is formed. a physical change is where the substance changes its properties, but it does not become a different substance some chemical changes are irreversible, but some can be reversed most physical changes are reversible but some are not chemical reactions can be summarized using word equations. word equations show the names of the chemicals reacting and the names of the products formed. 	

Useful Resources for Supporting Your Child at Home:	Homework:
<ul style="list-style-type: none"> BBC Bitesize – Science Explorify website WOW Science website 	<ul style="list-style-type: none"> Link current science topic to everyday experiences and discussions Make a poster or leaflet about your current topic