

# Coleshill Heath School

## Science Handbook



2019-2020

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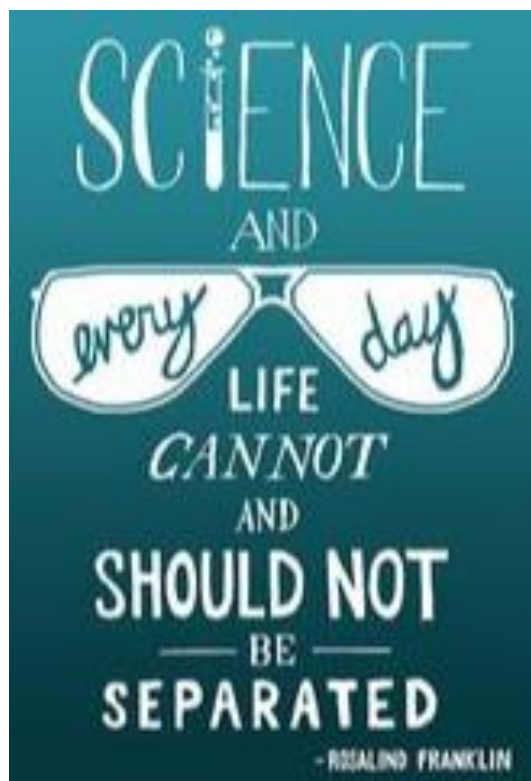
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### National Curriculum Expectations for Science

A high quality science education provides the **foundations for understanding the world** through the specific disciplines of biology, chemistry and physics. Science **has changed our lives and is vital to the world's future prosperity**, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, **pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena**. They should be encouraged to **understand how science can be used to explain what is occurring**, predict how things will behave, and analyse causes.

**The New National Curriculum for science aims to ensure that all pupils:**

- 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 knowledge required to understand the uses and implications of science, today and for the future

### CHS Science Vision

For all pupils to foster a love and curiosity of science and develop a deep and meaningful understanding of the world around them.

### CHS Science Aims

- To foster positive attitudes, a curiosity and a sense of excitement of natural phenomena through the teaching and learning of scientific concepts and enquiry.
- To broaden children's knowledge and understanding of how science has changed our lives and is vital to the world's prosperity by making science meaningful and relevant to our pupils' lives.
- To use a wide range of scientific enquiry methods to build independence in answering relevant questions and in asking their own.
- To enable our pupils to articulate scientific concepts clearly and precisely through discussion and access to the teaching of high level scientific vocabulary.
- To enable our pupils to confidently challenge their own, and others' misconceptions about the world around them, recognising the power of rational explanation.

## Key Elements of our teaching and learning

At Coleshill Heath we strive for all teachers to deliver high quality, effective science lessons based on a secure foundation of subject knowledge and pedagogy.

The Teaching and Learning of science at Coleshill Heath should include all of the below in a sequence of lessons:

### Vocabulary Development

The quality and variety of language that pupils hear and speak are key factors in developing their scientific concepts clearly and precisely. Pupils need the opportunity to experience and be exposed to a wide range of scientific vocabulary at all ages and have the chance to use the correct scientific vocabulary within lessons. Pupils must be assisted in making their thinking clear, both to themselves and to others and teachers should ensure that pupils build secure foundations by using discussion to discover and remedy misconceptions.

### Knowledge Acquisition

The process of acquiring, processing and understanding information is fundamental to pupils understanding the world around them. Acquiring new knowledge often happens through visual, aural and tactile signals, therefore pupils needs to be given the opportunity to experience the world around them for themselves. Images, sounds and use of concrete manipulatives will make it easier for pupils to understand new concepts and make meaningful links. To embed this new knowledge in to the long term memory, pupils should be frequently applying it and using it across the curriculum.

### Scientific Enquiry

Scientific enquiry should be embedded within the content of biology, chemistry and physics and not taught as a separate strand. A range of opportunities should be provided, which expose pupils to a variety of scientific enquiry methods. As pupils progress through the national curriculum, they should learn to use these approaches independently to answer relevant questions.

The types of scientific enquiry should include:

- Observing over time
- Asking questions
- Pattern seeking
- Identifying, classifying and grouping
- Comparative and fair testing (controlled investigations)
- Researching and using secondary sources

Through scientific enquiry, pupils should apply mathematical and numerical skills in enabling them to collect, represent and analyse data in order to answer scientific questions. Scientific enquiry must be relevant to the overall learning outcome and should be used to apply previous or discover new knowledge.

## Science Expectations and CHS

### Learning Journey

In order to make good progress within science, pupils need to have solid foundations of the key concepts and vocabulary and being confident in articulating ideas. They need to be able to draw on their knowledge and skills and make links across the science curriculum and across the wider curriculum. Throughout the pupil's learning journey, it is important to provide opportunities to revisit previously taught concepts and continually address any misconceptions. Following the National Curriculum, science lessons should provide opportunities for both knowledge acquisition and scientific enquiry.

### Start of the new topic –

Introduce pupils to KWL grids which have questions relating to each of the curriculum strands for that topic. At the start of the topic, give children time to answer the questions based on what they already know. If they do not know anything, they can leave it blank. Throughout the unit, at the end of each lesson, pupils should return to the KWL grid and update it with what they have learned. After having time to independently complete the grid, have a class discussion and share ideas. Use this to address and make note of any misconceptions.

Introduce Knowledge organisers and explain how to use them.

- One to be stuck in the books as a starter to the new topic
- One to go home to parents / put on class Dojo for pupils to use at home

### Start of the lesson – AFL – 15 mins

Mini quiz to be stuck in the children's book with questions to assess pupil's previous learning and current learning.

There should be a minimum of 2 questions to assess knowledge from a previous topic and 2 questions to assess the current topic.

Science Mini Quiz		
What I know from last term / year	True or False	Correction
What I know from last lesson	True or False	Correction

These questions could take the form of True / False questions, with an opportunity to challenge children to input the correct answer if they disagree with the statement so that they can show their thinking. The questions may also be retrieval style questions whereby children have to recall information. The types of questions and style of answering will be dependent on what is appropriate to the Key Stage and class.

Mini quizzes should be marked in class, with the pupils and any misconceptions should be addressed and clarified at this point. Ensure common misconceptions are continually revisited to ensure the correct knowledge is embedded.

### Main Teaching

**What are the children learning?** Discuss and share the learning objective and link it to the KWL grid.

**What vocabulary do the pupils need?** Explicitly teach scientific vocabulary which is relevant to the lesson.

**How are pupils going to acquire the knowledge?** Think about what you want the outcome of the lesson to be, and how best to get the children there. Use a mixture of visual, aural and tactile signals, which are relevant to the pupils, to help them deepen their understanding and make connections.

**What scientific enquiry will support the knowledge acquisition?** Try to incorporate scientific enquiry in to every lesson but make sure it is relevant and will deepen the knowledge. Although a specific type of enquiry may be engaging, it must be useful to the topic and age range of the pupils. Enquiry will be more effective when pupils are able to explore for themselves and answer their own questions.

### Plenary

At the end of the lesson pupils should be able to summarise their learning and discuss it with others. If there are any misconceptions, these should be addressed here. For practical activities, discussion what pupils have found and reasons why their results might not fit with what they expected.

### Assessment - End of Each Unit

At the end of each unit, use the Twinkl summative assessment to independently assess the pupils on the knowledge and skills they have acquired during the specific unit taught. Upload these results on to Insight and use the data to identify misconceptions that are still held and to inform planning for mini quizzes to make sure any gaps in knowledge are addressed.



**National Curriculum Units**

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Plants	Plants	Plants			
Animals Including Humans	Animals Including Humans	Animals Including Humans	Animals Including Humans	Animals Including Humans	Animals Including Humans
Everyday Materials	Everyday Materials		States of Matter	Properties and changes of materials	
Seasonal Changes					
	Living Things and their Habitats		Living Things and their Habitats	Living Things and their Habitats	Living Things and their Habitats
		Rocks			
		Light			Light
		Forces and Magnets		Forces	
			Sound		
			Electricity		Electricity
				Earth and Space	
					Evolution and Inheritance



## Progression across year groups

### Working Scientifically

Year 1 and 2	Year 3 and 4	Year 5 and 6
Can ask simple questions and recognises that they can be answered in different ways	Can ask relevant questions and use different types of scientific enquiries to answer them	
Can observe closely, using simple equipment	Can make systematic and careful observations	
Can perform simple tests	Can set up simple practical enquiries including comparative and fair tests	Can recognise and control variables in an investigation where necessary
Can identify and compare objects, materials and living things	Can take accurate measurements using standard units and using a range of equipment	Can take measurements, using a range of scientific equipment, with increasing accuracy and precision
Can classify objects, materials and living things	Can gather and record data	
	Can classify and present data in a variety of ways to help answer questions	
	Can recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables	Can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
Can talk about what they have found out and how they found it out	Can reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	Can report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results
Can gather and record data in order to answer questions	Can use results to draw simple conclusions and make predictions	Can use test results to make predictions to set up further comparative and fair tests
Can use their observations and ideas to suggest answers to questions	Can suggest improvements to investigations and raise further questions	Can plan different types of scientific enquiries to answer questions
	Can identify differences, similarities or changes related to simple scientific ideas and processes	
	Can use straightforward scientific evidence to answer questions or to support their findings.	Can identify scientific evidence that has been used to support or refute ideas or arguments



### Animals including humans

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals	notice that animals, including humans, have offspring which grow into adults	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	describe the simple functions of the basic parts of the digestive system in humans	describe the changes as humans develop to old age.	identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
identify and name a variety of common animals that are carnivores, herbivores and omnivores	find out about and describe the basic needs of animals, including humans, for survival (water, food and air)	identify that humans and some other animals have skeletons and muscles for support, protection and movement.	identify the different types of teeth in humans and their simple functions		recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)	describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene		construct and interpret a variety of food chains, identifying producers, predators and prey		describe the ways in which nutrients and water are transported within animals, including humans
identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense					

## Materials

Year 1	Year 2	Year 4	Year 5
distinguish between an object and the material from which it is made	identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses	compare and group materials together, according to whether they are solids, liquids or gases	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
identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock	find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	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)	know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
describe the simple physical properties of a variety of everyday materials		identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
compare and group together a variety of everyday materials on the basis of their simple physical properties.			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

### Living things and their habitats

Year 2	Year 4	Year 5	Year 6
explore and compare the differences between things that are living, dead, and things that have never been alive	recognise that living things can be grouped in a variety of ways	describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird	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
identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other	explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment	describe the life process of reproduction in some plants and animals.	give reasons for classifying plants and animals based on specific characteristics.
identify and name a variety of plants and animals in their habitats, including microhabitats	recognise that environments can change and that this can sometimes pose dangers to living things		
describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food			

## Plants

Year 1	Year 2	Year 3
Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	Observe and describe how seeds and bulbs grow into mature plants.	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
Identify and describe the basic structure of a variety of common flowering plants, including trees	Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	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 formation and seed dispersal

## Light

Year 3	Year 6
recognise that they need light in order to see things and that dark is the absence of light	recognise that light appears to travel in straight lines
notice that light is reflected from surfaces	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
recognise that light from the sun can be dangerous and that there are ways to protect their eyes	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
recognise that shadows are formed when the light from a light source is blocked by an opaque object	use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
find patterns in the way that the size of shadows change	

### Forces

Year 3	Year 5
compare how things move on different surfaces	explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
notice that some forces need contact between two objects, but magnetic forces can act at a distance	identify the effects of air resistance, water resistance and friction, that act between moving surfaces
observe how magnets attract or repel each other and attract some materials and not others	recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect
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.	

### Electricity

Year 4	Year 6
identify common appliances that run on electricity	associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers	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
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	use recognised symbols when representing a simple circuit in a diagram.
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	