



**HCAT**

**Working Scientifically**

## Purpose of study

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.

## Aims

The 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 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.

'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content

## Key Stage 1

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking simple questions and recognising that they can be answered in different ways
- observing closely, using simple equipment
- performing simple tests
- identifying and classifying
- using their observations and ideas to suggest answers to questions
- gathering and recording data to help in answering questions.

## Lower Key Stage 2

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

## Upper Key Stage 2

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

<b>Working Scientifically</b>	<b>Scientific Testing</b>	<b>Incerts Assessments</b>	<b>Year 1</b> <b>To be able to ask simple questions.</b>	<b>Year 2</b> <b>To be able to ask simple questions and recognise that they can be answered in different ways.</b>	<b>LKS2</b> <b>To ask relevant questions and use different types of scientific enquiries to answer them.</b>	<b>UKS2</b> <b>To plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.</b>
			I ask questions about what I see. I contribute to class discussion in science. I know why I am trying to find things out.	I find information from books or other printed and screen sources I begin to give reasons to support my ideas	I recognise why it is important to collect data to answer questions. I use a range of texts to investigate science topics. I act on suggestions and put forward my own ideas about how to find the answer to a question. I predict what might happen before I carry out any tests. With help, I can carry out a fair test and explain why it was fair.	I find an appropriate approach when trying to answer a question I experiment with a range of methods to ensure I have the correct approach to a given task I work both individual and in groups to make improvements to my work I make practical suggestions about how my working methods can be improved
	<b>Using Equipment</b>	<b>Incerts Assessments</b>	<b>To be able to observe closely using simple equipment.</b>	<b>To perform a simple test.</b>	<b>To set up simple practical enquiries, comparative and fair tests.</b>	<b>To take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.</b>
			I can use simple equipment to investigate. I give some reasons why some things might happen.	I use all of my senses to observe so that I can try to answer questions I make measurements using simple equipment	I measure length, mass, time and temperatures using suitable equipment. I give reasons for my observations. I use scientific vocabulary to describe my observations. I can use a variety of ways to gather information. I can use a variety of ways to record my findings. I can use a variety of ways to classify information. I can present data in different ways.	I record observations and measurements systematically I make a series of precise observations, comparisons and measurements when completing scientific tasks I select appropriate apparatus for a task I repeat observations and measurements and offer explanations for any differences I encounter

	<b>Incerts Assessments</b>	<b>To record data from a simple test.</b>	<b>To be able to gather, record, classify and present data in a variety of ways to answer questions</b>	<b>To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</b>	<b>To record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables scatter graphs, bar and line graphs</b>
<b>Recording Data</b>	To record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables scatter graphs, bar and line graphs	I can put information on a chart. I can suggest ways to answer my question.	I act on suggestions about how to find things out I can use simple equipment to carry out a test	I begin to record relevant information from text and screen sources. I record my observations, comparisons and measurements using tables, charts, text and labelled diagrams. I can report my findings to others in a variety of ways.	I use the computer to collect data (data logging) I select appropriate sources from a range of information I plan to use this apparatus effectively in my work I present data as line graphs where appropriate I can select other appropriate charts and tables to present my findings
	<b>Incerts Assessments</b>	<b>To be able to identify and classify animals and objects</b>	<b>To be able to use their observations and ideas to suggest answers to questions</b>	<b>To report findings from scientific enquiries including oral and written explanations, displays or presentations of results and conclusions</b>	<b>To use test results to make predictions to set up further comparative and fair tests</b>
<b>Conclusions</b>		I can sort animals according to a given criteria. I can sort objects according to a given criteria.	I can sort animals according to a given criteria. I can sort objects according to a given criteria.	I can sort animals according to a given criteria. I can sort objects according to a given criteria. I can use my findings to draw conclusions. I can make predictions from my conclusions. I can generate further questions to test results.	When my investigation involves a fair test, I find and discuss the key factors to be considered I use the key factors to decide on the variables for my experiment I make predictions based on my scientific knowledge and understanding I can give scientific reasons, using my past knowledge, to give reasons for predictions
	<b>Incerts Assessments</b>	<b>To be able to gather and record data in order to answer questions</b>	<b>To use straight forward scientific evidence to answer questions or support their findings</b>	<b>To use straight forward scientific evidence to answer questions or support their findings</b>	<b>To report and present findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral</b>

						and written forms such as displays and other
	Evaluating		I can tell others what I have found out.	I describe my observations using scientific vocabulary I say whether what happened was what I expected	I suggest how I can make improvements to my work I refer back to my observations and measurements when giving explanations	I use appropriate scientific language and conventions to communicate both quantitative and qualitative data I draw conclusions which are consistent with the evidence and relate these to scientific knowledge I use my comparisons to inform my conclusions I give reasons and explanations to support my conclusions
	Using Data		I can use a simple chart to record my findings.	I record my observations on screen and paper using text, tables, drawings and labelled diagrams I compare observations using scientific vocabulary	I look for patterns in my data and try to explain them.	I describe how experimental evidence and creative thinking have been combined to provide a scientific explanation (Jenner's work on vaccination) I spend time investigating experimental evidence and apply knowledge to my own work

Working Scientifically

Year 1 Year 2 Year3 Year 4 Year 5 Year 6