# HCAT

# Science Chemistry Curriculum

## 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.

## Subject content

### Key stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of 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.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

## Lower Key stage 2 – years 3 and 4

The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

'Working 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.

Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

## Upper Key stage 2 – years 5 and 6

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

'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.

Pupils should read, spell and pronounce scientific vocabulary correctly.

| HCAT Science Curriculum Coverage | KS1 | | | | LKS2 | | KS2 | |
|---|---|---|---|---|---|---|---|---|
| | Cycle A | | Cycle B | | Cycle A | Cycle B | Cycle A | Cycle B |
| | | | | | Working Scientifically to be integrated across | | | |
| **Autumn 1** | Animals including humans | | Animals including humans | | Animals Including Humans | Animals Including Humans | Animals Including Humans | Animals including humans |
| **Autumn 2** | Materials: Properties and changes | Seasonal Changes (incl. Working Scientifically) | Use of everyday materials – Working Scientifically | | Light | Electricity (Linked to Santa's Hot Rod DT) | Materials | Electricity |
| **Spring 1** | Animals including humans | | Living Things & Their Habitats | | Forces | Living Things & Their Habitats | Earth and Space | Living Things |
| **Spring 2** | Plants-Working Scientifically | | Living Things & Their Habitats | Seasonal Changes (incl. Working Scientifically) | Magnets | States of Matter | Earth and Space | Plants |
| **Summer 1** | Plants | | Plants | | Plants | Sound | Plants | Light |
| **Summer 2** | Materials: Properties and changes- Working Scientifically | Seasonal Changes (incl. Working Scientifically) | Plants | | Rocks & Fossils | Materials: Properties and changes | Forces | Evolution |

## Science - Chemistry

| | | KS1 | LKS2 | KS2 |
|---|---|---|---|---|
| Materials | Type & uses | I know how to identify what material an object is made from: wood, plastic, glass, metal and rock.<br><br>I know how to identify a range of common materials: wood, plastic, glass, metal, water and rock.<br><br>I know the names of different everyday materials: brick, paper, fabrics, elastic, foil etc.<br><br>I know how to give reasons why a material may or may not be suitable for a certain purpose: wood, metal, plastic, glass, brick, rock, paper and cardboard.<br><br>I know how to identify that a material can be used for more than one purpose. e.g. Metal – coins, cans, cars.<br><br>I know how to identify that different materials can be used for the same purpose. E.g. Spoons – metal, plastic, wood. | | I know how to use scientific vocabulary to explain why materials are used for specific purposes.<br><br>I know how to discuss the scientific physical properties of these materials to explain why they are suitable or unsuitable for different purposes. |
| | Properties | I know how to describe materials by saying what they look like and what they feel like.<br><br>I know how to identify physical properties of different materials: **soft/hard, stretchy/stiff, shiny/dull, rough/smooth, bendy/not bendy, waterproof/not waterproof, absorbent/not absorbent, opaque/transparent.**<br><br>I know how to discuss the physical properties of these common materials, using my senses.<br><br>I know how to describe how the physical properties of a material would make them suitable or unsuitable for a purpose. | I know how to understand the properties of different states of matter. (Solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).<br><br>I know how to describe the structure of solids, liquids and gases.<br><br>I know how to create a representation of the particles in solids, liquids and gases. | I have developed a wide scientific vocabulary for describing the properties of materials: hardness, solubility, transparency, conductivity (electrical and thermal) and magnetic.<br><br>I describe the properties of materials using scientific vocabulary.<br><br>I know how to understand the main properties of metals: lustrous, malleability, conductivity and high melting point.<br><br>I use these properties to distinguish between metals and non-metals. |
| | Comparison | I know how to compare materials using the physical properties of them.<br><br>I know how to use my knowledge of the properties of materials to sort them into groups.<br><br>I know how to explain how I have grouped materials based on their physical properties.<br><br>I know how to use the physical properties of materials to discuss the similarities and differences between them. | I know how to group materials according to whether they are solids, liquids or gases. | I know how to describe the difference in properties of a range of materials: hardness, solubility, transparency, conductivity (electrical and thermal) and magnetic.<br><br>I know how to compare and group materials based on their properties: hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. |
| | Changes | I know how to experiment with squashing, twisting, bending and stretching materials.<br><br>I know how to explain how these processes change materials.<br><br>I know how to use the vocabulary I have gathered on physical properties to describe how the materials change.<br><br>I know how to sort materials into groups for which will or will not change. (Squashing, twisting, bending and stretching). | I know how to record changes in state when objects are heated or cooled (water – ice, water, water vapour).<br><br>***Note – avoid using heat where chemical changes occur e.g. baking or burning***<br><br>I know how to measure the temperature in degrees Celsius when changes in state occur in different materials (water, chocolate, butter, cream)<br><br>I know how to research about changes in state with extreme temperatures. (E.g. iron melts/oxygen condenses)<br><br>I know how to identify the part played by evaporation and condensation in the water cycle.<br><br>I know how to explain how the rate of evaporation changes in water based on the temperature. | I know how to understand reversible and irreversible changes.<br><br>I know how to describe how materials form into a solution.<br><br>I understand that some materials will dissolve in a liquid and form a solution.<br><br>I know how to investigate a range of contexts in which changes take place.<br><br>I know how to describe the difference between melting and dissolving. (Melting – only one material, dissolving – two or more materials)<br><br>***Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage.*** |
| | Separation | | | I understand how a range of mixtures can be separated: evaporating, filtering and sieving.<br><br>I know how to explain the processes of filtering, sieving and evaporating.<br><br>I know how to describe how to recover a substance from a solution as a process.<br><br>I know how to suggest how different mixtures may be separated. (liquids and different sized solids) |

## Science - Chemistry

| | | KS1 | LKS2 | KS2 |
|---|---|---|---|---|
| **Rocks** | Types | | I know how to identify and name a range of rock types: granite, marble, chalk, limestone, slate, sandstone, pumice, basalt, shale.<br><br>I know how to explain the difference between igneous, metamorphic and sedimentary rocks.<br><br>I know how to describe the process of how fossils are formed. | |
| | Properties | | I know how to identify the physical properties of rocks: permeable, durable, density (sinks or floats), hardness.<br><br>I know how to identify if a rock has grains or crystals.<br><br>I know how to suggest uses for types of rocks based on their physical properties. | |
| | Compare | | I know how to compare different kinds of rocks based on their appearance and simple physical properties.<br><br>I know how to group together different kinds of rocks based on their appearance and simple physical properties.<br><br>I know how to investigate what changes occur to rocks: rubbing them together and submerging in water | |
| | Soil | | I know how to describe the main components of soil: rock, humus (dead plants and animals), microorganisms, air and water.<br><br>I know how to understand different types of soils and their properties: sandy soil, clay soil, chalky soil and peat. | |

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