

# Primary Science Curriculum Framework



UNIVERSITY *of* CAMBRIDGE  
International Examinations

## Primary Science Curriculum Framework

This curriculum framework document is based on the primary National Curriculum and the optional exemplar schemes of work produced by the Department for Education and Skills (DfES) in England for upper primary (7 to 11 years).

This detailed framework should facilitate the development of courses that are stimulating for both students and teachers. The knowledge and skills developed should ensure a smooth transition from primary to secondary schooling, particularly for those who will be progressing to the Cambridge Checkpoint scheme and then on to Cambridge qualifications such as GCE O Level or IGCSE.

The Science Curriculum Framework contains a range of teaching objectives divided into four stages (labelled 3 – 6). The age at which a stage is implemented will depend upon the educational context. For example, it might be appropriate for stage 3 Science to be introduced later than the corresponding stage for English or Mathematics, in which case the later stages could be implemented in the early years of secondary schooling.

University of Cambridge International Examinations (CIE) produces the Cambridge International Primary Achievement test in science for the end of primary teaching. This test is moderated in Cambridge and statements of achievement are issued to students.

The Science Curriculum Framework is divided into four strands, as shown below.

- Scientific Enquiry
  - Ideas and evidence in science
  - Planning experimental work
  - Obtaining and presenting evidence
  - Considering evidence and evaluating
- Biology
  - Life processes
  - Humans
  - Plants
  - Ecosystems/environment
- Chemistry
  - Materials
  - States of matter
  - Changes
- Physics
  - Light
  - Sound
  - Electricity and magnetism
  - Forces and motion



## Stage 3: Scientific Enquiry

### Ideas and Evidence in Science

Pupils should be able to:

- Collect evidence in a variety of contexts to answer a question or test an idea

### Plan Experimental Work

Pupils should be able to:

- Suggest ideas, make predictions
- Think about collecting evidence and plan fair tests with help

### Obtain and Present Evidence

Pupils should be able to:

- Observe and compare objects, living things and events
- Measure using simple equipment and record observations in a variety of ways

### Consider Evidence and Evaluate

Pupils should be able to:

- Present results in drawings, bar charts and tables
- Draw conclusions from results and begin to use scientific knowledge to suggest explanations
- Make generalisations and begin to identify simple patterns in results

## Stage 3: Biology

### Life Processes

Pupils should know that:

- Life processes common to humans and other animals include nutrition, movement, growth and reproduction
- Life processes common to plants include growth, nutrition and reproduction

Pupils should be able to:

- Describe differences between living and non-living things using knowledge of life processes
- Sort things into groups, using simple features and describe basis for groupings

### Humans

Pupils should know that:

- All animals, including humans, need water and food to stay alive
- Exercise and an adequate, varied diet is needed to keep healthy
- Some foods can be damaging to teeth

### Plants

Pupils should know that:

- Plants have roots, leaves, stems and flowers
- Plants need water to grow and green plants need light
- Water is taken in through the roots and transported through the stem
- Plants need healthy roots, leaves and stems to grow well
- Plant growth is affected by temperature

## Stage 3: Chemistry

### Materials

Pupils should know that:

- Every material has many properties (e.g. hard, soft, shiny)
- Some materials are magnetic but many are not
- Materials are chosen for specific purposes on the basis of their properties

Pupils should be able to:

- Sort materials according to properties

## Stage 3: Physics

### Forces and Motion

Pupils should know that:

- Pushes and pulls are examples of forces
- Pushes or pulls can make objects start or stop moving
- Sometimes pushes and pulls can change the shape of objects
- Pushes or pulls can make objects move faster or slower or change direction

### Stage 4: Scientific Enquiry

#### Ideas and Evidence in Science

Pupils should be able to:

- Collect evidence in a variety of contexts
- Test an idea or prediction based on scientific knowledge and understanding

#### Plan Experimental Work

Pupils should be able to:

- Suggest questions that can be tested and make predictions
- Design a fair test or plan how to collect sufficient evidence
- Choose apparatus and decide what to measure

#### Obtain and Present Evidence

Pupils should be able to:

- Make relevant observations and comparisons in a variety of contexts
- Measure temperature, time, force and length
- Begin to think about the need for repeated measurements of length
- Present results in bar charts and tables

#### Consider Evidence and Evaluate

Pupils should be able to:

- Identify simple trends and patterns in results and suggest explanations for some of these
- Explain what the evidence shows and whether it supports predictions
- Link evidence to scientific knowledge and understanding in some contexts

### Stage 4: Biology

#### Humans

Pupils should know that:

- Humans (and some other animals) have bony skeletons inside their bodies
- Skeletons grow as humans grow and support the body
- Animals with skeletons have muscles attached to the bones
- A muscle has to contract (shorten) to make a bone move and muscles act in pairs

#### Ecosystems/Environment

Pupils should know that:

- Different animals are found in different habitats and are suited to the environment in which they are found
- Living things and the environment need protection

Pupils should be able to:

- Use simple identification keys

### Stage 4: Chemistry

#### States of Matter

Pupils should know that:

- Matter can be solid, liquid or gas
- Materials change when they are heated and many materials change when they are cooled
- Melting is when a solid turns to a liquid and is the reverse of freezing
- Water turns to steam when it is heated but on cooling the steam turns back to water

### Stage 4: Physics

#### Sound

Pupils should know that:

- Sounds are made when objects, materials or air vibrate
- Sound travels through different materials to the ear
- Some materials are effective in preventing sound from travelling through them
- 'Pitch' describes how high or low a sound is and high and low sounds can be loud or soft
- Pitch can be changed in musical instruments in a range of ways

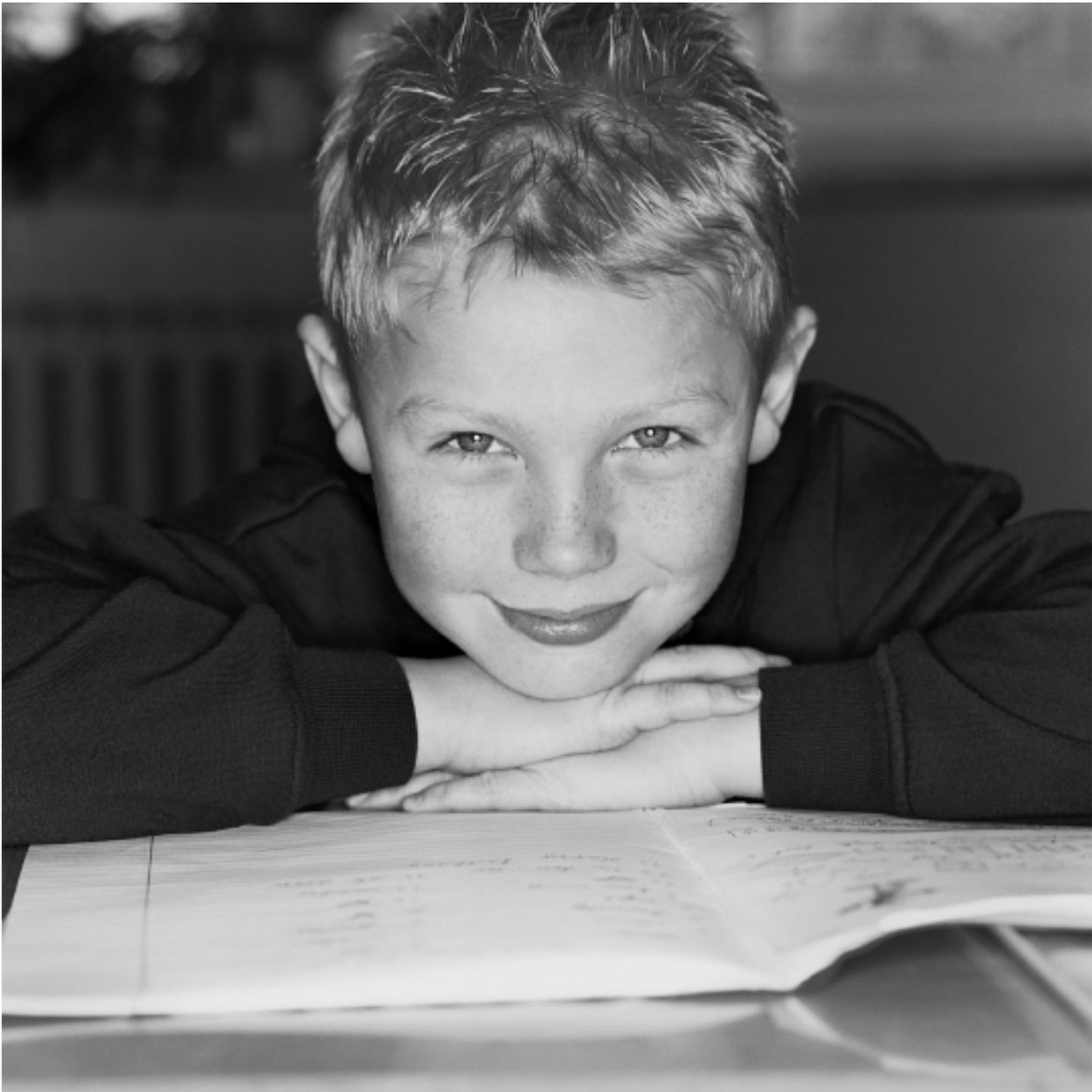
#### Electricity and Magnetism

Pupils should be able to:

- Make a complete circuit using switch, battery, wire and bulbs

Pupils should know that:

- An electrical device will not work if there is a break in the circuit
- Electrical current flows
- There are forces between magnets and magnets can attract or repel each other
- Magnets attract some metals but not others



### Stage 5: Scientific Enquiry

#### Ideas and Evidence in Science

Pupils should know that:

- Scientists have combined evidence with creative thinking to suggest new ideas and explanations for phenomena

#### Plan Experimental Work

Pupils should be able to:

- Make predictions of what will happen based on scientific knowledge and understanding, and suggest how to test these
- Use knowledge and understanding to plan how to carry out a fair test or how to collect sufficient evidence to test an idea
- Identify factors that need to be taken into account in different contexts

#### Obtain and Present Evidence

Pupils should be able to:

- Make relevant observations
- Consolidate measurement of volume, temperature, time and length
- Think about the need for repeated observations and measurements
- Present results in bar charts and line graphs

### Consider Evidence and Evaluate

Pupils should be able to:

- Decide whether results support predictions
- Begin to evaluate repeated results
- Recognise and make predictions from patterns in data and suggest explanations using scientific knowledge and understanding
- Interpret data and think about whether it is sufficient to draw conclusions
- Draw conclusions and indicate whether these match any prediction made

### Stage 5: Biology

#### Plants

Pupils should know that:

- Plants reproduce
- Seeds can be dispersed in a variety of ways
- Seeds need water and warmth for germination, but not light
- Insects pollinate some flowers
- Plants produce flowers which have male and female organs; seeds are formed when pollen from the male organ fertilises the ovum (female)
- Flowering plants have a life cycle including pollination, fertilisation, seed production, seed dispersal and germination

### Stage 5: Chemistry

#### States of Matter

Pupils should know that:

- Evaporation is when a liquid turns to a gas
- Condensation is when a gas turns to a liquid and is the reverse of evaporation
- Air contains water vapour and when this hits a cold surface it may condense
- The boiling temperature of water is 100°C

## Stage 5: Physics

### Light

Pupils should know that:

- Shadows are formed when light travelling from a source is blocked
- Size of a shadow is affected by the position of the object
- Shadows change in length and position throughout the day
- The sun does not move, its apparent movement is caused by the earth spinning on its axis
- The earth spins on its axis once in every 24 hours
- The earth takes a year to orbit the sun, spinning as it goes
- Opaque objects/materials do not let light through and transparent objects/materials let lots of light through
- We see light sources because light from the source enters our eyes
- Beams/rays of light can be reflected by a mirror, the reflected light enters our eyes and we see the object
- When a beam of light is reflected from a surface it changes direction

## Stage 6: Scientific Enquiry

### Ideas and Evidence in Science

Pupils should be able to:

- Consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena

### Plan Experimental Work

Pupils should be able to:

- Decide how to turn ideas into a form that can be tested
- Make predictions using scientific knowledge and understanding
- Identify factors that are relevant to a particular situation
- Choose what evidence to collect to investigate a question, ensuring that the evidence is sufficient
- Choose what equipment to use

### Obtain and Present Evidence

Pupils should be able to:

- Make a variety of relevant observations and measurements using simple apparatus correctly
- Decide when observations and measurements need to be checked, by repeating, to give more reliable data
- Use tables, bar charts and line graphs to present results

### Consider Evidence and Evaluate

Pupils should be able to:

- Make comparisons
- Evaluate repeated results
- Identify patterns in results and results that do not appear to fit the pattern
- Use results to draw conclusions and to make further predictions
- Suggest and evaluate explanations for predictions using scientific knowledge and understanding
- Say whether the evidence supports any prediction made

### Stage 6: Biology

#### Humans

Pupils should be able to:

- Use scientific names for some major organs of body systems
- Identify the position of major organs in the body
- Describe the main functions of the major organs of the body
- Explain how the functions of the major organs are essential

#### Ecosystems/Environment

Pupils should know that:

- Food chains can be used to represent feeding relationships in a habitat
- Food chains begin with a plant (the producer)

Pupils should be able to:

- Understand the terms 'producer', 'consumer', 'predator' and 'prey'
- Construct food chains in a particular habitat

### Stage 6: Chemistry

#### Changes

Pupils should be able to:

- Distinguish between reversible and irreversible changes

Pupils should know that:

- Solids can be mixed and it is often possible to get the original materials back
- Changes occur when some solids are added to water
- When solids do not dissolve or react with the water they can be separated by filtering which is similar to sieving
- Some solids dissolve in water to form solutions and although the solid cannot be seen the substance is still present
- When liquid evaporates from a solution the solid is left behind

### Stage 6: Physics

#### Electricity and Magnetism

Pupils should know that:

- Some materials are better conductors of electricity than others
- Metals are good conductors of electricity, most other materials are not
- Metals are used for cables and wires; plastics are used to cover wires and as covers for plugs and switches

Pupils should be able to:

- Predict effects of making changes to circuits including length and thickness of wire

#### Forces and Motion

Pupils should be able to:

- Distinguish between mass and weight
- Recognise and use units of force, mass and weight
- Understand the notion of energy in movement

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