



# Biology

## Science long-term overview incorporating Breadth of Study and Threshold Concepts and skills YR-Y6

**Threshold Concepts (KS1 and KS2):** These are designed to be advanced throughout the primary years. This reflects the nature of growing depth and mastery. They should be repeatable. They become both the planning and assessment foci.

Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

**Breadth of Study KS1:** What will be covered?

### Plants

- Identify, classify and describe their basic structure.
- Observe and describe growth and conditions for growth.

### Habitats

- Look at the suitability of environments and at food chains.

Animals and humans

- Identify, classify and observe.
- Look at growth, basic needs, exercise, food and hygiene.

### All living things

- Investigate differences.

Across all year groups scientific knowledge and skills should be learned by working scientifically.

(This is documented in the Essentials for progress section.)

### Threshold Concepts

**Work scientifically**  
**Years 1 and 2**

**Biology**

- Ask simple questions.
- Observe closely, using simple equipment.
- Perform simple tests.
- Identify and classify.
- Use observations and ideas to suggest answers to questions.
- Gather and record data to help in answering questions.

#### **Understand plants**

This concept involves becoming familiar with different types of plants, their structure and reproduction.

#### **Understand animals and humans**

This concept involves becoming familiar with different types of animals, humans and the life processes they share.

#### **Investigate living things**

This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.

#### **Understand evolution and inheritance**

This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.

### **Milestone 1 Year 1**

#### **Understand plants**

- Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen.
- Identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers

#### **Understand animals and humans**

- Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores.
- Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets).
- . Identify name, draw and label the basic parts of the human body and say which part of the body is associated with each sense

#### **Scientific skills**

- . Ask simple questions and recognise that they can be answered in different ways (Year 1 focus)

- . Use simple equipment to observe closely (Year 1 focus)
- . Perform simple tests (Year 1 focus)
- . Identify and classify (Year 1 focus)
- . Use their observations and ideas to suggest answers to questions (Year 1 focus)
- . Gather and record data to help in answering questions (Year 1 focus)

**Enrichment**

Use of the B.O.L.E  
Science Stem Week  
Conducting experiments

**Vocabulary**

Birds, animals, mammals, fish, amphibians, reptiles, carnivores, herbivores, omnivores, diet, category, sort, characteristics, examine, investigate, observe, species

**Milestone 1 Year 2****Understand plants**

- 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.

**Animals, including humans**

- Notice that animals, including humans, have offspring which grow into adults.
- Investigate 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.

**Living things and their habitats**

- Explore and compare the differences between things that are living, that are dead and that have never been alive.
- 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.
- Identify and name a variety of plants and animals in their habitats, including micro-habitats.

- 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.

**Understand evolution and inheritance -This is not statutory in the National Curriculum**

- *Identify how humans resemble their parents in many features.*

**Scientific Skills**

- . Ask simple questions and recognise that they can be answered in different ways including use of scientific language from the national curriculum (Year 2 focus)
- . Use simple equipment to observe closely including changes over time (Year 2 focus)
- . Perform simple comparative tests (Year 2 focus)
- . Identify, group and classify (Year 2 focus)
- . Use his/her observations and ideas to suggest answers to questions noticing similarities, differences and patterns (Year 2 focus)
- . Gather and record data to help in answering questions including from secondary sources of information (Year 2 focus)

**Vocabulary**

Growth, water, sunlight, nutrients, seed, bulb, soil, healthy, germinate, food, light, air, living, dead, alive, habitat, micro-habitat, adaptation, never alive, food, food chain, organism

**Enrichment**

Use of the B.O.L.E  
Science Stem Week  
Conducting experiments

**Threshold Concepts (KS1 and KS2):** These are designed to be advanced throughout the primary years. This reflects the nature of growing depth and mastery. They should be repeatable. They become both the planning and assessment foci.

Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

**Biology**

**Understand plants**

This concept involves becoming familiar with different types of plants, their structure and reproduction.

### **Understand animals and humans**

This concept involves becoming familiar with different types of animals, humans and the life processes they share.

### **Investigate living things**

This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.

### **Understand evolution and inheritance**

This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.

#### **Work scientifically**

**Years 3 and 4**

**This concept involves learning the methodologies of the discipline of science.**

- Ask relevant questions.
- Set up simple, practical enquiries and comparative and fair tests.
- Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers.
- Gather, record, classify and present data in a variety of ways to help in answering questions.
- Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.
- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
- Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.
- Identify differences, similarities or changes related to simple, scientific ideas and processes.

#### **Work scientifically**

**Years 5 and 6**

**This concept involves learning the methodologies of the discipline of science.**

- Plan enquiries, including recognising and controlling variables where necessary.
- Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work.
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision.
- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models.
- Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions.
- Present findings in written form, displays and other presentations.
- Use test results to make predictions to set up further comparative and fair tests.

• Use straightforward, scientific evidence to answer questions or to support their findings.

• Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.

## Milestone 2 Year 3

### Understand plants

- Identify and describe the functions of different parts of flowering plants: roots, stem, 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 role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

### Understand animals and humans

- Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat.
- Identify that humans and some animals have skeletons and muscles for support, protection and movement.

### Understand evolution and inheritance

#### *Italics – not statutory in N.C*

- *Identify how plants and animals, including humans, resemble their parents in many features.*
- *Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.*
- *Identify how animals and plants are suited to and adapt to their environment in different ways.*

### Scientific Skills

- . Ask relevant questions and use different types of scientific enquiries to answer them (Year 3 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 3 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 3 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 3 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 3 focus)

.Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 3 focus)

. Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 3 focus)

. Identify differences, similarities or changes related to simple scientific ideas and processes (Year 3 focus)

. Use straightforward scientific evidence to answer questions or to support his/her findings (Year 3 focus)

### **Enrichment**

Use of the B.O.L.E

Science Stem Week

Conducting experiments

### **Vocabulary**

Growth, water, sunlight, nutrients, seed, bulb, soil, healthy, germinate, food, light, roots, stem, leaf, petal, flower, bud, pollination, seed formation, seed dispersal

## **Milestone 2 Year 4**

### **Investigate living things**

- 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 specific habitats.

### **Understand animals and humans**

- 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.
- Describe the simple functions of the basic parts of the digestive system in humans.
- Construct and interpret a variety of food chains, identifying producers, predators and prey.

**Scientific Skills**

- . Ask relevant questions and use different types of scientific enquiries to answer them (Year 4 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 4 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 4 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 4 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 4 focus)
- . Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 4 focus)
- . Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 4 focus)
- . Identify differences, similarities or changes related to simple scientific ideas and processes (Year 4 focus)
- . Use straightforward scientific evidence to answer questions or to support his/her findings (Year 4 focus)

**Vocabulary**

Animals, humans, nutrition, skeleton, tongue, taste, senses, digestive system, digestion, vitamins, environment, adapt, change, habitat, differences, similarities, investigate, predict, evidence, process, findings, classify, data

**Enrichment**

Use of the B.O.L.E  
Science Stem Week  
Conducting experiments

**Milestone 2** Year 5

**Understand plants**

*Italics – not statutory in N.C*

- *Relate knowledge of plants to studies of evolution and inheritance.*
- *Relate knowledge of plants to studies of all living things.*

### **Understand animals and humans**

- Describe the changes as humans develop to old age.

### **Investigate living things**

- 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.

### **Scientific skills**

. Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary (Year 5 focus)

. Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 5 focus)

. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 5 focus)

. Use test results to make predictions to set up further comparative and fair tests (Year 5 focus)

. Report and present 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 (Year 5 focus)

. Identify scientific evidence that has been used to support or refute ideas or arguments (Year 5 focus)

### **Vocabulary**

Life cycle, mammal, animal, amphibian, insect, bird, reproduce, egg, process, data, predict, investigate, fair test, variables, plants, change, grow

## Enrichment

Milestone 3 Year 6

### Understand plants

*Italics – not statutory in N.C*

- *Relate knowledge of plants to studies of evolution and inheritance.*
- *Relate knowledge of plants to studies of all living things.*

### Understand animals and humans

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- Recognise the importance of diet, exercise, drugs and lifestyle on the way the human body functions.
- Describe the ways in which nutrients and water are transported within animals, including humans.

### Investigate living things

- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro –organisms, plants and animals.
- Give reasons for classifying plants and animals based on specific characteristics.

### Scientific skills

- . Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling variables where necessary (Year 6 focus)
- . Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 6 focus)
- . Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 6 focus)

- . Use test results to make predictions to set up further comparative and fair tests (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources
- . Group and classify things and recognise patterns

**Enrichment**

Use of the B.O.L.E  
Science Stem Week  
Conducting experiments

**Vocabulary**

Plants, animals, classify, characteristics, heart, lungs, blood vessels, oxygen, diet, healthy, unhealthy, food, drugs, lifestyle, nutrients, water, evaluate, predict



# Chemistry

## Science long-term overview incorporating Breadth of Study and Threshold Concepts and skills YR-Y6

**Threshold Concepts (KS1 and KS2):** These are designed to be advanced throughout the primary years. This reflects the nature of growing depth and mastery. They should be repeatable. They become both the planning and assessment foci.

Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

**Breadth of Study KS1:** What will be covered? **Chemistry**

### Materials

- Identify, name, describe, classify, compare properties and changes.
- Look at the practical uses of everyday materials.

Across all year groups scientific knowledge and skills should be learned by working scientifically.  
(This is documented in the Essentials for progress section.)

### Threshold Concepts

#### Work scientifically Years 1 and 2

This concept involves learning the methodologies of the discipline of science.

- Ask simple questions.
- Observe closely, using simple equipment.

- **Investigate materials**
- This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.

- Perform simple tests.
- Identify and classify.
- Use observations and ideas to suggest answers to questions.
- Gather and record data to help in answering questions.

### **Milestone 1 Year 1**

- 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.
- Compare and group together a variety of everyday materials on the basis of their simple physical properties.

#### **Scientific skills**

- Ask simple questions.
- Observe closely, using simple equipment.
- Perform simple tests.
- Identify and classify.
- Use observations and ideas to suggest answers to questions.
- Gather and record data to help in answering questions.

#### **Investigate materials**

**This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.**

#### **Enrichment**

Conducting experiments, Use of B.O.L.E

**Vocabulary** soft, hard, see through, big, squashy, bendy, stretchy, strong, squidgy, heavy, rough, clear, shiny, rubbery, rigid, transparent, opaque, cold, absorbent, waterproof.

## Milestone 1 Year 2

- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock, and paper/cardboard for particular uses.

### Scientific Skills

- Ask simple questions.
- Observe closely, using simple equipment.
- Perform simple tests.
- Identify and classify.
- Use observations and ideas to suggest answers to questions.
- Gather and record data to help in answering questions.

### Investigate materials

**This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed**

### Vocabulary

Materials, man-made, manufactured, natural, property, group, freeze, melt, liquid, solid.

### Enrichment

Conducting experiments

**Threshold Concepts (KS1 and KS2):** These are designed to be advanced throughout the primary years. This reflects the nature of growing depth and mastery. They should be repeatable. They become both the planning and assessment foci.

Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

## Chemistry

### Rocks and fossils

- Compare and group rocks and describe the formation of fossils.

States of matter

- Look at solids, liquids and gases, changes of state, evaporation, condensation and the water cycle.

### Materials

- Examine the properties of materials using various tests.
- Look at solubility and recovering dissolved substances.
- Separate mixtures.
- Examine changes to materials that create new materials that are usually not reversible.

### Work scientifically

Years 3 and 4

**This concept involves learning the methodologies of the discipline of science.**

- Ask relevant questions.
- Set up simple, practical enquiries and comparative and fair tests.

### Work scientifically

Years 5 and 6

**This concept involves learning the methodologies of the discipline of science.**

- Plan enquiries, including recognising and controlling variables where necessary.
- Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work.
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision.

- Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers.
- Gather, record, classify and present data in a variety of ways to help in answering questions.
- Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.
- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
- Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.
- Identify differences, similarities or changes related to simple, scientific ideas and processes.
- Use straightforward, scientific evidence to answer questions or to support their findings.

- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models.
- Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions.
- Present findings in written form, displays and other presentations.
- Use test results to make predictions to set up further comparative and fair tests.
- Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.

## Milestone 2 Year 3

### Rocks and Soils

- Compare and group together different kinds of rocks on the basis of their simple, physical properties.
- Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock.

- Recognise that soils are made from rocks and organic matter.

**Scientific Skills**

- .Ask relevant questions and use different types of scientific enquiries to answer them (Year 3 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 3 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 3 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 3 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 3 focus)
- .Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 3 focus)
- . Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 3 focus)
- . Identify differences, similarities or changes related to simple scientific ideas and processes (Year 3 focus)
- . Use straightforward scientific evidence to answer questions or to support his/her findings (Year 3 focus)

**Enrichment**

Use of B.O.L.E

Conducting experiments

**Vocabulary**

Rock, soil, solid, hard, soft, chalk, clay, gravel, sand, rough, smooth, permeable, impermeable, volcano, volcanic, granite, metamorphic, sedimentary, igneous.

## Milestone 2 Year 4

### States of Matter

- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when they are heated or cooled, and measure the temperature at which this happens in degrees Celsius ( $^{\circ}\text{C}$ ), building on their teaching in mathematics.
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

### Scientific Skills

- . Ask relevant questions and use different types of scientific enquiries to answer them (Year 4 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 4 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 4 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 4 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 4 focus)
- . Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 4 focus)
- . Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 4 focus)
- . Identify differences, similarities or changes related to simple scientific ideas and processes (Year 4 focus)
- . Use straightforward scientific evidence to answer questions or to support his/her findings (Year 4 focus)

**Vocabulary**

solid, matter, states of matter, plasma, gas, liquid, temperature, heat, energy, condensation, melting, freezing, chemical symbol, kinetic energy, vaporisation, physical change, chemical change, sublimation, melting point, chemical property, element, boiling point, physical properties, atom, mass, mixture

**Enrichment**

Conducting experiments

**Milestone 2 Year 5**

- Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets.
- Understand how 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, oxidation and the action of acid on bicarbonate of soda.

**Scientific skills**

. Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary (Year 5 focus)

- . Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 5 focus)
- . Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 5 focus)
- . Use test results to make predictions to set up further comparative and fair tests (Year 5 focus)
- . Report and present 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 (Year 5 focus)
- . Identify scientific evidence that has been used to support or refute ideas or arguments (Year 5 focus)

**Vocabulary**

hardness, solubility, conductivity, electrical, thermal, magnets, magnetic, solid, liquid, gas, test, prediction, variables, findings, evaporation, sieve, metal, wood, plastic, burning, melting, acidic, dissolve

**Enrichment**

Conducting experiments

**Milestone 3 Year 6****Scientific skills**

- . Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling variables where necessary (Year 6 focus)
- . Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 6 focus)

- . Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 6 focus)
- . Use test results to make predictions to set up further comparative and fair tests (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources
- . Group and classify things and recognise patterns

**Enrichment**

Conducting experiments

Use of the B.O.L.E

**Vocabulary**

Predict, fair test, variables, conclusion, table, findings, enquiry, pattern, comparative, comparison, explanation



# Physics

Science long-term overview incorporating Breadth of Study and Threshold Concepts and skills YR-Y6

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Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

**Breadth of Study KS1:** What will be covered?

*Light\**

- Look at sources and reflections.

*Sound\**

- Look at sources.

*Electricity\**

- Look at appliances and circuits.

Forces

- Describe basic movements.

Earth and space

- Observe seasonal changes.

\*Items in italics are not statutory in the English National Curriculum.

Across all year groups scientific knowledge and skills should be learned by working scientifically.

(This is documented in the Essentials for progress section.)

## Threshold Concepts

### Work scientifically

#### Years 1 and 2

This concept involves learning the methodologies of the discipline of science.

- Ask simple questions.
- Observe closely, using simple equipment.
- Perform simple tests.
- Identify and classify.
- Use observations and ideas to suggest answers to questions.
- Gather and record data to help in answering questions.

- **Understand movement, forces and magnets**

This concept involves understanding what causes motion.

- **Understand the Earth's movement in space**

This concept involves understanding what causes seasonal changes, day and night.

- **Investigate light and seeing**

This concept involves understanding how light and reflection affect sight.

- **Investigate sound and hearing**

This concept involves understanding how sound is produced, how it travels and how it is heard.

- **Understand electrical circuits**

This concept involves understanding circuits and their role in electrical applications.

### Milestone 1 Year 1

\*Items in italics are not statutory in the English National Curriculum.

#### Understand light and seeing

*Observe and name a variety of sources of light, including electric lights, flames and the Sun, explaining that we see things because light travels from them to our eyes.*

**Understand movement, forces and magnets**

- Notice and describe how things move, using simple comparisons such as faster and slower.
- Compare how different things move.

**Investigate sound and hearing**

- *Observe and name a variety of sources of sound, noticing that we hear with our ears.*

**Understand electrical circuits**

- *Identify common appliances that run on electricity.*
- . *Construct a simple series electrical circuit.*

**Understand the Earth's movement in space**

- Observe the apparent movement of the Sun during the day.
- Observe changes across the four seasons.
- Observe and describe weather associated with the seasons and how day length varies.

**Scientific skills**

- . Ask simple questions and recognise that they can be answered in different ways (Year 1 focus)
- . Use simple equipment to observe closely (Year 1 focus)
- . Perform simple tests (Year 1 focus)
- . Identify and classify (Year 1 focus)
- . Use their observations and ideas to suggest answers to questions (Year 1 focus)
- . Gather and record data to help in answering questions (Year 1 focus)

**Enrichment**

Science Stem Week

Conducting experiments

Use of the B.O.L.E

**Vocabulary**

Light, beam, torch, shadow, reflect, opaque, absorption, convex lens, shine, sun, prism, translucent, transparent, wavelength, sun

**Milestone 1** Year 2

**\*Items in italics are not statutory in the English National Curriculum.**

**Understand movement, forces and magnets**

- *Notice and describe how things move, using simple comparisons such as faster and slower.*
- *Compare how different things move.*

**Investigate sound and hearing**

- *Observe and name a variety of sources of sound, noticing that we hear with our ears.*

**Understand electrical circuits**

- *Identify common appliances that run on electricity.*
- *Construct a simple series electrical circuit.*

**Scientific Skills**

- . Ask simple questions and recognise that they can be answered in different ways including use of scientific language from the national curriculum (Year 2 focus)
- . Use simple equipment to observe closely including changes over time (Year 2 focus)
- . Perform simple comparative tests (Year 2 focus)
- . Identify, group and classify (Year 2 focus)
- . Use his/her observations and ideas to suggest answers to questions noticing similarities, differences and patterns (Year 2 focus)
- . Gather and record data to help in answering questions including from secondary sources of information (Year 2 focus)

**Vocabulary**

motion, potential energy, force, forces and motion, pushing force, pulling force, momentum, simple machine, action force, friction, balanced forces, unbalanced forces, gravity, inclined plane, solar energy, electrical energy, chemical energy, mechanical energy, thermal energy, sound energy, kinetic energy, wheel and axle, air resistance, pulley, position, scientific method, energy, machine, mechanical advantage, speed, wedge, lever, screw, axle, acceleration, Newton, joule, mass, weight, distance, work, wheel, gear, ramp, gear ratio, direction, inertia, velocity, interaction

### **Enrichment**

**Conducting experiments**

**Stem Week**

**Threshold Concepts (KS1 and KS2):** These are designed to be advanced throughout the primary years. This reflects the nature of growing depth and mastery. They should be repeatable. They become both the planning and assessment foci.

Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)

**Breadth of Study KS2:** What will be covered?

#### **Light**

- Look at sources, seeing, reflections and shadows.
- Explain how light appears to travel in straight lines and how this affects seeing and shadows.

#### **Sound**

- Look at sources, vibration, volume and pitch.

#### **Electricity**

- Look at appliances, circuits, lamps, switches, insulators and conductors.
- Look at circuits, the effect of the voltage in cells and the resistance and conductivity of materials.

#### **Forces and magnets**

- Look at contact and distant forces, attraction and repulsion, comparing and grouping materials.
- Look at poles, attraction and repulsion.
- Look at the effect of gravity and drag forces.

- Look at transference of forces in gears, pulleys, levers and springs.

### Earth and space

- Look at the movement of the Earth and the Moon
- Explain day and night

### Work scientifically Years 3 and 4

**This concept involves learning the methodologies of the discipline of science.**

- Ask relevant questions.
- Set up simple, practical enquiries and comparative and fair tests.
- Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers.
- Gather, record, classify and present data in a variety of ways to help in answering questions.
- Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.
- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
- Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.
- Identify differences, similarities or changes related to simple, scientific ideas and processes.
- Use straightforward, scientific evidence to answer questions or to support their findings.

### Work scientifically Years 5 and 6

**This concept involves learning the methodologies of the discipline of science.**

- Plan enquiries, including recognising and controlling variables where necessary.
- Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work.
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision.
- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models.
- Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions.
- Present findings in written form, displays and other presentations.
- Use test results to make predictions to set up further comparative and fair tests.
- Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.

## Milestone 2 Year 3

### Understand light and seeing

- 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.
- 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.

### Understand movement, forces and magnets

- 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

**Scientific Skills**

- . Ask relevant questions and use different types of scientific enquiries to answer them (Year 3 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 3 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 3 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 3 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 3 focus)
- . Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 3 focus)
- . Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 3 focus)
- . Identify differences, similarities or changes related to simple scientific ideas and processes (Year 3 focus)
- . Use straightforward scientific evidence to answer questions or to support his/her findings (Year 3 focus)

**Enrichment**

Conducting experiments  
Use of B.O.L.E  
Science Stem Week

**Vocabulary**

Light, torch, shadow, concave, refraction, shade, law of reflection, transmit, spectrum, beam, opaque, absorption, convex lens, wavelength, mirror, light source, shine, sun, prism, daylight, frequency

## Milestone 2 Year 4

### **Investigate sound and hearing**

- Identify how sounds are made, associating some of them with something vibrating.
- Recognise that vibrations from sounds travel through a medium to the ear.

### **Understand electrical circuits**

- 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.

### **Scientific Skills**

- . Ask relevant questions and use different types of scientific enquiries to answer them (Year 4 focus)
- . Set up simple practical enquiries, comparative and fair tests (Year 4 focus)
- . Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers (Year 4 focus)
- . Gather, record, classify and present data in a variety of ways to help in answering questions (Year 4 focus)
- . Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables (Year 4 focus)
- . Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions (Year 4 focus)

- . Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions (Year 4 focus)
- . Identify differences, similarities or changes related to simple scientific ideas and processes (Year 4 focus)
- . Use straightforward scientific evidence to answer questions or to support his/her findings (Year 4 focus)

### **Vocabulary**

Sound, pitch, volume, hearing, decibel, vibrate, vibration, ear, soundwave, frequency, noise, electricity, cell, terminal, switch, open, closed, circuit, positive, negative, pole, current, motor, buzzer, resistor, conductor, insulator

### **Enrichment**

Conducting experiments  
Science Stem Week

**Milestone 2** Year 5

### **Understand movement, forces and magnets**

#### **Magnets**

- Describe magnets as having two poles.
- Predict whether two magnets will attract or repel each other, depending on which poles are facing.

#### **Forces –**

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effect of drag forces, such as air resistance, water resistance and friction that act between moving surfaces.
- *Describe, in terms of drag forces, why moving objects that are not driven tend to slow down.*
- *Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs.*
- Understand that some mechanisms including levers, pulleys and gears, allow a smaller force to have a greater effect.

Items in italics are not statutory in the English National Curriculum.

### **Understand the Earth's movement in space**

- 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.

### **Scientific skills**

- . Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary (Year 5 focus)
- . Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 5 focus)
- . Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 5 focus)
- . Use test results to make predictions to set up further comparative and fair tests (Year 5 focus)
- . Report and present 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 (Year 5 focus)
- . Identify scientific evidence that has been used to support or refute ideas or arguments (Year 5 focus)

### **Vocabulary**

magnet, attract, conductors. diamagnetic, electricity, electromagnet. magnetic domain, magnetic field, magnetism. poles, repel

### **Enrichment**

Conducting experiments

**Milestone 3** Year 6

**Understand light and seeing**

- Understand 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 eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes.
- 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.

**Understand electrical circuits**

- 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.

**Scientific skills**

- . Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling variables where necessary (Year 6 focus)
- . Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate (Year 6 focus)
- . Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (Year 6 focus)

- . Use test results to make predictions to set up further comparative and fair tests (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Report and present 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 (Year 6 focus)
- . Describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources
- . Group and classify things and recognise patterns

**Enrichment****Vocabulary**

Light, beam, torch, shadow, reflect, opaque, absorption, convex lens, shine, sun, prism, translucent, transparent, wavelength, sun, electricity, cell, terminal, switch, open, closed, circuit, positive, negative, pole, current, motor, buzzer, resistor, conductor, insulator