SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - BIOLOGY

Small Steps

PLANTS

Key Stage 1 Science National Curriculum Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they should observe the growth of flowers and vegetables that they have planted. They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem). Pupils might work scientifically by: observing closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants; describing how they were able to identify and group them, and drawing diagrams showing the parts of different plants including trees. Pupils might keep records of how plants have changed over time, for example, the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants.

Lower Key Stage 2 Science National Curriculum Pupils should be introduced to the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction.

Year group	Statutory Requirements from the Programme of Study
1	• 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 plants including roots, stem/trunk, leaves and flowers.
2	• 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.
3	• Identify and describe the functions of different parts of 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 ways 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

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - BIOLOGY

Small Steps

LIVING THINGS AND THEIR HABITATS

Key Stage 1 Science National Curriculum Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'microhabitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. Pupils should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.

Lower Key Stage 2 Science National Curriculum Pupils should use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitat. They should identify how the habitat changes throughout the year. Pupils should explore possible ways of grouping a wide selection of living things that include animals, flowering plants and non-flowering plants. Pupils could begin to put vertebrate animals into groups, for example: fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects.

Upper Key Stage 2 Science National Curriculum Pupils should study and raise questions about their local environment throughout the year. They should observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.

Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and

Year group	Statutory Requirements from the Programme of Study
2	• Explore and compare the differences between things that are living, dead, and things 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.
4	• 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 living things
5	• 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.
6	• 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

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - BIOLOGY

Small Steps

INVESTIGATE ANIMALS INCLUDING HUMANS

Key Stage 1 Science National Curriculum Pupils should use the local environment throughout the year to explore and answer questions about animals in their habitat. They should understand how to take care of animals taken from their local environment and the need to return them safely after study. Pupils should become familiar with the common names of some fish, amphibians, reptiles, birds and mammals, including those that are kept as pets.
Pupils should have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes.

Lower Key Stage 2 Science National Curriculum Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions. Pupils might work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. They might research different food groups and how they keep us healthy, and design meals based on what they find out.

Upper Key Stage 2 Science National Curriculum Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.

Year group	Statutory Requirements from the Programme of study
1	• Identify and name a variety of common animals that are birds, fish, amphibians, reptiles and 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 and mammals, and including pets). • Identify, name draw and label the basic parts of the human body and say which parts of the body is associated with each sense.
2	• Notice that animals, including humans, have offspring which grow into adults • Find out about 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.
3	• 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 • Identify that humans and some animals have skeletons and muscles for support, protection and movement.
4	• 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 • Construct and interpret a variety of food chains, identifying producers, predators and prey.
5	• Describe the changes as humans develop from birth to old age.
6	• Identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • Describe the ways in which nutrients and water are transported within animals, including humans.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - BIOLOGY

Small Steps

INVESTIGATE EVOLUTION AND INHERITANCE

Upper Key Stage 2 Science National Curriculum Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles.

They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.

Note: at this stage, pupils are not expected to understand how genes and chromosomes work.

Year Group	Statutory requirements from programme of study
6	• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - CHEMISTRY

Small Steps

INVESTIGATE MATERIALS

Key Stage 1 Science National Curriculum Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Pupils should explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil.

Lower Key Stage 2 Science National Curriculum inked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment. Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled.

Upper Key Stage 2 Science National Curriculum Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4. They should explore reversible changes, including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes. Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Year group	Statutory Requirements from the Programme of Study
1	• . Distinguish between and object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, 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 physical properties.
2	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
3	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • Describe in simple terms how fossils are formed when things that have lived are trapped within rock • Recognise that soils are made from rocks and organic matter.
4	• 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 or research the temperature at which this happens in degrees Celsius (°C) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
5	• 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
	• Understand that 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 and the action of acid on bicarbonate of soda.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - PHYSICS

Small Steps

INVESTIGATE EARTH'S MOVEMENT IN SPACE

Key Stage 1 Science National Curriculum Pupils should observe and talk about changes in the weather and the seasons

Upper Key Stage 2 Science National Curriculum Pupils should be introduced to a model of the sun and Earth that enables them to explain day and night. Pupils should learn that the sun is a star at the centre of our solar system and that it has 8 planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has 1 moon; Jupiter has 4 large moons and numerous smaller ones).

Note: pupils should be warned that it is not safe to look directly at the sun, even when wearing dark glasses.

Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

Year Group	Statutory Requirements from programme of study
1	Observe change across the four seasons Observe and describe weather associated with the seasons and how day length varies.
5	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

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - PHYSICS

Small Steps

INVESTIGATE LIGHT

Lower Key Stage 2 Science National Curriculum Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. They should think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.

Upper Key Stage 2 Science National Curriculum Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.

Year group	Statutory Requirements from the Programme of Study
3	• 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 sizes of shadows change.
6	• Recognise 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 eye • 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 • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - PHYSICS

Small Steps

INVESTIGATE SOUND

Lower Key Stage 2 Science National Curriculum Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways.

Year Group	Statutory Requirements from programme of study
4	• Identify how sounds are made, associating some of them with something vibrating • Recognise that vibrations from a sound travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it • Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sound source increases.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - PHYSICS

Small Steps

INVESTIGATE ELECTRICITY

Key Stage 1 Science National Curriculum Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices. Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in year 6.

Note: pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity.

Upper Key Stage 2 Science National Curriculum Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols.

Note: pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity.

Year group	Statutory Requirements from the Programme of Study
4	• 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.
6	• 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.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - PHYSICS

Small Steps

INVESTIGATE FORCES

Lower Key Stage 2 Science National Curriculum Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They should explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe).

Upper Key Stage 2 Science National Curriculum Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys and simple machines on movement.

Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Year group	Statutory Requirements from the Programme of Study
3	• 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.
5	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces
	• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - WORKING SCIENTIFICALLY

Small Steps

MILESTONE 1

Key Stage 1

Science National Curriculum

Pupils in years 1 and 2 should explore the world around them and raise their own questions. They should experience different types of scientific enquiries, including practical activities, and begin to recognise ways in which they might answer scientific questions.
They should use simple features to compare objects, materials and living things and, with help, decide how to sort and group them, observe changes over time, and, with guidance, they should begin to notice patterns and relationships.
They should ask people questions and use simple secondary sources to find answers.
They should use simple measurements and equipment (for example, hand lenses, egg timers) to gather data, carry out simple tests, record simple data, and talk about what they have found out and how they found it out. With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language.
These opportunities for working scientifically should be provided across years 1 and 2 so that the expectations in the programme of study can be met by the end of year 2. Pupils are not expected to cover each aspect for every area of study.

- 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.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - WORKING SCIENTIFICALLY

Small Steps

MILESTONE 2

Lower Key Stage 2

Science National Curriculum

Pupils in years 3 and 4 should be given a range of scientific experiences to enable them to raise their own questions about the world around them. They should start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; recognise when a simple fair test is necessary and help to decide how to set it up; talk about criteria for grouping, sorting and classifying; and use simple keys. They should begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. They should help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used. They should learn how to use new equipment, such as data loggers, appropriately. They should collect data from their own observations and measurements, using notes, simple tables and standard units, and help to make decisions about how to record and analyse this data. With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. With support, they should identify new questions arising from the data, making predictions for new values within or beyond the data they have collected, and finding ways of improving what they have already done. They should also recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.
Pupils should use relevant scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences.
These opportunities for working scientifically should be provided across years 3 and 4 so that the expectations in the programme of study can be met by the end of year 4. Pupils are not expected to cover each aspect for every area of study.

- 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.

SUBJECT CONCEPT PLANS

SCIENCE

SUBJECT CONCEPT - WORKING SCIENTIFICALLY

Small Steps

MILESTONE 3

Upper Key Stage 2

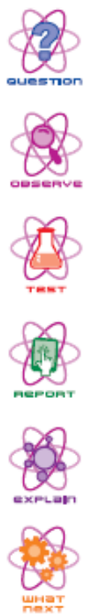
Science National Curriculum

Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment.

They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They should decide how to record data from a choice of familiar approaches; look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They should use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact.

They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time.

These opportunities for working scientifically should be provided across years 5 and 6 so that the expectations in the programme of study can be met by the end of year 6. Pupils are not expected to cover each aspect for every area of study.



- 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.