Key Learning in Science: Year 1

Please Note: Much of the learning in Year 1 can be done throughout the year using the school and the local environment. For example plants can be observed to make a linked to seasonal change and weather at various different times. Materials could be linked to a different creative theme throughout the year. Key learning can also be covered as a blocked science unit in its own right to introduce or consolidate learning at other times.

Plants: Common Names and Basic Structure

Pupils should be taught to:

- Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.
- Identify and describe the basic structure of a variety of common flowering plants, including trees (at least: flower, leaf, root, stem, trunk, seed, branch and petal).

Notes and Guidance (non-statutory):

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.
- **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.
- **Keeping records** of how plants have **changed over time**, for example the leaves falling off trees and buds opening.
- **Comparing and contrasting** what they have found out about different plants.

Animals - Humans

Pupils should be taught to:

- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.
  - Recognise that humans are animals.
  - Compare and describe differences in their own features (eye, hair, skin colour, etc.).
  - Recognise that humans have many similarities.

Notes and Guidance (non-statutory):

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.

Pupils might work scientifically by using their observations to:

- **Compare and contrast** animals (humans) at first hand or through videos and photographs.
- **Using their senses** to **compare** different textures, sounds and smells.

Animals - Other Animals

Pupils should be taught to:

- Identify and name a variety of common animals including some fish, some amphibians, some reptiles, some birds and some mammals.
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores (i.e. according to what they eat).
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, and including pets).
  - Find out and describe how animals look different to one another.
  - Group together animals according to their different features.
  - Recognise similarities between animals:

    Structure: head, body, way of moving, senses, body covering, tail.
  - Animals have senses to explore the world around them and to help them to survive.
  - Recognise that animals need to be treated with care and sensitivity to keep them alive and healthy.
  - Animals are alive; they move, feed, grow, use their senses and reproduce.

Notes and Guidance (non-statutory):

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 fish, amphibians, reptiles, birds and mammals, including those that are kept as pets.

Pupils might work scientifically by using their observations to:

- **Compare and contrast** animals at first hand or through videos and photographs.
- **Describing** how they identify and group them.
- **Grouping** animals according to what they eat.
- **Using their senses**.

Key Learning in Science: Year 1

Material Properties – Everyday Materials	Light and Astronomy – Seasonal Change
Pupils should be taught to: ▪ 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, rock, brick, paper and cardboard. ▪ 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. **Notes and Guidance (non-statutory):** 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 and 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. **Pupils might work scientifically by:** • **performing simple tests** to **explore questions**, for example: - 'What is the best material for an umbrella? ...for lining a dog basket? ...for curtains? ...for a bookshelf? ...for a gymnast's leotard?'	Pupils should be taught to: ▪ Observe and describe changes across the four seasons. ▪ Observe and describe weather associated with the seasons and how day length and temperature varies. **Notes and Guidance (non-statutory):** Pupils should observe and talk about changes in the weather and the seasons. **Note:** Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. **Pupils might work scientifically by:** • **Making tables and charts** about the weather and • **Making displays** of what happens in the world around them, including day length, as the seasons change. Additional suggestion from Lancashire for working scientifically opportunities which enhance learning and support using ICT across the curriculum • This unit provides an ideal opportunity for **using data logging equipment** to **record temperatures**

Year Group Expectations: Year 1

Exploring / Observing *KS1 - observing closely* *Using their observations and ideas to suggest answers to questions*	Grouping and Classifying *KS1 - Compare and contrast a variety of examples linked to KS1 PoS*	Questioning *KS1 - asking simple questions*	Researching *KS1 - finding things out using secondary sources of information*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
▪ Begin to use simple scientific language (from yr1 PoS) to talk about or **record** what they have noticed ▪ Use observations to make suggestions and/or ask questions ▪ Look / **observe** closely and communicate changes over time ▪ Look / **observe** closely and communicate the features or properties of things in the real world ▪ **Observe** closely using their senses	▪ **Name**/identify common examples and some common features ▪ With help, decide how to sort and **group** objects, materials or living things ▪ **Name** basic features of objects, materials and living things ▪ Say how things are similar or different ▪ **Compare** and contrast simple observable features / characteristics of objects, materials and living things	▪ Ask simple questions about what they notice about the world around them ▪ Demonstrate curiosity by the questions they ask	▪ Ask people questions (e.g. an expert or hot-seating) ▪ Use simple primary and secondary sources (such as objects, books and photographs) to find things out	▪ With help, follow movements (dance / drama) to act out their Science	▪ Share ideas in a group and listen to the ideas of others ▪ Work with others on a science task

Planning and Testing *KS1 - performing simple tests*	Using Equipment and Measures *KS1 - Using simple equipment and gathering data to help in answering their questions*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *KS1 - Talk about what happened / what they noticed*	Explaining results *KS1 - talk about what they found out*	Trusting results
▪ With help, **carry out** a simple test/comparative test ▪ With help, make a simple prediction or suggestion about what might happen ▪ Begin to suggest some ideas e.g. choose which equipment to use, choose which materials to test from a selection ▪ **Talk** about ways of setting up a test	▪ **Measure** using non-standard units e.g. how many lolly sticks/cubes/handfuls, etc. ▪ Observe closely, using simple **equipment** (e.g. hand lenses, egg timers) ▪ use senses to **compare** different textures, sounds and smells	▪ Communicate their ideas to a range of audiences in a variety of ways ▪ Complete a pre-constructed table / chart using picture records or simple words ▪ Contribute to a class display ▪ Add annotations to drawings or photographs ▪ Begin to use some simple scientific language from yr1 PoS ▪ **Record** simple visual representations of observations made	▪ Use recordings to talk about and describe what happened ▪ Sequence photographs of an event/observation	▪ Begin to use simple scientific language (from yr1 PoS) to talk about what they have found out or why something happened	N/A in Y1

Key Learning in Science: Year 2

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe plant growth, changes in habitats across the seasons and life cycles of a variety of different animals (for example: chicks/other birds, tadpoles/frogs, caterpillars/butterflies, other mini-beasts, other young animals during trips to farms/zoos). This could be done through an ongoing/monthly nature journal to observe, record and review over a period of time. The unit of work on 'Animal survival and growth' can be covered in the same half term as work on 'Habitats' in order to link the concept of survival.

Environment - Living things and their habitats

Pupils should be taught to:

- 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.
  - Different kinds of plants and animals live in different kinds of places.
  - There are different kinds of habitat near school which need to be cared for
  - Habitats provide the preferred conditions for the animals/plants that live there (compare local habitats and less familiar examples).
  - Observe living things in their habitats during different seasonal changes

Notes and Guidance (non-statutory):

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 'micro-habitat' (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.

Pupils might work scientifically by:

- **Sorting and classifying** things as to whether they are living, dead or were never alive.
- **Recording** their findings using charts
- **Describing** how they decided where to place things,
- **Exploring questions** such as: 'Is a flame alive? Is a deciduous tree dead in winter?'
- **Talking about ways of answering their questions.**
- **Constructing a simple food chain** that includes humans (e.g. grass, cow, human);
- **Describing** the conditions in different habitats and micro-habitats (under log, on stony path, under bushes);
- **Finding out how** the conditions **affect** the number and type(s) of plants and animals that live there.

Animals - Animal survival and growth

Pupils should be taught to:

- Notice that animals have offspring which grow into adults.
- Find out about and describe the basic needs of animals for survival (water, food and air).

Notes and Guidance (non-statutory):

Pupils should be introduced to the basic needs of animals for survival.

They should also be introduced to the process of reproduction and growth in animals. The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs. The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep.

Pupils might work scientifically by:

- **Observing, through video or first-hand observation** and **measurement**, how different animals grow
- **Asking questions** about what things animals need for survival **suggesting ways to find answers to their questions**.
- **Describing** the main changes as young animal offspring grow into adults (at least: between egg and adult bird; between egg and adult insect; between baby and adult mammal)

Health – How we grow and stay healthy

Pupils should be taught to:

- Notice that humans have offspring which grow into adults.
- Find out about and describe the basic needs of 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.
  - Medicines can be useful when we are ill.
  - Medicines can be harmful if not used properly.

Notes and Guidance (non-statutory):

Pupils should be introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans.

They should also be introduced to the process of reproduction and growth in animals [humans]. The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs. Growing into adults can include reference to baby, toddler, child, teenager, adult.

Pupils might work scientifically by:

- **Observing**, **through video or first-hand observation** and **measurement**, how humans grow.
- **Recording** their findings using charts.
- **Asking questions** about what things animals [humans]. need for survival and what humans need to stay healthy and
- **Suggesting ways to find answers to their questions**.

Key Learning in Science: Year 2

Plants – Plant growth	Material Properties – Uses of Materials
Pupils should be taught to: ▪ 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 (and how changing these affects the plant) ▫ Plants are living and eventually die **Notes and Guidance (non-statutory):** Pupils should use the local environment throughout the year to observe how different plants grow. Pupils should be introduced to the requirements of plants for germination, growth and survival, as well as the process of reproduction and growth in plants. **Note:** Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them. **Pupils might work scientifically by:** • **Observing** and **recording**, with some accuracy, the growth of a variety of plants as they **change over time** from a seed or bulb, or • **Observing** similar plants **at different stages** of growth; • **Setting up a comparative test** to show that plants need light and water to stay healthy.	Pupils should be taught to: ▪ Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, water, 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 (applying a force) ▫ Some materials can be found naturally; others have to be made **Notes and Guidance (non-statutory):** Pupils should identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They should think about the properties of materials that make them suitable or unsuitable for particular purposes and they should be encouraged to think about unusual and creative uses for everyday materials. Pupils might find out about people who have developed useful new materials; for example, John Dunlop, Charles Macintosh or John McAdam. **Pupils might work scientifically by:** • **Comparing** the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs); • **Observing closely**, • **Identifying and classifying** the uses of different materials, and • **Recording their observations**. • **Thinking about** unusual and creative uses for everyday materials.

Year Group Expectations: Year 2

Exploring / Observing *KS1 - observing closely* *Using their observations and ideas to suggest answers to questions*	Grouping and Classifying *KS1 - Compare and contrast a variety of examples linked to KS1 PoS*	Questioning *KS1 - asking simple questions*	Researching *KS1 - finding things out using secondary sources of information*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
▪ Use simple scientific language from the year 2 PoS to talk about / **record** what they have noticed ▪ Use observations to make suggestions and/or ask questions ▪ **Observe** and describe simple processes/cycles/changes with several steps *(e.g. growth cycle, simple food chain, saying how living things depend on one another)* ▪ **Observe** closely and communicate with increasing accuracy the features or properties of things in the real world	▪ **Name / Identify** common examples, some common features or different uses ▪ **Sort** and **group** objects, materials or living things by observable and/or behavioural features ▪ **Compare** and contrast… a variety of things [objects, materials or living things] - focusing on the similarities as well as the differences	▪ Raise their own logical questions based on or linked to things they have observed ▪ With help / scaffolds, begin to ask questions such as 'What will happen if…?"	▪ Talk about how useful the information source was and express opinion about findings ▪ Make suggestions about who to ask or where to look for information. ▪ Ask people questions to help them answer their questions ▪ Use simple and appropriate secondary sources (such as books, photographs, videos and other technology) to find things out / find answers	▪ Act out something to represent something else about the world around us *(e.g a life cycle)*	▪ Share ideas in a group and listen to the ideas of others ▪ Work cooperatively with others on a science task making some choices

Planning and Testing *KS1 - performing simple tests*	Using Equipment and Measures *KS1 - Using simple equipment and gathering data to help in answering their questions*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *KS1 - Talk about what happened / what they noticed*	Explaining results *KS1 - talk about what they found out*	Trusting results
▪ Carry out simple comparative tests as part of a group, following a **method** with some independence ▪ Make a simple prediction about what might happen and try to give a vague reason (even though it might not be correct) ▪ With support, make suggestions on a **method** for setting up a simple comparative test ▪ Talk about a practical way to find answers to their questions	▪ **Measure** using non-standard and simple standard measures (e.g. cm, time) with increasing accuracy ▪ Begin to make decisions about which equipment to use ▪ Correctly and safely use **equipment** provided to make observations and/or take simple measurements	▪ **Record** and communicate their findings in a range of ways to a variety of audiences ▪ Use simple scientific language with increasing accuracy (from year 2 PoS) ▪ **Record** simple data with some accuracy to help in answering questions: - With support or using frameworks, make decisions about how to complete a variety of tables/charts *(e.g. a 2 column table, tally charts, Venn diagram, pictograms, block graphs with 1:1 scale).* - *Present findings in a class displays* - *Sequence / annotate photographs of change over time* - *Produced increasingly detailed drawings which are labelled/annotated*	▪ With guidance, begin to notice **patterns** in their data e.g. order their findings, sequence best to worst, say what happened over time, etc. ▪ Recognise if **results** matched **prediction**s. (say if results were what they expected) ▪ Use their recordings to talk about and describe what has happened	▪ Begin to use simple scientific language (from year 2 PoS) to explain what they have found out. ▪ Give a simple, logical reason why something happened *(e.g. I think … because …)*	▪ Begin to discuss if the test was un**fair**

Key Learning in Science: Year 3

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe plant lifecycles with a particular focus on the different parts of a plant (e.g. comparing fruits and seeds and looking for examples of pollination). This could be done through an ongoing/monthly nature journal to observe, record and review over a period of time.

Plants – Functions of Parts of a Plant

Pupils should be taught to:

- Identify, locate and describe the functions of different parts of flowering plants: roots, stem/trunk, 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 part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
  - Roots grow downwards and anchor the plant.
  - Water, taken in by the roots, goes up the stem to the leaves, flowers and fruit.
  - Nutrients (not food) are taken in through the roots.
  - Stems provide support and enable the plant to grow towards the light.
  - Plants make their own food in the leaves using energy from the sun.
  - Flowers attract insects to aid pollination.
  - Pollination is when pollen is transferred between plants by insects, birds, other animals and the wind.
  - Seeds are formed after the flowers are pollinated.
  - Many flowers produce fruits which protect the seed and/or aid seed dispersal.
  - Seed dispersal, by a variety of methods, helps ensure that new plants survive.
  - Plants need nutrients to grow healthily (either naturally from the soil or from fertiliser added to soil).

Notes and Guidance (non-statutory):

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.

Note: Pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens.

Pupils might work scientifically by:

- **Comparing** the effect of different factors on plant growth, for example the amount of light, the amount of fertiliser;
- Discovering (**research and modelling**) how seeds are formed by
- **Observing** the different stages of plant cycles over a period of time;
- **Looking for patterns** in the structure of fruits that relate to how the seeds are dispersed.
- **Observing** how water is transported in plants, for example, by putting cut, white carnations into coloured water.
- **Observing** how water travels up the stem to the flowers.

Animals - Health/Nutrition

Pupils should be taught to:

- 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.
- An adequate and varied diet is beneficial to health (along with a good supply of air and clean water).
- Regular and varied exercise *from a variety of different activities* is beneficial to health (focus on *energy in versus energy out*. Include information on making informed choices).

Notes and Guidance (non-statutory):

Pupils should continue to learn about the importance of nutrition

Pupils might work scientifically by:

- **Comparing and contrasting** the diets of different animals (including their pets).
- Decide ways of **grouping** them according to what they eat.
- **Researching** different food groups and how they keep us healthy.
- Designing meals based (**Create / Invent/ Design**) on what they find out.

Animals - Skeletons and Movement

Pupils should be taught to:

- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.
- Identify animals (vertebrates) which have a skeleton which supports their body, aids movement & protects vital organs (e.g. name and locate skull, backbone, ribs, bones for movement/limbs, pelvis and be able to name some of the vital organs protected).
- Identify animals without internal skeletons/backbones (invertebrates) and describe how they have adapted other ways to support themselves, move & protect their vital organs.
  - Know how the skeletons of birds, mammals, fish, amphibians or reptiles are similar (backbone, ribs, skull, bones used for movement) and the differences in their skeletons.
  - Know that muscles, which are attached to the skeleton, help animals move parts of their body.
  - Explore how humans grow bigger as they reach maturity by making comparisons linked to body proportions and skeleton growth – e.g. do people with longer legs have longer arm spans?
  - Recognise that animals are alive; they move, feed, grow, use their senses and reproduce.

Notes and Guidance (non-statutory):

Pupils 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.
- **Observing** and **comparing** their movement.
- **Exploring** ideas about what would happen if humans did not have skeletons.

Key Learning in Science: Year 3

Material Properties - Rocks

Pupils should be taught to:

- 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
  - Recognise that rocks and soils can feel and look different.
  - Recognise that rocks and soils can be different in different places/environments.

Notes and Guidance (non-statutory):

Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment.

Pupils might work scientifically by:

- **Observing** rocks, including those used in buildings and gravestones.
- **Exploring** how and why they might have changed over time.
- **Using (equipment)** a hand lens or microscope to help them.
- **Identify and classify** rocks according to whether they have grains or crystals, and whether they have fossils in them.
- **Research** and discuss the different kinds of living things whose fossils are found in sedimentary rock.
- **Explore** how fossils are formed.
- **Explore** different soils and …
- **Identify similarities and differences** between them and describe the composition of soil.
- I**nvestigate** what happens when rocks are rubbed together (classify according to hardness) or what changes occur when they are in water.
- **Raise and answer questions** about the way soils are formed.

Light and Astronomy - Light, reflections and shadows

Pupils should be taught to:

- 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 can change.

Notes and Guidance (non-statutory):

Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them 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 shadows to change.

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

Pupils might work scientifically by:

- **Looking for patterns** in what happens to shadows when the light source moves or the distance between the light source and the object changes.

Forces and Magnets

Pupils should be taught to:

- Compare how some 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 (like and unlike poles).
- Predict whether two magnets will attract or repel each other, depending on which poles are facing.

Notes and Guidance (non-statutory):

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, horseshoe).

Pupils might work scientifically by:

- **Comparing** how different things move and grouping them.
- **Raising questions** and **carrying out tests** to find out how far things move on different surfaces.
- **Gathering and recording data** to find answers to their questions.
- **Exploring** the strengths of different magnets and **finding a fair way to compare them**.
- **Sorting materials** into those that are magnetic and those that are not.
- **Looking for patterns** in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another.
- **Identifying** how these properties make magnets useful in everyday items and suggesting creative uses for different magnets.

Year Group Expectations: Year 3

Exploring / Observing *LKS2 - developing their own ideas and their understanding of the world around them*	Grouping & Classifying *LKS2 - Compare and contrast a variety of examples linked to LKS2 PoS*	Questioning *LKS2 - asking relevant questions*	Researching *LKS2 - finding things out using a wide range of secondary sources of information*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
▪ Observe and record relationships between structure and function (linked to Y3 PoS) ▪ Observe and record changes /stages over time (linked to Y3 PoS) ▪ Explore / observe things in the local environment / real contexts and record observations (linked to Y3 PoS) – see 'Communicating' section also re links to vocabulary	▪ Decide ways and give reasons for sorting, grouping, classifying, identifying things/objects, living things, processes or events based on specific characteristics ▪ Compare and contrast and begin to consider the relationships between different things *(e.g. structures of plants, functions of plant parts, diets, skeletons of humans and other animals, changes over time, etc.)* ▪ Record similarities as well as differences *(e.g. what do all skeletons have? as well as the differences between skeletons)*	▪ Explore their own ideas about 'what if….?' scenarios e.g. humans did not have skeletons. ▪ Ask questions such as 'What if we tried….? or 'What if we changed…?' ▪ Begin to understand that some questions can be tested in the classroom and some cannot. ▪ Within a group suggest questions that can be explored, observed, tested or investigated further ▪ Within a group suggest relevant questions about what they observe and about the world around them.	▪ Find things out using a range of secondary sources of information *(e.g. books, photographs, videos and other technology)*	▪ Act out or make a model of something to represent something in the real world using appropriate scientific vocabulary verbally.	▪ Begin to make some decisions about an idea within a group from a list of choices (e.g. let's put them all in a pile first OR I think we should try ….) ▪ With help; support, listen to and acknowledge others in the group *(e.g. Yes. I prefer that one too)* ▪ Build on / add to someone else's idea. *(e.g. we could use x and as well as y)* ▪ Begin to understand that it is okay to disagree with their peers and offer a reason for their opinion

Planning & Testing *LKS2 - making decisions about and setting up simple practical enquiries, comparative tests and fair tests*	Using Equipment & Measures *LKS2 - making accurate measurements and gathering data*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *LKS2 - Describing their findings / results*	Explaining results *LKS2 - reporting on findings saying why something happened*	Trusting results *LKS2 - suggest improvements for further tests*
▪ Help to decide about how to set up a simple **fair test** and begin to recognise when a test is not **fair**. ▪ Make a **prediction** based on everyday experience ▪ With support/as a group, set up simple practical enquiries incl. comparative and **fair tests** e.g. make a choice from a list of a things (variables) to change when conducting a **fair test**. *(e.g. choose which magnets to compare and which method to use to test their strength).* ▪ As a group, begin to make some decisions about the best way of answering their questions. ▪ Find/suggest a practical way to compare things *e.g. rocks, magnets.*	▪ Collect data from their own observations and measurements using notes/ simple tables/standard units ▪ Help to make some decisions about what observations to make, how long to make them for, the type of simple equipment that might be used and how to work safely. ▪ Make simple **accurate** measurements using whole number standard **units**, using a range of equipment ▪ Gather data in a variety of ways to help in answering questions ▪ Use equipment **accurate**ly to improve the detail of their measurements/observations *(e.g. microscopes, measuring syringes, measuring cylinders, hand lenses)*	▪ Record and present findings using simple scientific language and vocabulary from the year 3 PoS, *including discussions, oral and written explanations, notes, annotated drawings, pictorial representations, labelled diagrams, simple tables, bar charts (using scales chosen for them), displays or presentations* ▪ With scaffold / support record, and present data in a variety of ways to help in answering questions. Communicate their findings in ways that are appropriate for different audiences. (linked to Y3 PoS)	▪ With scaffold/support, describe and compare the effect of different factors on something. *(e.g. we noticed that larger magnets are not always stronger)* ▪ With help, look for changes and simple patterns in their observations, data, chart or graph. ▪ Use their results to consider whether they met their **prediction**s.	▪ Use their experience and some **evidence** or results to draw a simple **conclusion** to answer their original question. ▪ Write a simple explanation of why things happened (using the word 'because') and using simple scientific language and vocabulary from the year 3 PoS	▪ Say whether what happened was what they expected and notice any results that seem odd. ▪ Begin to recognise when a test is not **fair** and suggest improvements.

Key Learning in Science: Year 4

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe and identify how a habitat changes. This could include a focus on the relationships between the plants and animals within a habitat. This could be done through an ongoing/monthly nature journal to observe, record and review over a period of time.

Environment – Living Things and Their Habitats

Pupils should be taught to:

- 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.
  - Use and make identification keys for plants and animals.

Notes and Guidance (non-statutory):

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 and flowering plants and non-flowering plants, Pupils could begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects.

Note: Plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, such as ferns and mosses.

Pupils should explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks or garden ponds, and the negative effects of population and development, litter or deforestation.

Pupils might work scientifically by:

- **Using and making simple guides or keys [grouping & classifying]** to explore and identify local plants and animals.
- **Making a guide [grouping & classifying]** to local living things.
- **Raising and answering questions** based on their **observations** of animals and
- What they have found out about other animals that they have **researched**.

Animals – Teeth, Eating and Digestion

Pupils should be taught to:

- 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 *(NB Link with types of teeth and eating in this unit but this concept could be developed further in the yr4 Environment / habitats unit).*
  - Describe how teeth and gums have to be cared for in order to keep them healthy.

Notes and Guidance (non-statutory):

Pupils should be introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine and explore questions that help them understand their special functions.

Pupils might work scientifically by:

- **Comparing** the teeth of carnivores and herbivores.
- **Suggesting reasons** for differences **[grouping & classifying]**.
- **Finding out [testing and/or researching]** what damages teeth and how to look after them.
- **Drawing and discussing their ideas** about the digestive system.
- **Comparing** them with …
- **… models** or images.

Key Learning in Science: Year 4

Material Properties and Changes – States of Matter

Pupils should be taught to:

- 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.
  - Solids, liquids and gases can be identified by their observable properties.
  - Solids have a fixed size and shape (the size and shape can be changed but it remains the same after the action).
  - Liquids can pour and take the shape of the container in which they are put.
  - Liquids form a pool not a pile.
  - Solids in the form of powders can pour as if they were liquids but make a pile not a pool.
  - Gases fill the container in which they are put.
  - Gases escape from an unsealed container.
  - Gases can be made smaller by squeezing/pressure.
  - Liquids and gases can flow.

Notes and Guidance (non-statutory):

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.

Note: Teachers should avoid using materials where heating is associated with chemical change, e.g. through baking or burning.

Pupils might work scientifically by:

- **Grouping and classifying** a variety of different materials.
- **Exploring** the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party).
- **Researching** the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid.
- **Observing** and **recording** evaporation over a period of time, such as a puddle in the playground or washing on a line.
- **Investigating** the effect of temperature on washing drying or snowmen melting.

Additional suggestion from Lancashire for working scientifically opportunities which enhance learning and support using ICT.

- This unit provides an ideal opportunity for **using data logging equipment** to detect/measure and compare temperatures.

Sound

Pupils should be taught to:

Vibrations

- Identify how sounds are made, associating some of them with something vibrating.
- Recognise that vibrations from sounds travel through a medium to the ear.
- 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.
  - Recognise that sounds can be made in a variety of ways (pluck, bang, shake, blow) using a variety of things (instruments, everyday materials, body).
  - Sounds travel away from their source in all directions.
  - Vibrations may not always be visible to the naked eye.

Pitch

- Find patterns between the pitch of a sound and features of the object that produced it.
  - Sounds can be high or low pitched.
  - The pitch of a sound can be altered.
  - Pitch can be altered either by changing the material, tension, thickness or length of vibrating objects or changing the length of a vibrating air column.

Muffling/blocking sounds

- Recognise that vibrations from sounds travel through a medium to the ear.
  - Sounds are heard when they enter our ears (although the structure of the ear is not important key learning at this age phase).
  - Sounds can travel through solids, liquids and air/gas by making the materials vibrate.
  - Sound travel can be reduced by changing the material that the vibrations travel through.
  - Sound travel can be blocked.

Notes and Guidance (non-statutory):

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.

Pupils might work scientifically by:

- **Finding patterns** in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses.
- They might make ear muffs from a variety of different materials **to investigate /test** which provides the best insulation against sound.
- They could **make [create/invent/design]** and play their own instruments by **using what they have found out** about pitch and volume.

Additional suggestion from Lancashire for working scientifically opportunities which enhance learning and support using ICT across the curriculum

- This unit provides an ideal opportunity for **using data logging equipment** to detect/measure and compare sounds.

Electricity

Pupils should be taught to:

- 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.
  - Electricity can be dangerous.
  - Electricity sources can be mains or battery.
  - Batteries 'push' electricity round a circuit and can make bulbs, buzzers and motors work.
  - Faults in circuits can be found by methodically testing connections.
  - Drawings, photographs and diagrams can be used to represent circuits (although standard symbols need not be introduced until UKS2).

Notes and Guidance (non-statutory):

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.

Pupils might work scientifically by:

- **Observing/noticing patterns**, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.

Year Group Expectations: Year 4

Exploring / Observing *LKS2 - developing their own ideas and their understanding of the world around them*	Grouping & Classifying *LKS2 - Compare and contrast a variety of examples linked to LKS2 PoS*	Questioning *LKS2 - asking relevant questions*	Researching *LKS2 - finding things out using a wide range of secondary sources of information*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
▪ Suggest their own ideas on a concept and compare these with what they observe / find out. ▪ Use observations to suggest what to do next ▪ Discuss ideas and develop descriptions from their observations using relevant scientific language and vocabulary (from Y4 PoS) ▪ Observe and record relationships between structure and function or between different parts of a processes (linked to Y4 PoS) ▪ Observe and record changes /stages over time (linked to Y4 PoS)	▪ Make a simple guide to local living things. ▪ Use guides or simple keys to classify / identify [animals, flowering plants and non-flowering plants]. ▪ Use their observations to identify and classify ▪ Begin to give reasons for these similarities and differences. ▪ Record similarities as well as differences and/or changes related to simple scientific ideas or processes or more complex groups of objects/living things/events *(e.g. evaporation and condensation, different food chains, different electrical circuits).*	▪ Ask/raise their own relevant questions with increasing confidence and independence that can be explored, observed, tested or investigated further ▪ Ask questions such as 'What will happen if…?" or 'What if we changed…? (linked with Y4 PoS) ▪ Choose/select a relevant question that can be answered [by research or experiment/test].	▪ Make decisions about which information to use from a wide range of sources and make decisions about how to present their research ▪ Recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.	▪ Make a visual representation or a model of something to represent something they have seen or a process that is difficult to see. ▪ Suggest their own ideas on a concept and compare these with models or images.	▪ Make some decisions about an idea within a group *(e.g. I think we should find out by testing…)* ▪ Increasingly support, listen to and acknowledge others in the group ▪ Build on / add to someone else's idea to improve a plan. ▪ Understand that it is okay to disagree with their peers and offer reasons for their opinion

Planning & Testing *LKS2 - making decisions about and setting up simple practical enquiries, comparative tests and fair tests*	Using Equipment & Measures *LKS2 - making accurate measurements and gathering data*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *LKS2 - Describing their findings / results*	Explaining results *LKS2 - reporting on findings saying why something happened*	Trusting results *LKS2 - suggest improvements for further tests*
▪ Carry out simple **fair tests** with increasing confidence investigating the effect of something on something else (linked to Y4 PoS). ▪ Start to make their own decisions about the most appropriate type of science enquiry they might use to answer scientific questions *(is a fair test the best way to investigate their question?).* ▪ Make a **prediction** based on the knowledge acquired from previous explorations /observations and apply it to a new situation ▪ Explain their planning decisions and choices ▪ Make some of the planning decisions about what to change and measure/observe. ▪ Begin to recognise when a **fair test** is necessary.	▪ Begin to identify where patterns might be found and use this to begin to identify what data to collect ▪ Make more of the decisions about what observations to make, how long to make them for and the type of equipment that might be used. ▪ Recognise obvious risks and how to keep themselves and others safe ▪ Learn how to use new equipment, such as data loggers & measure temperature in degrees Celsius (°C) using a thermometer. ▪ Collect data from their own observations and measurements, using notes/simple tables/standard **units** ▪ Make **accurate** measurements using standard **units** [and more complex units and parts of units] using a range of equipment and scales	▪ Record findings using relevant scientific language and vocabulary (from Y4 PoS), including discussions, oral and written explanations, notes, drawings (annotated), pictorial representations, labelled diagrams, tables and bar charts [where intervals and ranges agreed through discussion], displays or presentations ▪ Begin to select the most useful ways to collect, record, classify and present data from a range of choices ▪ Make decisions on how best to communicate their findings in ways that are appropriate for different audiences	▪ Notice/find patterns in their observations and data. (Describe the effect of something on something else) *(e.g. as I lengthen the ruler I notice that the pitch gets lower)* ▪ With some independence, analyse results / observations by writing a sentence that matches the **evidence** i.e. deciding the important aspect of the result and summarising in a **conclusion** *(e.g. metals tend to be good conductors of electricity)*	▪ Begin to develop their ideas about relationships and interactions between things and explain them ▪ Use relevant scientific language and vocabulary (from Y4 PoS) to begin to say/explain *why* something happened	▪ Use results to suggest improvements, new questions and/or predictions for setting up further tests ▪ Compare their results with others and give reasons why results might be different

Key Learning in Science: Year 5

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe and identify a variety of plant and animal life cycles. This could be done through an ongoing/monthly nature journal to observe, record and review a variety of examples over a period of time. The unit on 'Human life cycles' can be linked to PSHEE work on 'Relationships' and the Year 5 Science unit 'Habitats and life cycles' rather than being taught as a separate unit.

Environment - Observing Life cycles

Pupils should be taught to:

- 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.
  - Name, locate and describe the functions of the main parts of reproductive system of plants (stigma, stamen, petal, sepal, pollen, ovary)

Notes and Guidance (non-statutory):

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 sexual reproduction in animals.

Pupils might work scientifically by:

- **Observing** and **comparing** the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times).
- **Asking** pertinent **questions**.
- **Suggesting reasons** for similarities and differences **[grouping and classifying]**.
- They might **try to [explore]** grow new plants from different parts of the parent plant, for e.g., seeds, stem and root cuttings, tubers, bulbs.
- **Observe changes** in an animal **over a period of time** (e.g. by hatching and rearing chicks).
- **Comparing** how different animals reproduce and grow.

Material Properties – Testing Material Properties

Pupils should be taught to:

- 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.
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic (advantages and disadvantages).
  - Compare a variety of materials and measure their effectiveness (e.g. hardness, strength, flexibility, solubility, transparency, thermal conductivity, electrical conductivity).

Temperature and Thermal Insulation

- Heat always moves from hot to cold.
- Some materials (insulators) are better at slowing down the movement of heat than others.
- Objects/liquids will warm up or cool down until they reach the temperature of their surroundings.

Notes and Guidance (non-statutory):

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials and relating these to what they learnt about magnetism in Year 3 and about electricity in Year 4.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them.

Pupils might work scientifically by:

- **Carry out tests** to answer questions such as 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
- **Compare** materials in order to make a switch in a circuit.

Material Changes - Reversible changes

- Know 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.
- Demonstrate that dissolving, mixing and changes of state are reversible changes.
  - Changes can occur when different materials are mixed.
  - Some material changes can be reversed and some cannot.
  - Recognise that dissolving is a reversible change and recognise everyday situations where dissolving occurs.
  - Distinguish between melting and dissolving.
  - Mixtures of solids (of different particle size) can be separated by sieving.
  - Mixtures of solids and liquids can be separated by filtering if the solid is insoluble (un-dissolved).
  - Evaporation helps us separate soluble materials from water.
  - Changes to materials can happen at different rates (factors affecting dissolving, factors affecting evaporation – amount of liquid, temperature, wind speed, etc).
  - Freezing, melting and boiling changes can be reversed (revision from YR4).

Notes and Guidance (non-statutory):

Pupils should explore reversible changes including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.

Material Changes – Irreversible changes

Pupils should be taught to:

- 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 (producing a gas / fizzing).

Notes and Guidance (non-statutory):

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.

Note: Safety guidelines should be followed when burning materials.

Pupils might work scientifically by:

- **Observing** and **comparing** the changes that take place, for example, when burning different materials or baking bread or cakes.
- **Researching** and **discussing** how chemical changes have an impact on our lives, for example cooking.
- **Discuss [research]** the creative use of new materials such as polymers, super-sticky and super-thin materials.
- **Explain** how they know when a change is reversible or irreversible

Key Learning in Science: Year 5

Animals - Human Life Cycles

Pupils should be taught to:

- Describe the changes as humans develop to old age.
  - Animals are alive; they move, feed, grow, use their senses, reproduce, breathe/respire and excrete.

Notes and Guidance (non-statutory):

Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.

Pupils might work scientifically by:

- **Researching** the gestation periods other animals and **comparing** them with humans.
- By **finding out** and **recording** the length and mass of a baby as it grows.

Light and Astronomy – Earth and Space

Pupils should be taught to:

- Describe the movement of the Earth, and other planets, relative to the Sun and each other in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Describe Sun/Earth/Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night.
  - The Earth spins once around its own axis in 24 hours, giving day and night.
  - The Earth orbits the Sun in one year.
  - We can see the Moon because the Sun's light reflects off it.
  - The Moon orbits the Earth in approximately 28 days and changes to the appearance of the moon are evidence of this.
  - Use the Earth's movement in space to explain the apparent movement of the sun across the sky.
  - The Sun appears to move across the sky from East to West and this causes shadows to change during the day.
  - Changes to shadow length over a day or changes to sunrise and sunset times over a year are evidence supporting the movement of the Earth.

Notes and Guidance (non-statutory):

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 eight 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 one moon; Jupiter has four 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.

Pupils might work scientifically by:

- **Comparing** the time of day at different places on the Earth through internet links and direct communication.
- **Creating simple models** of the solar system.
- **Constructing** simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day.
- **Finding out** why some people think that structures such as Stonehenge might have been used as astronomical clocks.

Forces – Effects on Movement

Pupils should be taught to:

- 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 (causing things to slow down)
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
  - There are different types of forces (push, pull, friction, air resistance, water resistance, magnetic forces, gravity) which have different effects on objects
  - Gravity can act without direct contact between the Earth and an object.
  - Friction, air resistance and water resistance can be useful or unwanted.
  - The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect.
  - More than one force can act on an object simultaneously (either reinforcing or opposing each other).

Notes and Guidance (non-statutory):

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 such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Pupils might work scientifically by:

- **Exploring** falling paper cones or cup-cake cases.
- **Designing and making [exploring]** a variety of parachutes.
- **Carrying out fair tests** to determine which designs are the most effective.
- **Exploring** resistance in water by making and testing boats of different shapes.
- **Design and make [create/invent/design]** artefacts that use simple levers, pulleys, gears and/or springs and explore their effects.

Year Group Expectations: Year 5

Exploring / Observing *UKS2 - developing a deeper understanding of a wide range of scientific ideas and encountering more abstract ideas*	Grouping and Classifying *UKS2 - Compare and contrast a variety of examples linked to UKS2 PoS*	Questioning *UKS2 - asking their own questions about scientific phenomena*	Researching *UKS2 – summarise research from a wide variety of sources and recognising that scientific ideas change and develop over time*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
• Use their developing scientific knowledge and understanding and relevant scientific language and terminology to discuss, communicate and explain their observations (incl. more abstract ideas from Y5 PoS (e.g. friction, air resistance, forces, Earth and space, reversible and irreversible changes). • Evaluate their observations and suggest a further test, offer another question or make a **prediction** ▪ Observe (including changes over time) and suggest a reason for what they notice	▪ Suggest reasons for similarities and differences ▪ Compare and contrast things beyond their locality and use these similarities and differences to help to classify *(e.g. features of animals, life cycles of different living things, melting compared with dissolving, etc).* ▪ Use secondary sources of information to identify and classify. ▪ Decide which sources of information (and/or equipment and/or test) to help identify and classify	▪ Recognise scientific questions that do not yet have definitive answers. (linked to Y5 PoS) ▪ Refine a scientific question so that it can be tested e.g. 'What would happen to… if we changed…?' ▪ Decide whether their questions can be answered by researching or by testing ▪ Independently ask their own scientific questions taking some ownership for finding out the answers	▪ Find out how scientific ideas have changed/developed over time (linked to Y5 PoS) ▪ Articulate and explain findings from their research using scientific knowledge and understanding (see 'Communicating' box below re vocabulary) ▪ Make decisions about which information to use from a wide range of sources	▪ Perform / create simple models to exemplify scientific ideas using scientific terminology where appropriate *(e.g. spheres to represent movements of the Sun and Earth, solar system models, shadow clocks, a simple lever or mechanism).*	▪ Propose their own ideas and make decisions with agreement in a group ▪ Support, listen to and acknowledge others in the group e.g. Yes. I prefer that one too ▪ Check the clarity of each other's suggestions e.g. are you saying you think this one is a herbivore? ▪ Build on / add to someone else's idea to improve a plan or suggestion ▪ Understand that it is okay to disagree with their peers and offer a reasons for their opinion

Planning and Testing *UKS2 - using different types of scientific enquiry making decisions about and explaining choices for testing*	Using Equipment and Measures *UKS2 - increasing complexity and increasing accuracy and precision make their own decisions about the data to collect*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *UKS2 - Looking for patterns analysing functions, relationships and interactions more systematically*	Explaining results *UKS2 - draw conclusions based on / supported by evidence*	Trusting results *UKS2 - comment on how reliable the data is*
▪ Carry our **fair tests** and other investigations with increasing independence ▪ Suggest more than one possible prediction and begin to suggest which is the most likely. Justify their reason with some knowledge and understanding of the concept ▪ Make decisions about which **variable**s to change, measure and keep the same (linked to the appropriate units in the Y5 PoS) ▪ Make most of the planning decisions for an investigation. ▪ Recognise when it is appropriate to carry out a **fair test**.	▪ Make their own decisions about what observations to make or measurements to use and how long to take them for (recognising the need for repeat readings on some occasions). ▪ Take measurements using a range of scientific equipment with increasing accuracy and using more complex scales / **units** ▪ Identify possible risks to themselves and others and suggest ways of reducing these ▪ Choose the most appropriate equipment and make **accurate** measurements	▪ Use their developing scientific knowledge and understanding and relevant scientific language and terminology to communicate more abstract concepts (linked to Y5 PoS) ▪ Present and explain their findings through talk, in written forms or in other ways (e.g. using technology) for a range of audiences / purposes ▪ Record data and results of increasing complexity using different formats e.g. tables, annotated scientific diagrams, classification keys, graphs and models ▪ Make decisions about the most appropriate way of recording data	▪ Describe straightforward patterns in results linking cause and effect e.g. using er…er or the word 'more' *(e.g. the longer, thinner shapes move through the water more quickly OR the larger the wings, the longer it takes the spinner to fall)* ▪ Look for / notice relationships between things and begin to describe these. ▪ Comment on the results and whether they **support** the initial **prediction**	▪ Use their scientific KandU and appropriate scientific language and terminology (linked to Y5 PoS) to explain their findings and data and answer their initial question ▪ Draw a valid **conclusion** (explain *why* it happened) based on their data and observations (from Y5 PoS)	▪ Begin to recognise how repeated readings improve the **reliability** of results ▪ Compare results with others and comment on how **reliable** they are

Key Learning in Science: Year 6

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe and identify a variety of plants and animals that live there focusing on their adaptations for survival. This could be done through an ongoing/monthly nature journal to observe, record and review a variety of examples over a period of time and would support their learning and wider research in the 'Living Things and Their Habitats' unit and the 'Evolution and Inheritance' unit.

Living Things and their Habitats - Classification

Pupils should be taught to:

- 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.
  - Living things can be grouped into micro-organisms, plants and animals.
  - Vertebrates can be grouped as fish, amphibians, reptiles, birds and mammals.
  - Invertebrates can be grouped as snails and slugs, worms, spiders and insects.
  - Plants can be grouped as flowering plants (incl. trees and grasses) and non-flowering plants (such as ferns and mosses).

Notes and Guidance (non-statutory):

Pupils should build on their learning about grouping living things in Year 4 by looking at the classification system in more detail. They should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (e.g. insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They should discuss reasons why living things are placed in one group and not another. Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.

Pupils might work scientifically by:

- **Using classification systems and keys.**
- **Identifying [grouping and classifying]** some animals and plants in the immediate environment.
- **Researching** unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system **[grouping and classifying]**.

Living Things and their Habitats – Evolution and Inheritance

Pupils should be taught to:

- 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.

Notes and Guidance (non-statutory):

Building on what they have learnt 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.

Pupils might work scientifically by:

- **Observing** and **raising questions** about local animals and how they are adapted to the environment.
- **Comparing** how some living things adapt to survive in extreme conditions, e.g. cactuses, penguins and camels.
- **Analysing the advantages and disadvantages** of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

Animals/Health – Exercise, Health and The Circulatory System

Pupils should be taught to:

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function (in the long term and short term).
- Describe the ways in which nutrients and water are transported within animals, including humans.
  - The heart is a major organ and is made of muscle.
  - The heart pumps blood around the body through vessels and this can be felt as a pulse.
  - The heart pumps blood through the lungs in order to obtain a supply of oxygen.
  - Blood carries oxygen/essential materials to different parts of the body.
  - During exercise muscles need more oxygen so the heart beats faster and our breathing and pulse rates increase.
  - Animals are alive; they move, feed, grow, use their senses, reproduce, breathe/respire and excrete.
  - An adequate, varied and balanced diet is needed to help us grow and repair our bodies (proteins), provide us with energy (fats and carbohydrates) and maintain good health (vitamins and minerals).
  - Tobacco, alcohol and other 'drugs' can be harmful.
  - All medicines are drugs, not all drugs are medicines.

Notes and Guidance (non-statutory):

Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function. Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.

Pupils might work scientifically by:

- **Exploring the work of scientists** and
- Scientific **research** about the relationship between diet, exercise, drugs, lifestyle and health.

*Additional suggestion beyond NC2014 to support pupils working scientifically and to provide an opportunity to use ICT to collect/interpret data

- **Observing/Measuring changes** to breathing, heart beat and or pulse rates after exercise.

Key Learning in Science: Year 6

Light and Astronomy – How Light Travels

Pupils should be taught to:

- 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 the light that travels from light sources to our eyes or from light sources to objects and then to our eyes (and represent this in simple diagrammatic form).
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Notes and Guidance (non-statutory):

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

Pupils might work scientifically by:

- Deciding **[observe/explore]** where to place rear-view mirrors on cars.
- **Designing and making [Create / Invent / Design]** a periscope and using the idea that light appears to travel in straight lines to explain how it works.
- **Investigating** the relationship **[looking for patterns]** between light sources, objects and shadows by using shadow puppets.
- Extend their experience **[explore and observe]** of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).

Electricity

Pupils should be taught to:

- 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 (at least: cells, wires, switches, bulbs, buzzers and motors) when representing a simple circuit in a diagram.
  - Use/interpret circuit diagrams to construct a variety of more complex circuits predicting whether they will 'work'.

Notes and Guidance (non-statutory):

Building on their work in Year 4, pupils should construct simple series circuits, to help them 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.

Pupils might work scientifically by:

- Systematically identifying **[testing]** the effect of changing one [thing] component at a time in a circuit.
- **Designing and making [Create / Invent / Design]** a set of traffic lights, a burglar alarm or some other useful circuit.

Year Group Expectations: Year 6

Exploring / Observing *UKS2 - developing a deeper understanding of a wide range of scientific ideas and encountering more abstract ideas*	Grouping and Classifying *UKS2 - Compare and contrast a variety of examples linked to UKS2 PoS*	Questioning *UKS2 - asking their own questions about scientific phenomena*	Researching *UKS2 – summarise research from a wide variety of sources and recognising that scientific ideas change and develop over time*	Modelling *using dance, drama or a visual aid to represent science in the real world*	Collaborating *interacting effectively as part of a group*
▪ Use correct scientific knowledge and understanding and relevant scientific language to discuss their observations and explorations (linked to Y6 PoS) ▪ Identify changes that have occurred over a very long period of time (evolution) and discuss how changes have impacted the world ▪ Explore more abstract systems / functions /changes / behaviours and record their understanding of these *(e.g. the relationship between diet, exercise, drugs, lifestyle and health; evolutionary changes; how light travels)*	▪ Recognise the importance of classification to the scientific world and form a conclusion from their sorting and classifying ▪ Compare and contrast more complex processes, systems, functions (e.g. sexual and asexual reproduction) ▪ Construct a classification key / branching database using more than two items ▪ Compare and contrast things beyond their locality and discuss advantages/disadvantages, pros/cons of the similarities and differences ▪ Use *research** to identify and classify things ▪ Use classification systems, keys and other information records [databases] to help classify or identify things.	▪ Recognise scientific questions that do not yet have definitive answers (linked to Y6 PoS) ▪ Refine a scientific question to make it testable i.e. Ask a testable question which includes the change and measure variables - *e.g. what would happen to … if we changed …?* *e.g. What affect would we have on … if we …?* *e.g. How would exercise affect the pulse rate?* ▪ Use observations to suggest a further (testable or research) question. ▪ Independently ask a variety of scientific questions and decide the type of enquiry needed to answer them	▪ Research how scientific ideas have developed over time and had an impact on our lives. ▪ Use evidence from a variety of sources to justify their ideas ▪ Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. ▪ Interview people to find out information.	▪ Make / perform and use their own versions of simple models to describe and explain scientific ideas (e.g. circulatory system drama, periscopes to explain how light travels, burglar alarm to explain components in a circuit).	▪ Propose their own ideas and make decisions with agreement in a group ▪ Support, listen to and acknowledge others in the group ▪ Check the clarity of each other's suggestions ▪ Build on / add to someone else's idea to improve a plan or suggestion Understand that it is okay to disagree with their peers and offer a reasons for their opinion

Planning and Testing *UKS2 - using different types of scientific enquiry making decisions about and explaining choices for testing*	Using Equipment and Measures *UKS2 - increasing complexity and increasing accuracy and precision make their own decisions about the data to collect*	Communicating *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	Considering the results of an investigation / writing a conclusion		
			Describing results / Looking for patterns *UKS2 - Looking for patterns analysing functions, relationships and interactions more systematically*	Explaining results *UKS2 - draw conclusions based on / supported by evidence*	Trusting results *UKS2 - comment on how reliable the data is*
▪ Predict what a graph might look like before collecting results ▪ Make a hypothesis where they say how one thing will affect another and give a reason for their suggestion with a developing understanding of the scientific concept ▪ Identify **variables** to change, measure and keep the same in order for a test to be **fair** ▪ Independently plan investigations and explain planning decisions ▪ Decide when it is appropriate to carry out a **fair test** investigation, comparative test or alternative	▪ Decide whether to **repeat** any **readings** and justify the reason for doing so ▪ Make their own decisions about what measurements to take (and begin to identify the ranges used). ▪ Make, and act on, suggestions to control/reduce risks to themselves and others ▪ Use equipment fit for purpose to take measurements which are increasingly **accurate** and precise ▪ Decide the most appropriate equipment to use to collect data	▪ Articulate understanding of the concept using scientific language and terminology when describing abstract ideas, observations and findings (linked to the Y6 PoS) ▪ Record data and results of increasing complexity using scientific diagrams and labels, recognised symbols, classification keys, tables, bar and line graphs, and models. Make decisions about how to present and explain their findings through talk, in written forms or in other ways (e.g. using technology)	▪ Spot unexpected results that do not fit the pattern (anomalies) ▪ Identify patterns in results collected and describe them using the **change and measure variables** (causal relationships) (e.g. as we *increased the number of batteries* the *brightness the bulb increased*	▪ Identify **evidence** that refutes or **supports** their ideas ▪ Independently form a conclusion which draws on the **evidence** from the test (linked to Y6 PoS) ▪ Use scientific language and terminology (linked to Y6 PoS) to explain why something happened	▪ Be able to suggest reasons for unexpected results (anomalies) ▪ Describe how to improve planning to produce more **reliable** results ▪ Say how confident they are that their results are **reliable** and give a reason