

## Learning journeys in Science

### Biology: Plants

| Year group | When taught                            | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...  |
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| 1          | Cycle A & B – Spring and Summer        | <ul style="list-style-type: none"> <li>Identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen</li> <li>Identify and describe the basic structure of a variety of common plants including roots, stem/trunk, leaves, and flowers</li> </ul>   | <ul style="list-style-type: none"> <li>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</li> <li>Know a rose bush, a sunflower and a dandelion by sight</li> <li>Know an oak tree, a birch tree and a horse chestnut tree by sight</li> <li>Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn</li> <li>Know that a flowering plant consist of roots, stem, leaves and flowers, and that a tree's stem is called a trunk</li> <li>Know how a plant grows from a seed to a mature plant.</li> <li>Know that David Attenborough is a famous scientist who has created and presented some of the most famous television programmes ever made about plants and animals</li> </ul> |
| 2          |  | <ul style="list-style-type: none"> <li>Observe and describe how seeds and bulbs grow into mature plants</li> <li>Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy</li> </ul>  |  |
| 3          | Cycle A – Aut 2<br><br>Cycle B – Aut 1 | <ul style="list-style-type: none"> <li>Identify and describe the functions of different parts of plants: roots, stem, leaves, and flowers</li> <li>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</li> <li>Investigate the ways in which water is transported within plants</li> <li>Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal</li> </ul> | <ul style="list-style-type: none"> <li>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</li> <li>Know that different parts of plants have one or more functions (jobs)</li> <li>Know that the roots collect water and minerals from the soil and hold the plant firmly in the ground</li> <li>Know that the stem holds up the leaves so that they can gather light to make food and holds up the</li> </ul>   |

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|  |  |  | <p>flowers so that they can receive pollen and disperse their fruits; know that the stem also transports water and minerals from the roots to the other parts of the plant</p> <ul style="list-style-type: none"> <li>• Know that the leaves make food by absorbing light and using its energy to turn carbon dioxide and water into carbohydrates</li> <li>• Know that the function of a flower is reproduction, where flowers of the same kind exchange pollen – made by an anther – in a process called fertilisation, and a structure in the flower's ovary called an ovule becomes a seed; the ovary then becomes a fruit which helps the seed leave the plant in a process called dispersal Know that plants and animals including humans need certain nutrients to survive</li> <li>• Know that a plants structure is like a skeleton</li> <li>• Know that plants and animals have several similarities</li> </ul> |
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### Biology: Animals including humans

| Year group | When taught                        | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...   |
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| 1          | Cycle A + B<br>– Autumn and Summer | <ul style="list-style-type: none"> <li>• Identify and name a variety of common animals that are birds, fish, amphibians, reptiles and mammals</li> <li>• Identify and name a variety of common animals that are carnivores, herbivores and omnivores</li> <li>• Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles and mammals, and including pets)</li> <li>• Identify, name draw and label the basic parts of the human body and say which parts of the body is associated with each sense</li> </ul> | <ul style="list-style-type: none"> <li>• Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</li> <li>• Know that a trout is an example of a fish; a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and a human are examples of a mammal and explore further examples of each animal type</li> <li>• Know that herbivorous animals eat plants; carnivorous animals eat other animals; omnivorous animals eat both animals and plants</li> </ul> |
| 2          | Cycle A + B<br>– Autumn            | <ul style="list-style-type: none"> <li>• Notice that animals, including humans, have offspring which grow into adults</li> </ul>  |   |

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|  | and<br>Summer | <ul style="list-style-type: none"> <li>Find out about and describe the basic needs of animals, including humans, for survival (water, food, and air)</li> <li>Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene</li> </ul> | <ul style="list-style-type: none"> <li>Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians)</li> <li>Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone</li> <li>Know that fish are different to other animals in having gills so that they can breathe underwater and scaly skin.</li> <li>Know that amphibians are different to other animals in that they begin their lives with gills but then develop lungs and breathe on land</li> <li>Know and describe the basic needs of animals including humans</li> <li>Know that reptiles are different to other animals in that they breathe air and have scaly skin</li> <li>Know that birds are different to other animals in that they have feathers and wings</li> <li>Know that mammals are different to other animals in that they have fur/hair and they feed milk to their young</li> <li>Know that feet, legs, arms, hands, torso, head, skin, ears, eyes, nose, mouth and tongue are parts of the body and identify them</li> <li>Know that eyes are associated with sight, ears with sound, nose with smell, tongue with taste and skin with touch</li> <li>Know that eyes are associated with sight, ears with sound, nose with smell, tongue with taste and skin with touch</li> <li>Know that the food cycle starts with the producer and progresses to the consumer.</li> </ul> |
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| 3 | Cycle A-<br>Spr 2 +<br>Sum 2 | <ul style="list-style-type: none"> <li>Identify that animal, 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</li> <li>Identify that humans and some animals have skeletons and muscles for support, protection, and movement</li> </ul> | <ul style="list-style-type: none"> <li>Know that food passes through the body with the nutrients being extracted and the waste products excreted, and that this process is called digestion</li> <li>Know that the process of digestion involves breaking complex foodstuffs into simpler building blocks that can be absorbed by the body</li> </ul>  |
| 4 | Cycle A-<br>Spr 2 +<br>Sum 2 | <ul style="list-style-type: none"> <li>Describe the simple functions of the basic parts of the digestive system in humans</li> <li>Identify the different types of teeth in humans and their simple functions</li> <li>Construct and interpret a variety of food chains, identifying producers, predators, and prey</li> </ul>          | <ul style="list-style-type: none"> <li>Know that the process of digestion begins with food being chewed in the mouth by the teeth and saliva added</li> <li>Know that a human has three types of teeth – incisors, canines and molars – and that these each perform different functions</li> <li>Know that incisors slice food, canines tear food (especially meat) and that molars grind food</li> <li>Know that children develop an initial set of teeth which are gradually replaced between the ages of 6 and 12</li> <li>Know that food is squeezed down the oesophagus towards the stomach in a wave-like action called peristalsis</li> <li>Know that the stomach releases acid and enzymes to continue breaking down the food; the stomach is an organ; an organ is a part of living thing that is self-contained and has a specific important job</li> <li>Know that further enzymes and bile break down the food further as it moves through the duodenum towards the small intestine</li> <li>Know that the small intestine adds more enzymes and then absorbs the nutrients</li> <li>Know that the large intestine absorbs water from the undigested food</li> <li>Know that undigested food is stored in the rectum before being excreted through a muscle called the anus</li> </ul> |

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|   |  |  | <ul style="list-style-type: none"> <li>• Identify that humans and some animals have skeletons and muscles for support, protection, and movement</li> <li>• Know that a food chain traces the path of energy through a habitat</li> <li>• Know that the arrows in a food chain show the direction that energy is travelling through a habitat</li> <li>• Know that all energy for a food chain initially comes from the Sun which is absorbed and turned into energy by plants which are called producers</li> <li>• Know that consumers take in energy by eating</li> <li>• Know that an animal that is eaten by another is called prey, and that an animal that eats other animals is called a predator</li> <li>• Know that the first consumer in a food chain is called a primary consumer, the second is called a secondary consumer and above it is called a tertiary consumer</li> <li>• Know that an animal's digestive system is like the digestive system of a human</li> <li>• Know that animals have evolved to eat specific foods over a long period of time</li> </ul> |
| 5 | Cycle A-<br>Sum 1<br>Cycle B-<br>Spr 1 | <ul style="list-style-type: none"> <li>• Describe the changes that occur as humans as they develop from birth to old age</li> </ul>  | <ul style="list-style-type: none"> <li>• Know that the heart beats, pumping blood around the body and that blood vessels carry the blood; arteries carry blood away from the heart; veins carry blood towards the heart; capillaries are tiny blood vessels that connect arteries and veins</li> </ul>  |
| 6 | Cycle A-<br>Sum 1<br>Cycle B-<br>Spr 1 | <ul style="list-style-type: none"> <li>• Identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood</li> <li>• Recognise the impact of diet, exercise, drugs and lifestyle on the way their body's function</li> <li>• Describe the ways in which nutrients and water are transported within animals, including humans</li> </ul> | <ul style="list-style-type: none"> <li>• Know that the heart is composed of four chambers: two atria and two ventricles; the aorta is the largest artery in the body and most major arteries branch off from it</li> <li>• Know that blood travels around the body transporting nutrients that have been absorbed into the bloodstream from digestion; blood also absorbs oxygen from the lungs and carries it around the body</li> </ul>   |

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|  |  |  | <p>which is used to power the body; this use of oxygen to create energy is called respiration</p> <ul style="list-style-type: none"> <li>• Know that when we exercise, our heart beats more frequently so that the oxygen that is used around the body can be replenished; it returns to a resting heart rate afterwards; fitter people tend to have lower resting heart rates</li> <li>• Know that drugs are chemicals that have an impact on the natural chemicals in a person's body; know that drugs can be harmful or helpful, depending on what they are and how they are used; know that all drugs can be harmful if overused</li> <li>• Know that paracetamol and aspirin are examples of drugs that can be helpful as a painkiller</li> <li>• Know that cannabis and cocaine are examples of illegal drugs that can have serious negative effects</li> <li>• Know that alcohol and tobacco are examples of drugs that are legal to adults but that can have serious negative effects, such as liver disease and lung disease, respectively</li> </ul> |
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### Biology: Living Things and Their Habitats

| Year group | When taught                | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...   |
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| 2          | Cycle A + B<br>–<br>Spring | <ul style="list-style-type: none"> <li>• Explore and compare the differences between things that are living, dead, and things that have never been alive</li> <li>• 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.</li> <li>• Identify and name a variety of plants and animals in their habitats, including micro-habitats</li> </ul> | <ul style="list-style-type: none"> <li>• Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants</li> <li>• Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things</li> <li>• Know that light is a form of energy</li> </ul> |

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|   |                   | 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   | <ul style="list-style-type: none"> <li>• Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals</li> <li>• Know that the arrows on a food chain show the direction that the energy travels</li> <li>• Know that polar bears are an example of an animal adapted to its environment – thick fur for warmth and oily paw pads to ensure that they don't freeze to the ice</li> <li>• Know that sharks are another example – smooth skin and streamlined shape for quick swimming; and gills for breathing underwater</li> <li>• Know that cacti are an example of a plant adapted to its environment – thick skin keeps a store of water safe; sharp spikes keep animals from stealing the water</li> <li>• Know which animals and plants live in certain habitats and micro-habitats.</li> <li>• Know that pine trees are adapted to their environment in that they have thick bark and pinecones to protect against cold winters</li> <li>• Know that woodlice live under logs – an example of a microhabitat - as they need somewhere dark and damp so that they do not dry out</li> <li>• Know that frogs can live in ponds – an example of a microhabitat - as they water in which to lay their eggs (frogspawn)</li> </ul> |
| 4 | Cycle B-<br>Spr 2 | <ul style="list-style-type: none"> <li>• Recognise that living things can be grouped in a variety of ways</li> <li>• Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment</li> </ul> <p>Recognise that environments can change and that this can sometimes pose dangers to living things</p> | <ul style="list-style-type: none"> <li>• Know that animals can be grouped based on their physical characteristics (e.g. vertebrates and invertebrates) and based on their behaviour (e.g. herbivores, carnivores and omnivores)</li> <li>• Know that living things are divided into kingdoms: the animal kingdom, plants, fungi, bacteria, and single-celled organisms</li> </ul>  |

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|   |  |  | <ul style="list-style-type: none"> <li>• Know that a species is a group of living things which have many similarities that reproduce together to produce offspring</li> <li>• Know that environments can change</li> <li>• Know that if an environment changes, it can pose a danger to the living thing</li> </ul>  |
| 5 | Cycle A-<br>Aut 1<br>Cycle B-<br>Spr 2 | <ul style="list-style-type: none"> <li>• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>• Describe the life process of reproduction in some plants and animals</li> </ul>  | <ul style="list-style-type: none"> <li>• Know that in amphibians (e.g. frogs) a fertilised egg develops into an embryo and then hatches into a tadpole; the tadpole develops adult characteristics, metamorphoses into the adult form after which it can reproduce and the cycle can begin again</li> </ul>  |
| 6 | Cycle A-<br>Aut 1<br>Cycle B-<br>Spr 2 | <ul style="list-style-type: none"> <li>• 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</li> <li>• Give reasons for classifying plants and animals based on specific characteristics</li> </ul> | <ul style="list-style-type: none"> <li>• Know that in many insects (e.g. butterflies) a fertilised egg develops into wingless feeding form called a larva (caterpillar); the larva feeds then later becomes a pupa (chrysalis) with a protective cocoon; inside this cocoon, the pupa metamorphoses into the adult butterfly after which it can reproduce and the cycle can begin again</li> <li>• Know that in birds (e.g. robins) a fertilised egg hatches in a nest (a hatchling) and is fed by its parents until it is ready to fly (i.e. becomes a fledgling); it then leaves the nest and grows into an adult after which it can reproduce and the cycle can begin again</li> <li>• Know that humans go through stages of development throughout their lifetime.</li> <li>• Know that there are three types of micro-organism: viruses, fungi and bacteria; of these three, viruses are often not really considered to be alive by many scientists mainly because they don't have the 'machinery' to reproduce inside them</li> <li>• Know that germs are disease-causing micro-organisms</li> <li>• Know that an arthropod is an invertebrate with a hard, external skeleton and jointed limbs</li> </ul> |



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|  |  |  | <ul style="list-style-type: none"> <li>• Know that insects are a type of arthropod; their bodies consist of six legs, a head, a thorax and an abdomen; most insects also have a pair of antennae and a pair of wings (e.g. wasp)</li> <li>• Know that an arachnid (e.g. spider) is a type of arthropod with eight legs and no antennae or wings</li> <li>• Know that a crustacean is a type of arthropod with two pairs of antennae (e.g. woodlouse)</li> <li>• Know that a myriapod is an arthropod with a flat and long or cylindrical body and many legs (e.g. centipede)</li> <li>• Know that Jane Goodall is an anthropologist, most famous for her study of chimpanzees, of which she is considered the world's foremost expert who was born in London, England</li> </ul> |
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#### **Biology: Evolution and inheritance- Year 6 – Cycle B – Summer 2**

| <b>Year group</b> | <b>When taught</b> | <b>Statutory Requirements from the Programme of Study</b>   | <b>By the end of Cycle A and B our children will ...</b>  |
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| 6                 | Cycle B – Sum 2    | <ul style="list-style-type: none"> <li>• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</li> <li>• Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li> <li>• Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> </ul> | <ul style="list-style-type: none"> <li>• Know that all life on Earth began from a single point around 4.5 thousand million years ago</li> <li>• Know that living things change over time and that this gradual change is called evolution</li> <li>• Know that natural selection is the cause of this change; natural selection works as there is natural variation within a species; there is also competition to survive and reproduce and that members of a species with advantageous characteristics survive and reproduce - these characteristics are passed down to their offspring; members of a species with less advantageous characteristics do not survive and reproduce – these characteristics are not passed down to offspring</li> </ul> |

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|  |  |  | <ul style="list-style-type: none"> <li>• Know that offspring vary and are not identical to their parents</li> <li>• Know that the gradual change of species over millions of years can be observed by looking at examples of fossils</li> <li>• Know that Charles Darwin posited this theory of evolution by natural selection</li> <li>• Know that Darwin was a naturalist whose theory of evolution by natural selection developed while travelling through the Amazon rainforest</li> <li>• Know that Darwin's theory is accepted as fact by the scientific community</li> <li>• Know that Darwin did not know similarities were passed between parents and their offspring</li> <li>• Know that DNA, a chemical discovered in the 20th century, contains the "code" that passes on information between parents and their offspring in all living things</li> </ul> |
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#### Chemistry: Materials

| Year group | When taught                    | Statutory Requirements from the Programme of Study   | By the end of Cycle A and B our children will ...   |
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| 1          | Cycle A + B<br><br>Aut and Sum | <ul style="list-style-type: none"> <li>• Distinguish between an object and the material from which it is made</li> <li>• Identify and name a variety of everyday materials, including wood, plastic, glass, water and rock</li> <li>• Describe the simple physical properties of a variety of everyday materials.</li> <li>• Compare and group together a variety of everyday materials on the basis of their physical properties</li> </ul> | <ul style="list-style-type: none"> <li>• Know that materials can be hard, soft, strong, weak, absorbent, heavy, light, solid and runny, smooth and rough; these descriptions denote the properties of a material</li> <li>• Know from observation how to distinguish between materials made of wood, plastic, glass, metal, water, rock</li> <li>• Know that matter (stuff) is made from tiny building blocks</li> <li>• Know from observation how to distinguish between materials made of wood, plastic, glass, metal, water, rock</li> </ul> |
| 2          | Cycle A + B                    | <ul style="list-style-type: none"> <li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</li> </ul>   |   |

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|   | Aut and Sum                        | Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching  | <ul style="list-style-type: none"> <li>• Know that matter (stuff) is made from tiny building blocks</li> <li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</li> <li>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching</li> <li>• Know that many types of plastic are waterproof, that steel (a type of metal) is strong, that rock is hard, that cotton wool is soft, that rubber is flexible, that rock is rigid, that polystyrene (a type of plastic) is light and that iron (a type of metal) is heavy,</li> <li>• Know that when objects move across a surface there is friction when they rub against each other and that sometimes this friction is larger or smaller</li> <li>• Know that applying forces to objects can change their shape, by squeezing, stretching, bending and twisting</li> </ul> |
| 3 | Cycle A-Spr 1<br><br>Cycle B-Sum 2 | <ul style="list-style-type: none"> <li>• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</li> <li>• Describe in simple terms how fossils are formed when things that have lived are trapped within rock</li> </ul> <p>Recognise that soils are made from rocks and organic matter.</p>   | <ul style="list-style-type: none"> <li>• Know that there are three kinds of rocks: igneous, sedimentary and metamorphic</li> <li>• Know that granite and basalt are types of igneous rock and that igneous rocks form from molten rock below the Earth's crust</li> <li>• Know that limestone and sandstone are types of sedimentary rock which form when small, weathered fragments of rock or shell settle and stick together, often in layers</li> <li>• Know that marble and slate are types of metamorphic rock which form when rocks in Earth's crust get squashed and heated in processes such as when tectonic plates press against each other</li> <li>• Know that fossils form when a plant or animal dies and is quickly covered with silt or mud so that it cannot be rotted by microbes or eaten by scavenging</li> </ul>   |
| 4 | Cycle A-Spr 1<br><br>Cycle B-Sum 2 | <ul style="list-style-type: none"> <li>• Compare and group materials together, according to whether they are solids, liquids or gases</li> <li>• 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)</li> <li>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</li> </ul> |  |

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|  |  |  | <p>animals; in time layers of sediment build, squashing the mud and turning it to stone around the dead plant or animal; the materials in the body are replaced by minerals that flow in water through the rock, leaving a rock in the shape of the animal or plant that was once there</p> <ul style="list-style-type: none"> <li>• Know that fossils can help us learn about things that lived long ago</li> <li>• Know that soil is made from tiny particles of rock broken down by the action of weather (weathering)</li> <li>• Know that things are composed of a matter commonly in one of three states of matter: solid, liquid or gas</li> <li>• Know that things are made of particles (tiny building blocks) and that these are organised differently in different states</li> <li>• Know that materials can change state when temperature changes</li> <li>• Know that there are bonds between the particles (building blocks) in a solid; as temperature increases, these bonds are somewhat overcome as the particles absorb energy and solids can change into liquids; with a further increase in temperature, the particles become even more energetic, and the bonds are overcome entirely so the liquid changes into a gas</li> <li>• Know that when solids turn into liquids, this is called melting and that the reverse process is called freezing</li> <li>• Know that when liquids turn into gases, this is called evaporation and that the reverse process is called condensation</li> <li>• Know that when a solid turns into a gas without passing through the liquid state, this is called sublimation</li> <li>• Know that the melting point of water is 0° C and that the boiling point of water is 100° C</li> </ul> |
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|   |  |  | <ul style="list-style-type: none"> <li>• Know that water flows around our world in a continuous process called the water cycle</li> <li>• Know that, along with evaporation, water on the Earth's surface moves to the air in a process called transpiration in which water turns into water vapour (gas) on the surface of leaves on plants</li> <li>• Know that rain condenses in clouds and falls to earth as rain, snow or hail in a process called precipitation</li> <li>• Know that water flows across the land in rivers and streams in a process called surface run-off and under the ground as groundwater</li> </ul>   |
| 5 | Cycle A-<br>Spr 1 +<br>Sum 2<br><br>Cycle B –<br>Sum 1 | <ul style="list-style-type: none"> <li>• 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</li> <li>• Understand that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> <li>• Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>• Demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>• 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</li> </ul> | <ul style="list-style-type: none"> <li>• Know that materials can be sorted in a variety of ways based on their properties</li> <li>• Know that in some solid materials the bonds between particles break when surrounded by a liquid; this allows the liquid to absorb the solid; when this happens, the solid is called a solute, the liquid is called a solvent and the result is a solution; when a solid does dissolve in a liquid it is described as being soluble in that solvent (e.g. sugar in water); when it cannot it is insoluble (e.g. sand in water)</li> <li>• Know that a given amount of solvent can only absorb a certain amount of solid before no more will dissolve; when this happens the liquid is said to be saturated</li> <li>• Know that when a solvent is evaporated from a solution, the original solute is left behind; the remaining solid will often form crystals – the slower the solvent evaporates, the larger the crystals that will be formed</li> <li>• Know how to dissolve a solute in a solvent and then how to evaporate the solvent to recover the solute</li> <li>• Know that a reversible change is one that can be reversed and that examples of this are mixing,</li> </ul> |

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|  |  |  | <p>dissolving and changes of state where no chemical reaction takes place</p> <ul style="list-style-type: none"> <li>• Know that an irreversible change is one that cannot be reversed and that examples of this often involve a chemical change where a new material is made, often a gas (e.g. burning, boiling an egg, the reaction of bicarbonate of soda and acid)</li> <li>• Know how to separate a mixture of sand, salt and small stones by sieving (to remove the small stones), followed by dissolving in water (so the salt is absorbed), followed by filtering to remove the sand from the mixture, followed finally by evaporation of the water to recover the salt</li> <li>• Know that materials' different properties can be tested through acting upon them, including testing to find whether materials are magnetic, thermally conductive and electrically conductive; know that the various properties of different materials make them suitable for a given function</li> <li>• Know how to explain orally and in writing the reasons why various materials are suited or unsuited to a function</li> <li>• Know that Marie Curie was a genius physicist, earning two Nobel Prizes</li> <li>• She discovered two new elements (the building blocks of everything) and made discoveries that suggested that atoms - which were thought to be the smallest building blocks - could be divided into smaller building blocks still</li> </ul> |
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### Physics: Forces

| Year group | When taught                                   | Statutory Requirements from the Programme of Study   | By the end of Cycle A and B our children will ...  |
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| 3          | Cycle A-<br>Aut 1<br><br>Cycle B-<br>Spring 1 | <ul style="list-style-type: none"><li>• Compare how things move on different surfaces</li><li>• Notice that some forces need contact between two objects, but magnetic forces can act at a distance</li><li>• Observe how magnets attract or repel each other and attract some materials and not others</li><li>• 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</li><li>• Describe magnets as having two poles<br/>Predict whether two magnets will attract or repel each other, depending on which poles are facing</li></ul> | <ul style="list-style-type: none"><li>• Know that a force can be thought of as a push or a pull</li><li>• Know that there are different types of contact force: impact forces (when two surfaces collide), frictional forces (when two surfaces are already in contact) and strain forces (when an elastic material is stretched or squashed)</li><li>• Know that objects move differently on rough and smooth surfaces; objects resist, movement more on rough surfaces because there is higher friction as the object moves</li><li>• Know that friction can be reduced by external measures (varied materials) Know that there are such forces as contact and non-contact forces</li><li>• Know that there are also non-contact forces that can act between objects without them touching and that magnetism is an example of a non-contact force</li><li>• Know that magnets have two poles called north and south</li><li>• Know that like poles (south-south and north-north) of two magnets repel each other and that opposite poles of two magnets (north-south) attract each other</li><li>• Know that there is a magnetic field around a magnet which is strongest at each pole</li><li>• Know that some materials are magnetic, meaning that they are attracted to a magnet, while other materials are non-magnetic</li><li>• Know that Sir Isaac Newton (Local Scientist) discovered gravity</li></ul> |

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| 5 | Cycle A –<br>Spr 2 | <ul style="list-style-type: none"> <li>• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces<br/>Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect</li> </ul> | <ul style="list-style-type: none"> <li>• Know that a force is measured in a unit called Newtons, named after a British scientist, called Sir Isaac Newton who discovered lots about gravity and how planets move</li> <li>• Know that Newton was undoubtedly one of the greatest scientists who ever lived, a genius who discovered a great deal about forces, including gravity, mathematics and light</li> <li>• Know that pull forces can be measured using a device called a force meter</li> <li>• Know that the amount of matter (stuff) in an object is its mass</li> <li>• Know that gravity is a force that acts between all objects in the universe, but that it acts much more strongly between objects that have more mass and that are close together</li> <li>• Know that unsupported objects are pulled towards the Earth by the force of gravity</li> <li>• Know that acceleration is a change in speed and that unbalanced forces acting on an object cause it to accelerate</li> <li>• Know that air resistance is a force felt by an object as it moves through the air; it is caused by the object bumping into the gas particles that make up air; the quicker an object moves, the more gas particles it bumps into and the more air resistance it experiences</li> <li>• Know that a falling object will accelerate until its air resistance matches the gravitational force pulling it down; at this point, the object will continue to move at this speed (called its terminal velocity) without getting any quicker or slowing down</li> <li>• Know that a parachute's shape increases the air resistance that a falling object experiences, giving it a much lower terminal velocity</li> </ul> |
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|  |  |  | <ul style="list-style-type: none"> <li>• Know that water resistance is a force felt by an object as it moves through water; it is caused by the object bumping into the water particles</li> <li>• Know that the shape of an object determines how much air resistance or water resistance it experiences; shapes of object that experience little air resistance or water resistance are described as streamlined</li> <li>• Know how to draw a force diagram with arrows representing the different forces acting on an object</li> <li>• Know that a lever is a rigid length pivoting around a fulcrum</li> <li>• Know that a pulley is a wheel with a fulcrum that supports a moving cable or belt</li> </ul> |
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### Physics: Electricity

| Year group | When taught   | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...  |
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| 4          | Cycle B-Sum 1 | <ul style="list-style-type: none"> <li>• Identify common appliances that run on electricity</li> <li>• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers</li> <li>• 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</li> <li>• Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</li> <li>• Recognise some common conductors and insulators, and associate metals with being good conductors</li> </ul> | <ul style="list-style-type: none"> <li>• Know that electrical energy is one of many forms of energy</li> <li>• Know that static electricity is an imbalance of charged particles on a material; it does <u>not</u> operate by flowing around a complete circuit</li> <li>• Know that current electricity is the flow of charged particles called electrons around a circuit</li> <li>• Know that current electricity is the form of electricity that we use in our lives in lights, computers, televisions, etc</li> <li>• Know that electrical current flows well through some materials, called electrical conductors, and poorly through other materials, called electrical insulators</li> </ul> |

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|  |  |  | <ul style="list-style-type: none"> <li>• Know that conductors have free electrons (tiny, negatively charged particles) and that when electrical current flows around a conductor the electrons move</li> <li>• Know that electrical conductivity (how well a material conducts electricity) is an example of a property</li> <li>• Know that metals are good electrical conductors</li> <li>• Know that a chemical reaction inside a cell produces the charged particles that can flow around a circuit</li> <li>• Know that more than one cell lined up to work together is called a battery</li> <li>• Cells, batteries and the mains are all sources of electrical energy</li> <li>• Know that electrical current can flow if there is a complete circuit</li> <li>• Know that wires – which contain a conductor inside them, usually made of metal – can allow electrical current to flow around a circuit</li> <li>• Know that when electrical current flows through a circuit component within that circuit – such as buzzers which make a noise and bulbs which emit light – begin to work</li> <li>• Know that a switch functions by completing or breaking a complete circuit</li> <li>• Know how to construct a simple circuit using components</li> <li>• Know that exposure to high levels of electrical current can be dangerous</li> <li>• Know that Michael Faraday was a scientist who studied electricity</li> <li>• Know that he invented the electric motor and showed that the movement of a magnet could create electricity, which is the reason we can generate electricity to power our world</li> <li>• Know that he is considered “the father of electricity”</li> </ul> |
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| 6 | Cycle A-<br>Aut 2 | <ul style="list-style-type: none"> <li>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</li> <li>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</li> </ul> <p>Use recognised symbols when representing a simple circuit in a diagram</p> | <ul style="list-style-type: none"> <li>Know how to draw simple circuit diagrams</li> <li>Know the recognized symbols for a battery, bulb, motor, buzzer and wire</li> <li>Know how to predict whether components will function in a given circuit, depending on whether or not the circuit is complete; whether or not a switch is in an on or off position; and whether or not there is a cell to provide electrical current to the circuit</li> <li>Know that voltage is a measure of the power of a cell to produce electricity; it is a measure of the 'push' of electric current, not the size of the electric current</li> <li>Know that as the number and voltage of cells in a circuit increases, the brightness of a bulb or the volume of a buzzer will increase (though too high a voltage may 'blow' the bulb or buzzer)</li> <li>Know that two bulbs in a circuit can be wired up to create a series circuit or a parallel circuit; if one bulb blows in a series circuit the other will not shine as the circuit has been broken; in contrast, if one bulb blows in a parallel circuit, there will still be a complete circuit for the other bulb so it will continue to shine; use this knowledge to explain the advantages of using parallel circuits (e.g. in the lighting in homes)</li> </ul> |
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### Physics: Light

| Year group | When taught        | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...  |
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| 3          | Cycle B –<br>Aut 2 | <ul style="list-style-type: none"> <li>Recognise that they need light in order to see things and that dark is the absence of light</li> <li>Notice that light is reflected from surfaces</li> <li>Recognise that light from the sun can be dangerous and that there are ways to protect their eyes</li> <li>Recognise that shadows are formed when the light from a light source is blocked by a solid object</li> <li>Find patterns in the way that the sizes of shadows change</li> </ul> | <ul style="list-style-type: none"> <li>Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another</li> <li>Know that we need light to see things and that darkness is the absence of light</li> <li>Know that light travels in straight lines</li> <li>Know that light is reflected when it travels from a light source and then 'bounces' off an object</li> </ul> |

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|   |                    |  | <ul style="list-style-type: none"> <li>• Know that everything that we can see is either a light source or something that is reflecting light from a light source into our eyes</li> <li>• Know that the Sun is a light source, but that the Moon is not and is merely reflecting light from the Sun</li> <li>• Know that many light sources give off light and heat</li> <li>• Know that the Sun gives off light and heat when hydrogen turns into helium</li> <li>• Know that filaments in traditional bulbs heat up until they glow, giving off light and heat</li> <li>• Know that fluorescent bulbs glow when electricity adds energy to a gas within the bulb</li> <li>• Know that opaque objects block light creating shadows and that light passes easily through transparent objects</li> <li>• Know that opacity/transparency and reflectiveness are properties of a material</li> <li>• Know that sunglasses can protect eyes from sunlight but looking at the Sun directly – even with sunglasses – can damage the eyes</li> <li>• Know that as objects move towards a light source, the size of the shadow increases</li> <li>• Know how to show the changing of shadow size by drawing a diagram with straight lines representing light</li> <li>• Know that a data logger can keep track of light levels and that this can be plotted on a graph to show how these changes over the course of a day</li> </ul> |
| 6 | Cycle B –<br>Aut 2 | <ul style="list-style-type: none"> <li>• Recognise that light appears to travel in straight lines</li> <li>• 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</li> </ul> | <ul style="list-style-type: none"> <li>• Know that translucent objects allow some light to pass through, but some of the light changes direction as it passes through the object; this means that something seen through a translucent object is not clearly defined</li> </ul>  |

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|  |  | <ul style="list-style-type: none"> <li>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</li> </ul> <p>Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</p> | <ul style="list-style-type: none"> <li>Know that when light passes from one medium to another (e.g. from air to water), it changes direction; this is called refraction; this happens because light travels at different speeds in different media</li> <li>Know that white light comprises all the colours of light</li> <li>Know that white light refracted by two surfaces in a prism will spread out so that all of its constituent colours can be seen; this array of colours is called a spectrum; it happens because the different colours that constitute white light travel at different speeds</li> <li>Know how to draw a diagram to show why the shape of a shadow will match the shape of an object</li> <li>Know that when light reflects off an object, the angle of incidence is equal to the angle of reflection</li> </ul> |
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#### Physics: Sound -Year 4 – Cycle A- Summer 1

| Year group | When taught     | Statutory Requirements from the Programme of Study   | By the end of Cycle A and B our children will ...  |
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| 4          | Cycle A – Sum 1 | <ul style="list-style-type: none"> <li>Identify how sounds are made, associating some of them with something vibrating</li> <li>Recognise that vibrations from a sound travel through a medium to the ear</li> <li>Find patterns between the pitch of a sound and features of the object that produced it</li> <li>Find patterns between the volume of a sound and the strength of the vibrations that produced it</li> <li>Recognise that sounds get fainter as the distance from the sound source increases</li> </ul> | <ul style="list-style-type: none"> <li>Know that sound is a form of energy that transfers in a longitudinal wave - like that seen in a slinky - <u>not</u> a transverse wave</li> <li>Know that sound travels through a medium (e.g. particles in the air) and thus sounds does <u>not</u> travel through a vacuum which has no particles in it at all</li> <li>Know that longitudinal sound waves are detected in the ear by humans and that the brain interprets this as the sounds we hear</li> <li>Know that sound travels at different speeds through different objects; it travels at around 340 metres per second in air, much slower than light travels; this is why we often hear thunder <u>after</u> we see lightning as</li> </ul> |

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|  |  |  | <p>the light reaches our eye before the sound reaches our ears</p> <ul style="list-style-type: none"> <li>• Know that pitch is how high or low a sound is and that this is determined by how many vibrations per second are being made by the vibrating object; the number of vibrations per second is called frequency</li> <li>• Know that volume is how loud or quiet a sound is and that this is determined by the amount of energy in the wave (e.g. from how hard or soft a percussion instrument is hit)</li> <li>• Know that the volume of a sound is quieter if the listener is further away from the object</li> </ul> |
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#### Seasonal change: Year 1 - Throughout

| Year group | When taught                  | Statutory Requirements from the Programme of Study  | By the end of Cycle A and B our children will ...  |
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| 1          | Cycle A and B-<br>Throughout | <ul style="list-style-type: none"> <li>• Observe changes across the four seasons</li> <li>• Observe and describe weather associated with the seasons and how day length varies</li> </ul> | <ul style="list-style-type: none"> <li>• Know that days are longer in the summer and shorter in winter</li> <li>• Know that weather changes through the year, getting hotter in the summer and colder in the winter</li> <li>• Know that the four seasons are spring, summer, autumn and winter and know the order of the cycle</li> <li>• Know that the Earth is tilted and spins on an axis leading to the seasons</li> <li>• Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days</li> </ul> |