PRIMARY SCIENCE CURRICULUM PROGRESSION

Aligned with the National Curriculum for England (2013) and the Statutory Framework for the Early Years Foundation Stage (2021)

This document has been created based on the Twinkl PlanIt Science units. The teaching ideas for Scientific Enquiry are subject to be adapted based on a progression document currently in the process of production by Twinkl. This document will be updated accordingly when that is available.

Prior learning in the EYFS is included in relevant units.

Year 1 – Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• 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.	• Plants grow from seeds/bulbs • Plants need light and water to grow and survive • Plants are important • We can eat lots of plants	• Names of common plants: wild plant, garden plant, evergreen tree, deciduous tree, common flowering plant, weed, grass. • Name some features of plants: e.g. flower, vegetable, fruit, berry, leaf/leaves, blossom, petal, stem, trunk, branch, root, seed, bulb, soil. • Name some common types of plant e.g. sunflower, daffodil.
Prior Learning	**Future Learning**	**Key Scientists**
In EYFS children should: • Plant seeds and care for growing plants. • Understand the key features of the life cycle of a plant and an animal. • Begin to understand the need to respect and care for the natural environment and all living things. • Explore the natural world around them.	In the Year 2 Unit Plants, children will: • Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and warmth to grow and stay healthy.	• Beatrix Potter (Author & Botanist)

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
	Can you name these plants? Can you identify the parts of a plant and their role? 	How does my plant change as it grows from a seed? What happens to deciduous trees over the year? 	What is similar or different about these plants? Is there a pattern in where we find different types of plants? 	What are the most common British plants and where can we find them? 	What different plants are there?

Year 2 - Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and warmth to grow and stay healthy.	• Plants grow from seeds/bulbs • Plants need light, water and warmth to grow and survive • Flowers make seeds to make more plants (reproduce) • Plants are important • We need plants to survive (to clean air, to eat) • We can eat different parts of the plants (leaves, stems, roots, seeds, fruit)	• Growth of plants: germination, shoot, seed dispersal, grow, food store, life cycle, die, wilt, seedling, sapling. • Needs of plants: sunlight, nutrition, light, healthy, space, air. • Name different types of plant: e.g. bean plant, cactus. • Names of different habitats: e.g. rainforest, desert. • Previously introduced vocabulary: water, temperature, warm, hot, cold, habitat.
Prior Learning	**Future Learning**	**Key Scientists**
In the Year 1 Unit Plants, children should: • 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.	In the Year 3 Unit Plants, children will: • identify 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.	• Agnes Arber (Botanist) • Alan Titchmarsh (Botanist & Gardener)

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

What will happen to our seeds that we have planted in differing conditions? E.g. with all the things a plant needs to grow, without, light, without water, without soil and without the right temperature? 	How can we identify what a plant needs to grow healthily? 	What happens to my seed after I have planted it? 	How is a plant life cycle similar to the life cycle of other living things? Are all plants the same? 	What are the stages of a plant life cycle? How have some plants adapted to grow in different conditions? 	What should I do to grow a healthy plant?

Year 3 - Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• identify 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.	• Plants are producers, they make their own food. • Their leaves absorb sunlight and carbon dioxide • Plants have roots, which provide support and draw water from the soil • Flowering plants have specific adaptations which help it to carry out pollination, fertilisation and seed production • Seed dispersal improves a plants chances of successful reproduction • Seeds/bulbs require the right conditions to germinate and grow. • Seeds contain enough food for the plant's initial growth	• Water transportation: transport, evaporation, evaporate, nutrients, absorb, anchor. • Life cycle of flowering plants: pollination (insect/wind), pollen, nectar, pollinator, seed formation, seed dispersal (animal/wind/water), reproduce, fertilisation, fertilise, stamen, anther, filament, carpel (pistil), stigma, style, ovary, ovule, sepal, carbon dioxide. • Previously introduced vocabulary: life cycle.
Prior Learning	**Future Learning**	**Key Scientists**
In the Year 2 Unit Plants, children should: • Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and warmth to grow and stay healthy.	In the Year 6 unit Evolution and Inheritance, children will: • 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.	• Jan Ingenhousz (Photosynthesis) • Joseph Banks (Botanist)

Scientific Enquiry					
Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
What happens to plants grown in different conditions? How do different temperatures affect how long it takes for the food colouring to dye the petals? 	How many ways can you group our seed collection? 	What do plants need to grow well? 	What colour flowers do pollinating insects prefer? 	What are all the different ways that seeds disperse? What happens during pollination? 	Why do plants have flowers?

Year 1 – Animals including humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals; • identify and name a variety of common animals that are carnivores, herbivores and omnivores; • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets); • identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	• There are many different animals with different characteristics. • Animals have senses to help individuals survive. When animals sense things they are able to respond. • Animals need food to survive. • Animals need a variety of food to help them grow, repair their bodies, be active and stay healthy.	• Names of animal groups: fish, amphibians, reptiles, birds, mammals. • Animal diets: carnivore, herbivore, omnivore. • Human and animal body parts: e.g. body, head, neck, arms, elbows, legs, knees, face, ears, eyes, nose, hair, mouth, teeth, hands, feet, tail, wings, feathers, fur, beak, fins, gills. • Human senses: sight, hearing, touch, smell, taste. • Exploring senses: loud, quiet, soft, rough. • Other: human, animal, pet.
Prior Learning	**Future Learning**	**Key Scientists**
In EYFS children should: • Understand the key features of the life cycle of a plant and an animal. • Begin to understand the need to respect and care for the natural environment and all living things. • Continue developing positive attitudes about the differences between people	In the Year 2 unit Animals including humans, children will: • Know that animals, including humans, have offspring which grow into adults; • find out about and describe the basic needs of animals, including humans, for survival (water, food and air); • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	• Chris Packham (Animal Conservationist)

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Is our sense of smell better when we cannot see? Which is louder, a tambourine or the maracas?	What groups can we sort these animals into? What are the names for all the parts of our bodies?		Which animals do we see near school? Which common characteristics do animals in the same group have?	Do all birds fly? What are herbivores, carnivores and omnivores?	What are animals like?

Year 2 – Animals including humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know that animals, including humans, have offspring which grow into adults; • find out about and describe the basic needs of animals, • including humans, for survival (water, food and air); • describe the importance for • humans of exercise, eating the right amounts of different types of food, and hygiene.	• Animals move in order to survive. • Different animals move in different ways to help them survive. • Exercise keeps animal's bodies in good condition and increases survival chances. • All animals eventually die. • Animals reproduce new animals when they reach maturity. • Animals grow until maturity and then do not grow any larger.	• Being born and growing: Young, offspring, live young, grow, develop, change, hatch, lay, fly, crawl, talk. • Young and adult names: e.g. lamb and sheep, kitten and cat, duckling and duck. • Life cycle stages: e.g. baby, toddler, child, teenager, adult; frogspawn, tadpole, froglet, frog. • Survival and staying healthy: basic needs, survive, food, air, exercise, diet, nutrition, healthy, balanced diet, hygiene, germs. • Food groups: fruit and vegetables, proteins, dairy and alternatives, carbohydrates, oil and spreads, fat, salt, sugar. • Previously introduced vocabulary: water.
Prior Learning	**Future Learning**	**Key Scientists**
In the Year 1 unit Animals including humans, children should: • identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals; • identify and name a variety of common animals that are carnivores, herbivores and omnivores; • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets); • identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	In the Year 3 unit Animals including humans, children will: • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; • identify that humans and some other animals have skeletons and muscles for support, protection and movement.	• Steve Irwin (Crocodile Hunter) • Robert Winston (Human Scientist) • Joe Wicks (Personal Trainer)

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Which activity will make my heart rate faster? Which is the best way to wash our hands?	Which offspring belongs to which animal?	How does a tadpole change over time? How much does a child's foot grow from Year 1 to Year 6?	What do all animals have in common? Do animal offspring look like their adult when they are born?	What food do you need in a healthy diet and why? What happens to your body when you exercise? What do you need to do to look after a pet dog/cat/lizard and keep it healthy?	Do living things change or stay the same?

Year 3 – Animals including humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; • identify that humans and some other animals have skeletons and muscles for support, protection and movement.	• Different animals are adapted to eat different foods. • Many animals have skeletons to support their bodies and protect vital organs. • Muscles are connected to bones and move them when they contract. • Movable joints connect bones.	• Food groups and nutrients: fibre, fats (saturated and unsaturated), vitamins, minerals. • Skeletons and muscles: skeleton, muscles, tendons, joints, protection, support, organs, voluntary muscles, involuntary muscles, biceps, triceps, contract, relax, bone, cartilage, shell, vertebrate, invertebrate, endoskeleton, exoskeleton, hydrostatic skeleton. • Names of human bones: e.g. skull, spine, backbone, vertebral column, ribcage, pelvis, clavicle, scapula, humerus, ulna, pelvis, radius, femur, tibia, fibula. • Other: energy. • Previously introduced vocabulary: movement.
Prior Learning	**Future Learning**	**Key Scientists**
In the Year 2 unit Animals including humans, children should: • Know that animals, including humans, have offspring which grow into adults; • find out about and describe the basic needs of animals, • including humans, for survival (water, food and air); • describe the importance for • humans of exercise, eating the right amounts of different types of food, and hygiene.	In the Year 4 unit Animals including humans, children will: • 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.	• Adelle Davis (20th Century Nutritionist) • Marie Curie (Radiation / X-Rays)

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Can people with longer femurs jump further? Do people with longer middles fingers throw further? Can you plan your own investigation?	Can you sort these foods into different food groups? How do the skeletons of different animals compare?	What happens to our muscles when we move body parts?	Are foods that are high in fat always high in salt too?	Which foods are the most nutritious? What are vertebrates and invertebrates?	Why do animals have skeletons? What is a healthy diet and why is it important?

Year 4 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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**	• Animals have teeth to help them eat. • Different types of teeth do different jobs. • Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood. • The blood takes nutrients around the body. • Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.	• Digestive system: digest, digestion, tongue, teeth, saliva, salivary glands, oesophagus, stomach, liver, pancreas, gall bladder, small intestine, duodenum, large intestine, rectum, anus, faeces, organ. • Types of teeth and dental care: molar, premolar, incisor, canine, wisdom teeth, tooth decay, plaque, enamel, baby (milk) teeth. • Food chains and animal diets: decomposer, food web. Previously introduced vocabulary: producer, consumer, prey, predator, excretion, habitat.

Prior Learning	Future Learning:	Key Scientists
In the Year 3 unit Animals including humans, children should: • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; • identify that humans and some other animals have skeletons and muscles for support, protection and movement.	In Year 5 children will: • Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird. • Know the differences between different life cycles. • Know the process of reproduction in plants. • Know the process of reproduction in animals	**Ivan Pavlov** (Digestive System Mechanisms) **Joseph Lister** (Discovered Antiseptics)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
In our class, are omnivores taller than vegetarians?	What are the names for all the organs involved in the digestive system? How can we organise teeth into groups?	How does an eggshell change when it is left in cola?	Are foods that are high in energy always high in sugar?	How do dentists fix broken teeth?	What do our bodies do with the food we eat?

Year 5 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Describe the changes as humans develop to old age.**	• Different animals mature at different rates and live to different ages. • Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction • Hormones control these changes, which can be physical and/or emotional.	• Process of reproduction: **gestation, asexual reproduction, sexual reproduction,** sperm, egg, cells, clone. • Changes and **life cycle:** embryo, foetus, uterus, **prenatal, adolescence, puberty, menstruation, adulthood,** menopause, **life expectancy,** old age, hormones, sweat. • Changing body parts: e.g. breasts, penis, larynx, ovaries, genitalia, pubic hair. Previously introduced vocabulary: reproduction, **reproduce,** types of animals and animal groups, **fertilisation.**

Prior Learning	Future Learning	Key Scientists
In the Year 4 unit Animals including humans, children should: • 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	In Year 6: • 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. • Describe the ways in which nutrients and water are transported within animals, including humans.	**Dr Steve Jones** (Geneticist) Prof Robert Winston (Human Scientist) •

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does age affect a human's reaction time? **Who grows the fastest, girls or boys?**	Can you identify all the stages in the human life cycle?	How do different animal embryos change?	Is there a relationship between a mammal's size and its gestation period?	Why do people get grey/white hair when they get older?	Why and how does the human body change over time?

Year 6 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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.** • **Describe the ways in which nutrients and water are transported within animals, including humans.**	• The heart pumps blood around the body. • Oxygen is breathed into the lungs where it is absorbed by the blood. • Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)	• <u>Circulatory system</u>: circulation, **heart**, pulse, heartbeat, heart rate, lungs, breathing, **blood vessels**, blood, pump, transported, **oxygenated blood, deoxygenated blood,** oxygen, arteries, veins, capillaries, chambers, plasma, platelets, white blood cells, red blood cells. • <u>Lifestyle:</u> **drug, alcohol,** smoking, disease, calorie, energy input, energy output. • <u>Other:</u> water transportation, nutrient transportation, waste products. Previously introduced vocabulary: carbon dioxide.

Prior Learning	Future Learning	Key Scientists
In the Year 5 unit Animals including humans, children should: • Describe the changes as humans develop to old age.	In Key Stage 3 children will learn about: • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • the structure and functions of the gas exchange system in humans, including adaptations to function • the effects of recreational drugs (including substance misuse) on behaviour, health and life processes.	**Justus von Liebig** (Theories of Nutrition and Metabolism) **Sir Richard Doll** (Linking Smoking and Health Problems) **Leonardo Da Vinci** (Anatomy)

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>

How does the length of time we exercise for affect our heart rate? **Can exercising regularly affect your lung capacity?** **Which type of exercise has the greatest effect on our heart rate?**	Which organs of the body make up the circulation system, and where are they found?	How does my heart rate change over the day? How much exercise do I do in a week?	Is there a pattern between what we eat for breakfast and how fast we can run?	How have our ideas about disease and medicine changed over time?	How do our choices affect how our bodies work? Why does my heart beat?

Year 6 – Evolution & Inheritance

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know about evolution and can explain what it is. • Know how fossils can be used to find out about the past. • 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- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago	• Life cycles have evolved to help organisms survive to adulthood. • Over time the characteristics that are most suited to the environment become increasingly common. *NB: The following could be duplicated in Year 6 Living things and their habitats.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Variation exists within a population (and between offspring of some plants) • Competition exists for resources and mates	• <u>Evolution and inheritance:</u> evolve, **adaptation,** inherit, **natural selection, adaptive traits, inherited traits,** mutations, theory of evolution, ancestors, biological parent, chromosomes, genes, Charles Darwin. • <u>Other:</u> selective breeding, artificial selection, breed, cross breeding, genetically modified food, cloning, DNA. Previously introduced vocabulary: classification, **offspring, characteristics, habitat, environment,** adapt, **variations**, human, **fossil,** suited, cells, names of different habitats, names of animals and their body parts, species, **sedimentary rock**, lava, **igneous rock**, **metamorphic rock**, **magma**, heat, **fossilisation**.

Prior Learning	Future Learning	Key Scientists
From Key Stages 1 & 2, children should: • Understand there is a variety of life on Earth • Know that some animal's differences are important to their survival • Know how animals and plants reproduce • Know how fossils form over time	In Key Stage 3 children will learn about: • heredity as the process by which genetic information is transmitted from one generation to the next • the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.	**Charles Darwin and Alfred Russel Wallace** (Theory of Evolution by Natural Selection) **Jane Goodall** (Chimpanzees)

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>

What is the most common eye colour in our class? 	Compare the skeletons of apes, humans, and Neanderthals – how are they similar, and how are they different? Can you classify these observations into evidence for th idea of evolution, and evidence against? 	How has the skeleton of the horse changed over time? 	Is there a pattern between the size and shape of a bird's beak and the food it will eat? 	What happened when Charles Darwin visited the Galapagos islands? What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize? 	What is evolution, how does it happen and how do scientists know?

Year 2 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Explore and compare the difference 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 the different sources of food.**	• Some things are living, some were once living but now dead and some things never lived. • There is variation between living things. • Different animals and plants live in different places. Living things are adapted to survive in different habitats. • Environmental change can affect plants and animals that live there.	• Living or dead: **living, dead, never living,** not living, alive, never been alive, healthy. • **Habitats** including **microhabitats:** **depend,** shelter, safety, **survive**, suited, space, minibeast, air. • **Life processes:** movement, sensitivity, growth, reproduction, nutrition, excretion, respiration. • **Food chains: food sources,** food, producer, consumer, predator, prey. • Names of habitats and microhabitats: e.g. under leaves, woodland, rainforest, sea shore, ocean, urban, local habitat. Previously introduced vocabulary: senses, **carnivore**, **herbivore**, **omnivore**, **seed**, **water**, names of materials.

Prior Learning	Future Learning	Key Scientists
In Early Years children should: • Comments and questions about the place they live or the natural world. • Shows care and concern for living things and the environment. • Can talk about things they have observed such as plants and animals. • Notices features of objects in their environment. • Comments and asks questions about their familiar world.	In the Year 4 unit 'Living things and their habitats', children will: • 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. • Know and label the features of a river Recognise that environments can change and that this can sometimes pose danger to living things.	Terry Nutkins (TV Presenter) Liz Bonnin (Conservationist)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

Which pets are the easiest to look after? **Is there the same level of light in the evergreen wood compared with the deciduous wood?**	How would you group these plants and animals based on what habitat you would find them in?	How does the school pond change over the year?	What conditions do woodlice prefer to live in? Which habitat do worms prefer – where can we find the most worms?	How are the animals in Australia different to the ones that we find in Britain? How does the habitat of the Arctic compare with the habitat of the rainforest? What ideas did botanist Arthur Tansley have about habitats in 1935?	Why do different animals live in different places?

Year 4 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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 danger to living things.**	• Living things can be divided into groups based upon their characteristics • Environmental change affects different habitats differently • Different organisms are affected differently by environmental change • Different food chains occur in different habitats • Human activity significantly affects the environment	• <u>Living things:</u> **organisms, specimen,** species. • <u>Grouping living things:</u> **classification,** classification keys, classify, **characteristics**. • <u>Names of invertebrate animals</u>: snails and slugs, worms, spiders, insects. • <u>Invertebrate body parts:</u> e.g. wing case, abdomen, thorax, antenna, segments, mandible, proboscis, prolegs. • <u>Environmental changes:</u> **environment,** environmental dangers, adapt, natural changes, climate change, deforestation, pollution, urbanisation, invasive species, **endangered species, extinct.** Previously introduced vocabulary: carbon dioxide, **fish, bird, mammal, amphibian, reptile**, skeleton, bone, **vertebrate, invertebrate,** backbone, names for animal body parts, names of common plants, photosynthesis.
Prior Learning	Future Learning	Key Scientists

In the Year 2 unit 'Living things and their habitats', children should: • Explore and compare the difference 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 the different sources of food.	In the Year 5 unit 'Living things and their habitats', children will: • 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. •	**Cindy Looy** (Environmental Change and Extinction) **Jaques Cousteau** (Marine Biologist)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Does the amount of light affect how many woodlice move around? **How does the average temperature of the pond water change in each season?**	Can we use the classification keys to identify all the animals that we caught pond dipping?	How does the variety of invertebrates on the school field change over the year?	How has the use of insecticides affected bee population?	Why are people cutting down the rainforests and what effect does that have?	Are living things in danger?

Year 5 – Living things and their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird. • Know the process of reproduction in plants. • Know the process of reproduction in animals.	• Different animals mature at different rates and live to different ages. • Some organisms reproduce sexually where offspring inherit information from both parents. • Some organisms reproduce asexually by making a copy of a single parent. • Environmental change can affect how well an organism is suited to its environment. • Different types of organisms have different lifecycles.	• <u>Reproduction:</u> **asexual reproduction, sexual reproduction, gestation, metamorphosis,** gametes, tuber, runners/side branches, plantlet, cuttings, embryo, adolescent, penis, vagina, egg, pregnancy, gestation. Previously introduced vocabulary: **life cycle, pollination,** offspring, **fertilise,** fertilisation, sepal, filament, anther, stamen, pollen, petal, stigma, style, ovary, carpel, ovule, stem, bulb, roots, mammal, adult, baby, sperm, cells, live young. .

Prior Learning	Future Learning	Key Scientists
In Year 4 children should: • Construct and interpret a variety of food chains, identifying producers, predators and prey • 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.	In the Year 6 unit 'Living things and their habitats', children will: • Classify living things into broad groups according to observable characteristics and based on similarities and differences. • Give reasons for classifying plants and animals based on specific characteristics.	**James Brodie of Brodie** (Reproduction of Plants by Spores) **David Attenborough** (Naturalist and Nature Documentary Broadcaster) •

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>
How does the level of salt affect how quickly brine shrimp hatch?	Compare this collection of animals based on similarities and differences in their lifecycle.	How do brine shrimp change over their lifetime? How does a bean change as it germinates?	Is there are relationship between number of petals and number of stamens?	What are the differences between the life cycle of an insect and a mammal?	Do all plants and animals reproduce in the same way?

Year 6 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Classify living things into broad groups according to observable characteristics and based on similarities and differences.** • **Give reasons for classifying plants and animals based on specific characteristics.**	• Variation exists within a population (and between offspring of some plants) – *NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. • Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Competition exists for resources and mates.	• Classifying: Carl Linnaeus, Linnaean system, flowering and non-flowering plants, variation. • Microorganisms: **bacteria,** single-celled, microbes, microscopic, virus, fungi, fungus, mould, antibiotic, yeast, ferment, **microscope**, decompose.
Prior Learning	**Future Learning**	Key Scientists
In the Year 5 unit 'Living things and the habitats', children should: • Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird. • Know the process of reproduction in plants. • Know the process of reproduction in animals.	In Key Stage 3 children will learn about: • the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • the adaptations of leaves for photosynthesis. • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment including the accumulation of toxic materials.	**Carl Linnaeus** (Identifying, Naming and Classifying Organisms),

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

How does the temperature affect how much gas is produced by yeast? **Which is the most common invertebrate on our school playing field?**	How would you make a classification key for vertebrates/invertebrates or microorganisms?	What happens to a piece of bread if you leave it on the windowsill for two weeks?	Do all flowers have the same number of petals?	What do different types of microorganisms do? Are they always harmful?	In what ways can we sort living things?

Year 4 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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 a lamp will light in a simple series circuit, based on whether the lamp is part of a complete loop with a battery.** • **Recognise that a switch opens and closes the circuit and associate this with whether a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors.** • **Know the difference between a conductor and an insulator, giving examples of each.** • **Safety when using electricity.**	• A source of electricity (mains of battery) is needed for electrical devices to work. • Electricity sources push electricity round a circuit. • More batteries will push the electricity round the circuit faster. • Devices work harder when more electricity goes through them. • A complete circuit is needed for electricity to flow and devices to work. • Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are called insulators.	• <u>Electricity:</u> mains-powered, battery-powered, **mains electricity,** plug, **appliances**, devices. • <u>Circuits:</u> **circuit,** simple series circuit, complete circuit, incomplete circuit. • <u>Circuit parts:</u> bulb, cell, wire, buzzer, switch, motor, **battery.** • <u>Materials:</u> **electrical conductor, electrical insulator.** • <u>Other:</u> safety. Previously introduced vocabulary: names of materials.
Prior Learning	Future Learning	Key Scientists
In Early Years children: • May have some understanding that objects need electricity to work. • May understand that a switch will turn something on or off.	In the Year 6 unit 'Electricity' children will: • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	Thomas Edison (First Working Lightbulb) Joseph Swan (Incandescent Light Bulb)

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>

How does the thickness of a conducting material affect how bright the lamp is? **Which metal is the best conductor of electricity?**	How would you group these electrical devices based on where the electricity comes from?	How long does a battery light a torch for?	Which room has the most electrical sockets in a house?	How has electricity changed the way we live? How does a light bulb work?	What can we do with electricity?

Year 6 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	• Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' • The greater the current flowing through a device the harder it works. • Current is how much electricity is flowing round a circuit. • When current flows through wires heat is released. The greater the current, the more heat is released.	• <u>Flow and measure of electricity:</u> **voltage, amps, resistance, electrons**, volts (V), **current.** • <u>Circuits</u>: **symbol,** circuit diagram, component, function, filament. • <u>Variations:</u> dimmer, brighter, louder, quieter. • <u>Types of electricity:</u> natural electricity, human-made electricity, solar panels, power station. • <u>Other:</u> positive, negative.
Prior Learning	**Future Learning**	Key Scientists
In the Year 4 unit 'Electricity', children should: • 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 a lamp will light in a simple series circuit, based on whether the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes the circuit and associate this with whether a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors.	In Key Stage Three children will learn: • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference measured in volts, battery and bulb ratings, resistance measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects	Alessandro Volta (Electrical Battery) Nicola Tesla (Alternating Currents)

• Know the difference between a conductor and an insulator, giving examples of each. • Safety when using electricity.	• The idea of electric field, forces acting across the space between objects not in contact.	

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the voltage of the batteries in a circuit affect the brightness of the lamp? How does the voltage of the batteries in a circuit affect the volume of the buzzer? **Which make of battery lasts the longest?** **Which type of fruit makes the best fruity battery?**	How would you group electrical components and appliances base on what electricity makes them do?	How does brightness of bulb change as the battery runs out? How can we measure how quickly a battery is used up?	Does the temperature of a light bulb go up the longer it is on?	How has our understanding of electricity changed over time?	Can we vary the effects of electricity?

Year 3 – Forces (& Magnetism)

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Compare how things move on different surfaces. • Know how a simple pulley works and use making lifting an object simpler • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract and repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets with attract or repel each other, depending on which poles are facing.	• Magnets exert attractive and repulsive forces on each other. • Magnets exert non-contact forces, which work through some materials. • Magnets exert attractive forces on some materials. • Magnet forces are affected by magnet strength, object mass, distance from object and object material.	• How things move: move, movement, **surface**, distance, strength. • Types of **forces**: push, pull, contact force, non-contact force, **friction**. • Magnets: **magnetic, magnetic field,** magnetic force, bar magnet, horseshoe magnet, ring magnet, magnetic **poles** (north pole, south pole), **attract, repel,** compass. • Magnetic and non-magnetic materials: e.g. iron, nickel, cobalt. Previously introduced vocabulary: metal, names of materials.

Prior Learning	Future Learning	Key Scientists
In EYFS and KS1 children: • May have an awareness of how to make things stop and start, using simple pushes and pulls. • They may know about floating and sinking.	In the Year 5 unit 'Forces', children will: • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. • Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect. • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies	William Gilbert (Theories on Magnetism) Andre Marie Ampere (Founder of Electro-Magnetism)

	• Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the mass of an object affect how much force is needed to make it move? Which magnet is strongest? Which surface is best to stop you slipping?	Which materials are magnetic?	If we magnetise a pin, how long does it stay magnetised for?	Do magnetic materials always conduct electricity? Does the size and shape of a magnet affect how strong it is?	How have our ideas about forces changed over time? How does a compass work?	How can we move magnets?

Year 5 – Forces

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. • Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect.	• Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way. • Friction is a force against motion caused by two surfaces rubbing against each other. • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move	• Types of forces: **air resistance, water resistance, buoyancy, upthrust,** Earth's **gravitational pull, gravity**, opposing forces, driving force. • Mechanisms: levers, pulleys, gears/cogs. • Measurements: **weight, mass,** kilograms (kg), Newtons (N), scales, speed, fast, slow. • Other: **streamlined**, Earth. Previously introduced vocabulary: air, heat, moon.
Prior Learning	Future Learning	Key Scientists

In Year 3 children should: • Compare how things move on different surfaces. • Know how a simple pulley works and use making lifting an object simpler • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract and repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets with attract or repel each other, depending on which poles are facing.	In KS3 children will learn about: • opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface • forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • change depending on direction of force and its size.	Galileo Galilei (Gravity and Acceleration) Isaac Newton (Gravitation) Archimedes of Syracuse (Levers) John Walker (The Match) •

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the angle of launch affect how far a paper rocket will go? How does the surface area of an object affect the time it takes to sink?	Can you label and name all the forces acting on the objects in each of these situations?	How long does a pendulum swing for before it stops?	Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall?	How do submarines sink if they are full of air?	How and why do objects move?

Year 5 – Earth & Space

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	• Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. Gravity works over distance. • Objects with larger masses exert bigger gravitational forces. • Objects like planets, moons and stars spin. • Smaller mass objects like planets orbit large mass objects like stars. • Stars produce vast amounts of heat and light. • All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.	• Solar system: **star, planet.** • Names of planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune, Uranus. • Shape: **spherical bodies, sphere.** • Movement: **rotate, axis, orbit, satellite.** • Theories: **geocentric model, heliocentric model, astronomer.** • Day length: sunrise, sunset, midday, time zone. Previously introduced vocabulary: **Sun, moon, shadow**, day, night, heat, **light**, **reflect**.

Prior Learning	Future Learning	Key Scientists
In Key Stage 1 and in Year 3 children should: • Understand changes in weather patterns and seasons. • Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Describe magnets as having two poles. Predict whether two magnets with attract or repel each other, depending on which poles are facing	In KS3 children will learn about: • Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) • Our Sun as a star, other stars in our galaxy, other galaxies • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres the light year as a unit of astronomical distance	**Claudius Ptolemy and Nicolaus Copernicus** (Heliocentric vs Geocentric Universe) **Neil Armstrong** (First man on the Moon) **Helen Sharman** (First British astronaut) **Tim Peake** (First British ESA astronaut)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

How does the length of daylight hours change in each season?	How could you organise all the objects in the solar system into groups?	Can you observe and identify all the phases in the cycle of the Moon?	Is there a pattern between the size of a planet and the time it takes to travel around the Sun?	What unusual objects did Jocelyn Bell Burnell discover? How do astronomers know what stars are made of? How have our ideas about the solar system changed over time?	Sun, Earth & Moon: What is moving and how do we know?

Year 1 – (ENERGY) Seasonal Change

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Observe changes across the four seasons** • **Observe and describe weather associated with the seasons and how day length varies.**	• Weather can change • There are lots of different types of weather: Rain, Sun, Cloud, Wind, Snow, etc • Days are longer and hotter in the summer • Days are shorter and colder in the winter • There are four seasons: Spring, Summer, Autumn, Winter	• <u>Seasons:</u> **spring, summer, autumn, winter**, seasonal change. • <u>Weather:</u> e.g. sun, rain, snow, sleet, frost, ice, fog, cloud, hot/warm, cold, storm, wind, thunder, weather forecast. • <u>Measuring weather:</u> temperature, rainfall, wind direction, thermometer, rain gauge. • <u>Day length:</u> night, day, **daylight.**

Prior Learning	Future Learning	Key Scientists
In Early Years children should: • Developing an understanding of change. • Observe and explain why certain things may occur (e.g. leaves falling off trees, weather changes). • Look closely at similarities, differences, patterns and change. • Comments and questions about the place they live or the natural world.	In Year 3 children will: • Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by a solid object. • Find patterns in the way that the sizes of shadows change.	Dr Steve Lyons (Extreme Weather) Holly Green (Meteorologist)

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>
In which season does it rain the most? 	How could you organise all the objects in the solar system into groups? 	How does the colour of a UV bead change over the day? 	Does the wind always blow the same way? 	Are there plants that are in flower in every season? What are they? 	What is it like in Winter, Spring, Summer and Autumn?

Year 3 – (ENERGY) Light

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Recognise that they need light in order to see things and that dark is the absence of light.** • **Notice that light is reflected from surfaces.** • **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.** • **Recognise that shadows are formed when the light from a light source is blocked by a solid object.** • **Find patterns in the way that the sizes of shadows change.**	• There must be light for us to see. Without light it is dark. • We need light to see things even shiny things. • Transparent materials let light travel through them, and opaque materials don't let light through. • Beams of light bounce off some materials (reflection). • Shiny materials reflect light beams better than non-shiny materials. • Light comes from a source	• <u>Light and seeing:</u> **dark,** absence of light, **light source,** illuminate, visible, **shadow, translucent,** energy, block. • <u>Light sources:</u> e.g. candle, torch, fire, lantern, lightning. • <u>Reflective light:</u> **reflect, reflection,** surface, **ray**, scatter, reverse, beam, angle, mirror, moon. • <u>Sun safety:</u> dangerous, glare, damage, UV light, UV rating, sunglasses, direct. Previously introduced vocabulary: **opaque, transparent,** sunlight, sun.
Prior Learning	**Future Learning**	Key Scientists
In the Year 1 unit 'Seasonal changes', children should have: • Observed changes across the four seasons • Observed and describe weather associated with the seasons and how day length varies. Children may: • have some knowledge of were light comes from. • have seen their shadows and may know they appear when it is sunny. • Have some understanding of a reflection. • May understand they need light to be able to see things.	In the Year 6 unit 'Light', children will: • Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.	**James Clerk Maxwell** (Visible and Invisible Waves of Light)

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>

How does the distance between the shadow puppet and the screen affect the size of the shadow? Which pair of sunglasses will be best at protecting our eyes?	How would you organise these light sources into natural and artificial sources?	When is our classroom darkest? Is the Sun the same brightness all day?	Are you more likely to have bad eyesight and to wear glasses if you are older?	How does the Sun make light?	What is a shadow?

Year 4 – (ENERGY) Sound

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know how sound is made associating some of them with vibrating. • Know what happens to a sound as it travels from its source to our ears. • Know the correlation between the volume of a sound and the strength of the vibrations that produced it. • Know how sound travels from a source to our ears. • Know the correlation between pitch and the object producing a sound.	• Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Sound spreads out as it travels. • Changing the shape, size and material of an object will change the sound it produces. • Sound is produced when an object vibrates. • Sound moves through all materials by making them vibrate. • Changing the way an object vibrates changes its sound. • Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds	• Parts of the ear: **eardrum.** • Making sound: **vibration,** vocal cords, **particles.** • Measuring sound: **pitch, volume, amplitude, sound wave,** quiet, loud, high, low, travel, **distance.** • Other: **soundproof, absorb sound.**
Prior Learning	Future Learning	Key Scientists

In KS1 children: • May have some understanding that objects make different sounds. • Some understanding that they use their ears to hear sounds. • Know about their different senses.	In KS3 children will learn about: • frequencies of sound waves measured in hertz (Hz), echoes, reflection and absorption of sound • sound needs a medium to travel, the speed of sound in air, in water, in solids • sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • auditory range of humans and animals.	**Aristotle** (Sound Waves) **Gailileo Galilei** (Frequency and Pitch of Sound Waves) **Alexander Graham Bell** (Invented the Telephone)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the volume of a drum change as you move further away from it? How does the length of a guitar string/tuning fork affect the pitch of the sound? Are two ears better than one?	Which material is best to use for muffling sound in ear defenders?	When is our classroom the quietest?	Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of the school?	Do all animals have the same hearing range?	How can we make different sounds?

Year 6 – (ENERGY) Light

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. • Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.	• Animals see light sources when light travels from the source into their eyes. • Animals see objects when light is reflected off that object and enters their eyes. • Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light, so we do not see the beam. • Light travels in straight lines.	• Reflection: periscope. • Seeing light: **visible spectrum, prism.** • How light travels: light waves, wavelength, straight line, **refraction.** Previously introduced vocabulary: names and properties of materials, absorb.

Prior Learning	Future Learning	Key Scientists
In the Year 3 unit 'Light', children should: • Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by a solid object. • Find patterns in the way that the sizes of shadows change.	In Key Stage 3, children will learn about: • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative), the human eye • light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.	**Thomas Young** (Wave Theory of Light) **Ibn al-Haytham (Alhazen)** (Light and our Eyes) Percy Shaw (The Cats Eye)

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface? Which material is most reflective?	Can you identify all the colours of light that make white light when mixed together? What colours do you get if you mix different colours of light together?	Does the temperature of a light bulb go up the longer it is on? How does my shadow change over the day?	Is there a pattern to how bright it is in school over the day? And, if there is a pattern, is it the same in every classroom?	Why do some people need to wear glasses to see clearly? How do our eyes adapt to different conditions?	Why does my shadow change length over the course of a day?

Year 1 – Everyday Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Distinguish between and object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, metal, plastic, glass, water and rock • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple properties	• There are many different materials that have different describable and measurable properties. • Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic and ceramics (including glass). • The properties of a material determine whether they are suitable for a purpose.	• Names of materials: wood, plastic, glass, metal, water, rock, paper, cardboard, rubber, fabric. • Properties of materials: hard, soft, shiny, dull, stretchy, rough, smooth, bendy, not bendy, transparent, opaque, waterproof, not waterproof, absorbent, not absorbent, sharp, stiff. • Other: object.
Prior Learning	**Future Learning**	**Key Scientists**
In EYFS children should: • Use all their senses in hands-on exploration • of natural materials. • Explore collections of materials with similar and/or • different properties. • Talk about what they see, using a wide vocabulary. • Talk about the differences between materials • and changes they notice.	In the Year 2 unit 'Uses of Everday Materials' children will: • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
We need to choose a material to make an umbrella. Which materials are waterproof?	Which materials have which properties?		Is there a pattern in the types of materials that are used to make objects?		What are the things I use made from?

Year 2 – Uses of Everyday Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	• Materials can be changed by physical force (twisting, bending, squashing and stretching)	• Changing shape: squash, bend, twist, stretch. • Properties of materials: e.g. strong, flexible, light, hard-wearing, elastic. • Other: suitability, recycle, pollution.
Prior Learning	**Future Learning**	**Key Scientists**
In the Year 1 unit 'Everyday Materials' children should: • Distinguish between and object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, metal, plastic, glass, water and rock, • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple properties.	In the Year 3 unit 'Rocks' children will: • Compare and group together different kinds of rocks based on 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.	• John McAdam

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Can you compare the suitability of different materials for different uses? How can I change the shape of this material?	Can you group materials by similar properties and uses? Can you sort the materials for recycling?		What uses do you spot in the local environment? Why can different materials be used to make the same object? What properties do they have in common?	What happens after recycling has been collected? How did John McAdam change the way we build roads with his use of materials?	Can we change materials? How do we choose the best material?

Year 3 – Rocks

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Compare and group together different kinds of rocks based on 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	• There are different types of rock. • There are different types of soil. • Soils change over time. • Different plants grow in different soils. • Fossils tell us what has happened before. • Fossils provide evidence. • Palaeontologists use Fossils to find out about the past. • Fossils provide evidence that living things have changed over time.	• Types of rock: sedimentary rock, igneous rock, metamorphic rock. • Properties of rocks: permeable, semi-permeable, impermeable, durable. • Names of rocks: e.g. marble, chalk, granite, sandstone, slate. • Formation of rocks and fossils: natural, human-made, magma, lava, molten rock, sediment, erosion, fossilisation, layers, bone, fossil. • Soil: sandy, chalky, clay, peaty, loamy, topsoil, subsoil, bedrock, mineral, organic matter, compost. • Other: palaeontology.
Prior Learning	**Future Learning**	**Key Scientists**
In the year 2 unit 'Uses of Everyday Materials' children should: • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. In EYFS children learnt: • What fossils are • What palaeontologists do • That dinosaurs are extinct and we know about them due to the discovery of fossils	In the year 4 unit 'States of Matter' children will: • 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.	• Mary Anning • Georges Cuvier

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How permeable, durable and dense are the different rock types? How permeable are different types of soil?	Can you identify the types of rock in your collection?	Make a mini compost bin. How does the soil form over time?	Is there a pattern in where we find different types of rocks on planet Earth?	Who was Mary Anning and what did she discover? What happens in the fossilisation process?	What are rocks and soils like?

Year 4 – States of Matter

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius. • dentify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• Solids, liquids and gases are described by observable properties. • Materials can be divided into solids, liquids and gases. • Heating causes solids to melt into liquids and liquids evaporate into gases. Cooling causes gases to condense into liquids and liquids to freeze into solids. • The temperature at which given substances change state are always the same.	• States of matter: solids, liquids, gases, particles. • State change: evaporate, condense, melt, freeze, heat, cool, melting point, freezing point, boiling point, water vapour. • Water cycle: precipitation, evaporation, condensation, ground run-off, collection, underground water, bodies of water (sea, river, stream), water droplets, hail. • Other: atmosphere. • Previously introduced vocabulary: temperature, rain, cloud, snow, wind, sun, hot, cold, absorb, carbon dioxide
Prior Learning	**Future Learning**	**Key Scientists**
In KS1 children should: • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple physical properties. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	In the year 5 unit 'Properties and Changes of Materials', children will: • 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; • 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; • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic; • demonstrate that dissolving, mixing and changes of state are reversible changes; • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	• Joseph Priestly

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

Which fizzy drink contains the most gas? 	Can you group these materials and objects into solids, liquids, and gases? How would you sort these objects/materials based on their temperature? 	How long does it take to melt chocolate in different temperatures? What happens to the weight of a can of fizzy drink over 24 hours? 	How does evaporation rate change as you add more salt to your water? 	What happens in the water cycle? 	Where do ice cubes go when they disappear? Why does it rain and hail?

Year 5 – Properties and Changes of Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • comparative and fair tests, for the uses of everyday materials, including wood, metals and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda •	• All matter (including gas) has mass. • Sometimes mixed substances react to make a new substance. These changes are usually irreversible. • Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. • Indicators that something new has been made are: The properties of the material are different (colour, state, texture, hardness, smell, temperature) • If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)	• Properties of materials: thermal conductor/insulator, magnetism, electrical resistance, transparency. • Mixtures and solutions: dissolving, substance, soluble, insoluble. • Changes of materials: reversible change, physical change, irreversible change, chemical change, burning, new material, product. • Separating: sieving, filtering, magnetic attraction. • Previously introduced vocabulary: electrical conductor/insulator, bulb, translucent.

Prior Learning	Future Learning	Key Scientists
In KS1 children should: • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple physical properties. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	In KS3 children will learn about: • the concept of a pure substance mixtures, including dissolving • diffusion in terms of the particle model • simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography • the identification of pure substances	•

Scientific Enquiry

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity

Test different materials' magnetism, hardness, transparency, flexibility, permeability Which materials make the best thermal insulator for a lunch box? Which materials make the best electrical conductor to light a light bulb?	Can you identify and classify these reactions and changes into reversible, and irreversible? Can you describe their groups similarities and differences? Which materials are soluble or insoluble?	What happens when mixing a soluble material and liquid?	How does changing my variables affect my outcome?		How can we change materials reversibly and irreversibly?