Year 1 – Everyday Materials

National Curriculum Objectives

- 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

Sticky Knowledge

- Natural materials come from the world around us, such as the ground, plants and animals.
- Human-made materials are new materials people make from natural materials.
- A property is a quality that a material has. Materials can be described by their properties, such as hard, soft, stretchy, bendy, transparent and waterproof. Materials have different properties, which make them suitable for making different objects.
- Objects and materials can be compared and put into groups according to their similarities, differences or properties.
- A Venn diagram is a way of grouping information or objects using overlapping circles. It can be used to group objects according to their properties to find their similarities and differences.

Vocabulary

Absorbent, bendy, brick, ceramic, clay, concrete, cotton, fabric, glass, hard, human-made, leather, material, metal, metal alloy, natural, oil, opaque, paper, plastic, property, rough, rubber, sand, shiny, silk, smooth, soft, stone, stretchy, synthetic fabric, transparent, water, waterproof, wood, wool.

Key Scientists	Possible Texts
William Addis (Toothbrush Inventor) **Charles Mackintosh** (Waterproof coat) **John McAdam** (Roads) **Ole Kirk Christiansen** (Lego)	***The Great Paper Caper*** *(Oliver Jeffers)* ***Who Sank the Boat*** *(Pamela Allen)* ***The Story of Cinderella*** *(Walt Disney)*

Prior Learning

In Early Years children should:

- be able to ask questions about the place they live.
- Talk about why things happen and how things work.
- Discuss the things they have observed such as natural and found objects.
- Manipulates materials to achieve a planned effect.

Key Question(s):

- What is a natural material?
- Can you name a man-made material?
- What is one property of rubber used in welly boots?
- Can you name 2 objects that have very similar properties?
- What is a Venn diagram?

Future Learning

In Year 2 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Innovate: Observing, measuring and recording	Introductory knowledge: What are materials? Engage lesson 1: Introducing natural materials. Engage lesson 2: Human-made materials. Engage lesson 3: Identification and classification. Develop lesson 1: Properties of materials. Develop lesson 2: Venn diagrams	Innovate: Observing, measuring and recording	Develop lesson 3: Testing and recording materials' properties		Innovate: Observing, measuring and recording

Year 1 – Human Senses

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	• Humans are a type of animal called a mammal. • Mammals have limbs, such as arms and legs, and hair or fur on their bodies. Other mammals include cats, elephants and apes. • Humans have five senses. They are sight, hearing, smell, taste and touch. We have body parts to allow us to sense our surroundings. • Our senses keep us safe. They can warn us if something is wrong and help identify dangers. • There are many different parts of the human body. Each body part has a function.	Abdomen, animal, ankle, arm, calf, chest, chin, ear, elbow, eye, finger, foot, forearm, forehead, hair, hand, head, hearing, human, knee, leg, limb, mammal, mouth, neck, nose, pelvis, sense, shoulder, sight, skin, smell, taste, thigh, toe, tongue, touch, unique, upper arm, wrist. Key Scientists: **Chris Packham** (Animal Conservationist) **George Mottershead** (Zoo owner and designer) Possible Texts: **One Year with Kipper** (Mick Inkpen) **Snail Trail** (Ruth Brown) **Superworm** (Julia Donaldson & Axel Scheffler)

Prior Learning	Key Question(s):	Future Learning
In Early Years children should: • Be able to identify different parts of their body. • Have some understanding of healthy food and the need for variety in their diets. • Be able to show care and concern for living things. • Know the effects exercise has on their bodies. • Have some understanding of growth and change. • Can talk about things they have observed including animals	• What are the five senses? • What do our senses do? • What is one property of rubber used in welly boots? • Can you name 2 objects that have very similar properties? • What is a Venn diagram?	In Year 2 children will: • Know that animals, including humans, have offspring which grow into adults • Know the basic stages in a life cycle for animals, including humans. • Find out 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Innovate: Planning and carrying out	Engage lesson 3: Similarities and differences Develop lesson 1: Functions Develop lesson 4: Investigating our sense of touch		Engage lesson 2: How many?	Develop lesson 2: Why do we need our senses? Develop lesson 3: Sensory loss and assistive tools	

Year 1 – Seasonal Changes

National Curriculum Objectives

- Observe changes across the four seasons
- Observe and describe weather associated with the seasons and how day length varies.

Sticky Knowledge

- There are four seasons in the United Kingdom. These are winter, spring, summer and autumn.
- There are two main types of trees. Deciduous trees have leaves that change colour and fall from the trees in autumn and winter. Evergreen trees shed old leaves and grow new leaves all year round. This means that they keep their leaves in winter.
- The temperature on Earth changes during the day.
- Precipitation is water that falls from the clouds. Precipitation can fall as rain, sleet, snow or hail, depending on the temperature.
- The Beaufort Scale was invented in 1805 by Commander Francis Beaufort of the British navy.

Vocabulary

Anemometer, animal, autumn, Beaufort Scale, blossom, breeze, bud, cloud, dark, daytime, deciduous, dormant, Earth, evergreen, fog, fruit, gale, grow, hail, hibernate, hurricane, leaf, light, meteorologist, migrate, night time, Northern Hemisphere, precipitation, rain, rainfall, rain gauge, rays, season, seasonal change, sleet, snow, spring, storm, summer, Sun, sun cream, sunglasses, sunrise, sunset, temperature, thermometer, weather weather forecast, wind, windsock, winter.

Key Scientists	Possible Texts
Dr Steve Lyons (Extreme Weather) **Holly Green** (Meteorologist) **George James Symons** (Meteorologist)	**Tree: Seasons Come, Seasons Go** (Patricia Hegarty and Britta Teckentrup) **One Year with Kipper** (Mick Inkpen) **After the Storm** (Nick Butterworth)

Prior Learning

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.

Key Question(s):

- What are the four seasons?
- What do scientists use the Beaufort Scale for?
- The Earth travels around what to make the seasons?
- Why does the length of daytime change throughout the year?
- How do we measure temperature?

Future Learning

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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 2: Sun's rays Innovate: Asking and answering questions	Engage lesson 2: Deciduous and evergreen trees Engage Lesson 3: Seasonal changes in deciduous trees	Engage Lesson 3: Seasonal changes in deciduous trees. Engage lesson 4: Seasonal changes in animals. Develop lesson 2: Sun's rays. Develop lessons 3a/3b: Measuring and recording the wind. Develop lessons 4a/4b: Measuring and recording temperature. Develop lesson 5: Measuring precipitation. Innovate: Asking and answering questions	Engage lesson 1: Experiencing the season Develop lesson 1: Day length Develop lessons 4a/4b: Measuring and recording temperature		Develop lesson 2: Sun's rays Innovate: Asking and answering questions

Year 1 – Plant Parts

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. • Identify and name the roots, trunk, branches and leaves of trees.	• Plants are living things. There are garden plants and wild plants. People look after garden plants but not wild plants. • Plants change with the seasons. In winter, many plants die or become dormant. In spring, buds open to become leaves or flowers and new plants grow from seeds and bulbs. • Plants grow from seeds or bulbs. Inside seeds and bulbs are tiny plants waiting for the right conditions to start growing. Seeds are usually small and come in different shapes and sizes. Bulbs are bigger than seeds and have a rounded shape and papery coating. • Plants have five main parts: leaf, flower, fruit, stem, root. • Leaves have four main parts: margin, vein, blade, stalk.	Bark, blade, blossom, branch, bud, bulb, deciduous, evergreen, flower, fruit, garden, garden plant, hedgerow, leaf, margin, meadow, petal, plant, root, season, seed, shelter, soil, stalk, stem, tree, trunk, vein, wild plant, woodland.	
		Key Scientists	Possible Texts
		Beatrix Potter (Author & Botanist) **Tim Smit** (Horticulturalist)	**Tree: Seasons Come, Seasons Go** (Patricia Hegarty and Britta Teckentrup) **A Little Guide to Wild Flowers** (Charlotte Voake) **The Things That I LOVE about TREES** (Chris Butterworth) **Harry's Hazelnut** (Ruth Parsons) **Eden Project Website** **Beatrix Potter Texts**

Prior Learning	Key Question(s):	Future Learning
In EYFS Children should: • Make observations of plants (drawing, differences) • To know the difference between plants, trees and flowers • To be able to name and describe different plants, trees and flowers • Show some care for their world around them • To know that all plants are living things	• What is the job of the roots? • Where do you find wild plants? • Why are plants important for shelter? • What materials can be made from plants? • Name a plant that grows from a seed.	In Year 2 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Engage lesson 2: Identifying plants Develop lesson 1: Seeds and bulbs Develop lesson 2: Investigating leaves Innovate: Reporting and concluding	Engage lesson 1: Seasonal changes in plants Develop lesson 4: My plant		Develop lesson 1: Seeds and bulbs Develop lesson 3: Importance of plants	

Year 1 – Animal Parts

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	• Animals can be grouped into: fish, amphibians, birds, mammals, invertebrates, retiles. • Animals can be sorted into three groups based on what they eat. Carnivores only eat meat. Herbivores only eat plants or parts of plants, such as seeds, fruit and vegetables. Omnivores eat meat and plants. • Animals in different groups have different body parts to help them catch and eat food. • A pet is an animal that humans keep at home as a companion they spend a lot of time with. Pets come from different animal groups. • Animals can have similar body parts to humans. Animals can also have different body parts, such as a tail, gills or antennae.	Amphibian, animal, antenna, beak, bird, body covering, camouflage, carnivore, claw, ear, eye, feather, fin, fish, fur, gill, group, hearing, herbivore, human, hunt, invertebrate, limb, mammal, mouth, nose, offspring, omnivore, pet, reptile, scale, sense, shell, sight, skin, smell, tail, teeth, tongue, touch, wild animal, wing.

Key Scientists	Possible Texts
Chris Packham (Animal Conservationist) **George Mottershead** (Zoo owner and designer)	**One Year with Kipper** (Mick Inkpen) **Snail Trail** (Ruth Brown) **Superworm** (Julia Donaldson & Axel Scheffler)

Prior Learning	Key Question(s):	Future Learning
In Early Years children should: • Be able to identify different parts of their body. • Have some understanding of healthy food and the need for variety in their diets. • Be able to show care and concern for living things. • Know the effects exercise has on their bodies. • Have some understanding of growth and change. • Can talk about things they have observed including animals	• What features do fish have? • What features do birds have? • What is an antenna? • What features do carnivores have? • Name a herbivore.	In Year 2 children will: • Know that animals, including humans, have offspring which grow into adults • Know the basic stages in a life cycle for animals, including humans. • Find out 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 4: Observation and simple tests Innovate: Observing, measuring and recording	Engage lesson 1: Identifying animal parts. Engage lesson 2: Grouping animals. Engage lesson 3: Sorting and pattern seeking. Develop lesson 1: Our pets. Develop lesson 2: Carnivore, herbivore, omnivore. Innovate: Observing, measuring and recording	Develop lesson 4: Observation and simple tests Innovate: Observing, measuring and recording	Engage lesson 3: Sorting and pattern seeking	Develop lesson 3: Class pet Innovate: Observing, measuring and recording	

Year 1 – Plant Parts

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. • Identify and name the roots, trunk, branches and leaves of trees.	• Plants are living things. There are garden plants and wild plants. People look after garden plants but not wild plants. • Plants change with the seasons. In winter, many plants die or become dormant. In spring, buds open to become leaves or flowers and new plants grow from seeds and bulbs. • Plants grow from seeds or bulbs. Inside seeds and bulbs are tiny plants waiting for the right conditions to start growing. Seeds are usually small and come in different shapes and sizes. Bulbs are bigger than seeds and have a rounded shape and papery coating. • Plants have five main parts: leaf, flower, fruit, stem, root. • Leaves have four main parts: margin, vein, blade, stalk.	Bark, blade, blossom, branch, bud, bulb, deciduous, evergreen, flower, fruit, garden, garden plant, hedgerow, leaf, margin, meadow, petal, plant, root, season, seed, shelter, soil, stalk, stem, tree, trunk, vein, wild plant, woodland.	
		Key Scientists	Possible Texts
		Beatrix Potter (Author & Botanist) **Tim Smit** (Horticulturalist)	**Tree: Seasons Come, Seasons Go** (Patricia Hegarty and Britta Teckentrup) **A Little Guide to Wild Flowers** (Charlotte Voake) **The Things That I LOVE about TREES** (Chris Butterworth) **Harry's Hazelnut** (Ruth Parsons) **Eden Project Website** **Beatrix Potter Texts**

Prior Learning	Key Question(s):	Future Learning
In EYFS Children should: • Make observations of plants (drawing, differences) • To know the difference between plants, trees and flowers • To be able to name and describe different plants, trees and flowers • Show some care for their world around them • To know that all plants are living things	• What is the job of the roots? • Where do you find wild plants? • Why are plants important for shelter? • What materials can be made from plants? • Name a plant that grows from a seed.	In Year 2 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Engage lesson 2: Identifying plants Develop lesson 1: Seeds and bulbs Develop lesson 2: Investigating leaves Innovate: Reporting and concluding	Engage lesson 1: Seasonal changes in plants Develop lesson 4: My plant		Develop lesson 1: Seeds and bulbs Develop lesson 3: Importance of plants	

Year 2 – Human Survival

National Curriculum Objectives

- Know that animals, including humans, have offspring which grow into adults
- Know the basic stages in a life cycle for animals, including humans.
- Find out 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.

Sticky Knowledge

- Humans need different things to keep them alive and healthy. Without one or more of these things, we cannot survive. The most important human needs are: food, shelter, water, air, space, sleep.
- To stay healthy, humans need a balanced diet, plenty of water, exercise and enough sleep.
- Regular exercise keeps our bodies strong and healthy. It also improves our mood. There are four main types of exercise: aerobic, strengthening, stretching, balancing.
- All humans are born and they grow and change over time to become an adult. Baby, toddler, child, teenager, adult, elderly.
- Bodily hygiene is the way we keep our bodies clean and get rid of germs. Germs are tiny living things, such as bacteria, that can cause illness in humans.

Vocabulary

Adult, aerobic exercise, air, balancing exercise, balanced diet, birth, bone, carbohydrates, coordination, dairy and alternatives, embryo, energy, exercise, fat, food, food group, fruit and vegetables, germ, growth, healthy, heart, human, hydrate, hygiene, juvenile, life cycle, love, lungs, mammal, muscle, nutrient, nutrition, offspring, oils and spreads, omnivore, proteins, reproduction, sense, shelter, space, strengthening exercise, stretching exercise, sugar, survive, sweat, vegan diet, vegetarian diet, vitamin, water.

Key Scientists	Possible Texts
Steve Irwin (Crocodile Hunter) **Robert Winston** (Human Scientist) **Joe Wicks** (Personal Trainer) **Elizabeth Garrett Anderson** (Doctor)	**The Gruffalo** (Julia Donaldson) **Meerkat Mail** (Emily Gravett) **Tadpole's Promise** (Jeanne Willis and Tony Ross)

Prior Learning

In Year 1 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.

Key Question(s):

- What are the six stages of the human timeline?
- What six things do humans need to stay alive?
- What does water do in the human body?
- What are the five main food groups?
- What can you do to stop the spread of germs?

Future Learning

In Year 3 children will:

- Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat.
- Know how nutrients, water and oxygen are transported within animals and humans.
- Know about the importance of a nutritious, balanced diet.
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 4: Why should we use soap?	Engage lesson 1: Human life cycle	Develop lessons 2a/2b: Exercise challenge Innovate: Reporting and concluding	Develop lessons 2a/2b: Exercise challenge		Innovate: Reporting and concluding

Year 2 - Habitats

National Curriculum Objectives

- 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.

Sticky Knowledge

- A habitat is a place where plants and animals live. There are many different habitats on Earth, including: forest, polar, desert, ocean, mountain, rainforest.
- Every habitat provides the things that plants and animals need to survive.
- A food chain shows how energy from food is transferred from plants to animals in a habitat.
- Prey animals use different ways to avoid being eaten by predators.
- Plants also have adaptations that protect them from being eaten by animals.

Vocabulary

Adaptation, air, amphibian, animal, bird, camouflage, carnivore, excretion, fish, food, food chain, growth, habitat, herbivore, identify, invertebrate, living, mammal, mimicry, movement, non-living, nutrient, offspring, omnivore, plant, predator, prey, quill, reproduction, reptile, respiration, sensitivity, shelter, soil, space, temperature, thorn, warning colouration, water, woodland.

Key Scientists	Possible Texts
Terry Nutkins (TV Presenter) **Liz Bonnin** (Conservationist) **Rachel Carson** (Scientist)	**The Gruffalo** (Julia Donaldson) **Meerkat Mail** (Emily Gravett) **No Place Like Home** (Jonathon Emmett)

Prior Learning

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.

Key Question(s):

- What is a predator?
- Name a habitat.
- What is the definition of a living thing?
- What is a food chain?
- What do animals use camouflage for?

Future Learning

In Year 4 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Engage lesson 1: Living and non-living things Engage lesson 2: Identifying plants and animals in a habitat Develop lesson 3: Plant adaptations Innovate: Reporting and concluding		Develop lesson 2: Animal adaptations	Engage lesson 3: Why do these animals live in this habitat?	Innovate: Reporting and concluding

Year 2 – Uses of 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 have several properties. For example, wood is hard, strong, opaque and absorbent. • Objects are made from materials with suitable properties. • Materials can be shaped by bending, stretching, twisting and squashing. • Recycling means turning old products into new ones. This makes less waste and uses fewer of the Earth's natural resources. • Plants also have adaptations that protect them from being eaten by animals.	Absorbency, absorbent, bend, bendy, cardboard, clay, fabric, glass, hard, human-made, material, metal, natural, natural resource, object, opaque, paper, plastic, pollution, property, recycle, rock, rough, rubbish, shape, smooth, soft, squash, strength, stretch, stretchy, strong, sustainability, texture, transparent, twist, waterproof, wood.

Key Scientists	Possible Texts
William Addis (Toothbrush Inventor) **Charles Mackintosh** (Waterproof coat) **John McAdam** (Roads)	**The Tin Forest** (Helen Ward) **Traction Man** (Mini Grey) **Three Little Pigs** (Lesley Sims)

Prior Learning	Key Question(s):	Future Learning
In Year 1 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.	• What does opaque mean? • Name a material that you can stretch. • What is your water bottle made of? Why? • What are newspapers made of? • Why would you twist metal?	In Year 3 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 2: Testing paper Innovate: Asking and answering questions	Engage lesson 1: Exploring everyday materials Engage lesson 2: Shaping materials Engage lesson 3: Bending, stretching, twisting and squashing Develop lesson 3: The problem with materials	Develop lesson 2: Testing paper	Engage lesson 1: Exploring everyday materials	Develop lesson 3: The problem with materials	Develop lesson 2: Testing paper Develop lesson 3: The problem with materials Innovate: Asking and answering questions

Year 2 – Plant Survival

National Curriculum Objectives

- 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.

Sticky Knowledge

- Trees are plants. They have roots, a stem called a trunk, bark, branches and leaves.
- Some plants grow from seeds. A seed is a small object that a plant makes. It contains a tiny, young plant and a store of food that the plant needs to start growing before it can make food from sunlight.
- Germination is the first stage of plant growth when a seed starts to grow.
- Plants need sunlight, warmth, nutrients, water, air and space to grow and be healthy.
- Leaves come in different shapes and sizes. They make food for the plant.

Vocabulary

Air, bark, basal plate, branch, bulb, deciduous, embryo, evergreen, flower, flower bud, fruit, germinate, germination, habitat, leaf, nutrient, plant, root, scales, season, seed, seed coat, shade, soil, stem, sunlight, survive, temperature, tree, trunk, tunic, warmth, water.

Key Scientists	Possible Texts
Agnes Arber (Botanist) **Alan Titchmarsh** (Botanist & Gardener)	**The Tin Forest** (Helen Ward) **Jack and the Beanstalk** (Richard Walker) **Ten Seeds** (Ruth Brown) **A Seed Is Sleepy** (Dianna Aston)

Prior Learning

In Year 1 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.
- Identify and name the roots, trunk, branches and leaves of trees.

Key Question(s):

- Name the five parts of a tree.
- What does deciduous mean?
- What is the definition of germination?
- What happens during germination?
- What do plants need to grow?

Future Learning

In Year 3 Children will:

- Identify and describe the functions of different parts of the flowering plant: roots, stem/trunk/leaves and flowers
- Explore the part flowers play in a flowering plant's life cycle, including pollination, seed formation and seed dispersal
- Explain the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants
- Know the way in which water is transported between plants

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lesson 2: Germination Investigation Develop lesson 2: What do plants need to grow? Innovate: Observing, measuring and recording	Engage lesson 1: Exploring seasonal plants	Engage lesson 2: Germination Investigation Develop lesson 2: What do plants need to grow? Innovate: Observing, measuring and recording	Innovate: Observing, measuring and recording	Develop lesson 3: Unusual plants	

Year 2 – Animal Survival

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know that animals, including humans, have offspring which grow into adults • Know the basic stages in a life cycle for animals, including humans. • Find out 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.	• A habitat is a place where plants and animals live. There are different habitats, such as forests, polar regions, deserts, oceans, mountains and rainforests. • Habitats have living and non-living parts. Living parts include the plants and animals that live there. Non-living parts include sunlight, air, water, soil and temperature. • Invertebrates are animals without a backbone. Six invertebrate groups include arachnids, crustaceans, insects, molluscs, myriapods and worms. • A microhabitat is a small habitat contained within a larger habitat. • Animals change their behaviour as the seasons change in the United Kingdom.	Adult, air, amphibian, arachnid, bird, birth, carnivore, consumer, crustacean, egg, embryo, fish, food, food chain, grow, growth, habitat, hatch, hatching, herbivore, hibernation, insect, interdependent, invertebrate, larva, life cycle, mammal, metamorphosis, microhabitat, migration, mollusc, myriapod, offspring, omnivore, producer, pupa, pupation, reproduce, reproduction, reptile, season, shelter, space, survive, water, worm.

Key Scientists	Possible Texts
Steve Irwin (Crocodile Hunter) **Robert Winston** (Human Scientist) **Joe Wicks** (Personal Trainer) **Elizabeth Garrett Anderson** (Doctor)	**The Gruffalo** (Julia Donaldson) **Meerkat Mail** (Emily Gravett) **Tadpole's Promise** (Jeanne Willis and Tony Ross)

Prior Learning	Key Question(s):	Future Learning
In Year 1 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.	• What does consumer mean? • How can humans harm habitats? • How can humans help habitats? • Talk through a food chain that starts with a plant. • What is a microhabitat?	In Year 3 children will: • Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. • Know how nutrients, water and oxygen are transported within animals and humans. • Know about the importance of a nutritious, balanced diet. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Engage lesson 1: Introducing Invertebrates Engage lesson 2: Microhabitats Develop lesson 1: Life process of reproduction	Develop lesson 3: Observing insect lifecycles	Develop lesson 1: Life process of reproduction Develop lesson 2: Life cycles Develop lesson 4: Seasonal changes	Engage lesson 3: Animal needs	Engage lesson 3: Animal needs Innovate: Planning and carrying out

<table>
<tr><th colspan="3">Year 3 – Animal Nutrition and the Skeletal System</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th>Vocabulary</th></tr>
<tr>
<td rowspan="2">• Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat.
• Know how nutrients, water and oxygen are transported within animals and humans.
• Know about the importance of a nutritious, balanced diet.
• Identify that humans and some other animals have skeletons and muscles for support, protection and movement</td>
<td rowspan="2">• Nutrition is a life process by which living things make or eat food and absorb its nutrients. Plants can make their own food. They make food in their leaves. Animals cannot make their own food. They need to find food to eat.
• The adult human skeleton is a frame of 206 bones that supports the body and gives it shape. It allows the body to move and protects soft, internal organs like the brain, heart and lungs.
• An endoskeleton is found inside all vertebrates. It grows with the body and offers support but no protection to the outside of the body. An exoskeleton is found outside the body of invertebrates.
• A joint is a place where two or more bones meet and connect. Vertebrate skeletons have many bones connected by joints to move and bend body parts in different directions. Three types of joints in the human skeleton include the: hinge, ball and socket, pivot.
• Muscles are soft tissue made up of many stretchy fibres. They allow the body to move, breathe and digest food. There are three main types of muscle in the human body: smooth muscle in the intestines, skeletal muscle attached to the skeleton and cardiac muscle in the heart.</td>
<td>Ball and socket joint, biceps, bone marrow, carbohydrates, cardiac muscle, carnivore, cartilage, contract, cranium, dairy and alternatives, diet, endoskeleton, exoskeleton, femur, fibre, fibula, fruit and vegetables, gastrocnemius, gluteus maximus, hamstrings, herbivore, hinge joint, hip flexors, humerus, invertebrate, joint, latissimus dorsi, ligament, limb, malnutrition, mandible, mineral, muscle, nutrient, nutrition, oils and spreads, omnivore, patella, pectorals, pelvis, pivot joint, predator, prey, proteins, quadriceps, radius, relax, rib, ribcage, seasonal, skeletal muscle, skeleton, smooth muscle, spine, sternum, synovial fluid, tendon, tibia, tibialis anterior, triceps, ulna, vertebrae, vertebrate, vitamin.</td>
</tr>
<tr>
<td>
<table>
<tr><th>Key Scientists</th><th>Possible Texts</th></tr>
<tr><td>Adelle Davis
(20th Century Nutritionist)
Marie Curie
(Radiation / X-Rays)</td><td>The Story of Frog Belly Rat Bone (Timothy Basil Ering)
Funnybones (Janet and Allan Ahlberg)
I Will Never Not Ever Eat a Tomato (Lauren Child)
Goldilocks and the Three Bears (Samantha Berger)</td></tr>
</table>
</td>
</tr>
<tr><th>Prior Learning</th><th>Key Question(s):</th><th>Future Learning</th></tr>
<tr>
<td>In Year 2 children should:
• Know that animals, including humans, have offspring which grow into adults
• Know the basic stages in a life cycle for animals, including humans.
• Find out 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.</td>
<td>· Name an animal with an endoskeleton and an exoskeleton.
· What are tendons and what job do they perform?
· Name a hinge joint / ball and socket joint / pivot joint.
· What are the five main food groups and their role within our diet?
· How do animal diets change throughout the year?</td>
<td>In Year 4 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</td>
</tr>
</table>

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Engage lesson 2: Balanced and nutritious Engage lesson 4: Animal diets Develop lesson 4: Skeleton types	Engage lesson 3: Investigating fatty foods		Engage lesson 1: Asking questions Innovate: Asking and answering questions	Engage lesson 2: Balanced and nutritious Innovate: Asking and answering questions

<table>
<tr><th colspan="3">Year 3 – Forces and Magnets</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th>Vocabulary</th></tr>
<tr>
<td>
• 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.
</td>
<td>
• A force is simply a push or a pull that makes something move. Forces act in pairs that oppose each other. Forces cause objects to move, change their speed or change their shape.
• Contact forces happen when two objects or bodies physically touch each other. Frictional forces are a type of contact force.
• Friction is a force between two surfaces as they move across each other. Friction acts in the opposite direction to the movement. Friction always slows down a moving object. It also produces heat.
• Non-contact forces exert a push or a pull but have no direct contact with the objects they affect. We cannot see non-contact forces, but we can feel them. Magnetic forces are a type of non-contact force.
• The Earth acts like a huge bar magnet. It is surrounded by an invisible magnetic field called the magnetosphere. Without the magnetosphere, nothing could live on Earth. The magnetosphere is responsible for creating lights in the sky called aurora and also makes navigational compasses work.
</td>
<td>
Alloy, atmosphere, attract, attraction, aurora, bar chart, cobalt, compass, contact force, ferrofluid, ferrous, force, force meter, friction, iron, iron filings, lubricant, magnet, magnetic, magnetic field, magnetic force, magnetise, magnetism, magnetite, magnetosphere, newton, nickel, non-contact force, north pole, outer core, pull, push, repel, repulsion, solar wind, south pole, steel, surface, tread pattern.
<table>
<tr><th>Key Scientists</th><th>Possible Texts</th></tr>
<tr>
<td>William Gilbert
(Theories on Magnetism)
Andre Marie Ampere
(Founder of Electro-Magnetism)
Inge Lehmann
(Seismologist)</td>
<td>The Iron Man (Ted Hughes)
Mrs Armitage: Queen of the Road (Quentin Blake)
Mr Archimedes' Bath (Pamela Allen)</td>
</tr>
</table>
</td>
</tr>
<tr><th>Prior Learning</th><th>Key Question(s):</th><th>Future Learning</th></tr>
<tr>
<td>
In Year 2 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.
</td>
<td>
· What units do we use to measure forces and what equipment would you use?
· How would you increase the frictional force?
· What are the two ends of a magnet called?
· What are materials called that are attracted to the magnet?
· What does repulsion mean?
</td>
<td>
In Year 5 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
• Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
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</tr>
</table>

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lessons 4a/4b: Measuring and recording frictional forces Innovate: Observing, measuring and recording	Develop lesson 4: Grouping and sorting magnetic materials Introductory knowledge: What is a force?		Engage lessons 4a/4b: Measuring and recording frictional forces Innovate: Observing, measuring and recording Develop lesson 2: Exploring magnets	Develop lesson 6: Uses of magnets and friction	Engage lessons 4a/4b: Measuring and recording frictional forces

Year 3 – Plant Nutrition and Reproduction

National Curriculum Objectives

- 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.

Sticky Knowledge

- Leaves have two main functions. They make food for the plant through a process called photosynthesis. They also lose water from their underside in a process called transpiration.
- Flowers have one main function. Following reproduction, they make seeds that can grow into new plants.
- There are four stages in the life cycle of a plant: seed, seedling, young plant, mature plant.
- Seeds are moved away from the parent plant so that new plants do not have to compete for sunlight and water. This process is called seed dispersal. Seeds are dispersed in different ways.
- Roots have two main functions. They anchor the plant securely in the ground and take in water and nutrients from the growing medium, such as soil. There are two main types of root systems: taproots and fibrous roots.

Vocabulary

Anchor, anther, blade, bud, carbon dioxide, carpel, epiphyte, fibrous root system, filament, flower, fruit, germination, growth, lateral root, leaf, life cycle, nectar, nutrient, offspring, petal, phloem, photosynthesis, pollen, pollination, pollinator, pore, reproduction, root, seed, seed dispersal, seedling, sepal, stalk, stamen, stem, taproot system, transpiration, vascular plant, vein, vessel, xylem.

Key Scientists	Possible Texts
Jan Ingenhousz (Photosynthesis) **Joseph Banks** (Botanist) **Tim Smit** (Botanist) **Nicholas Grimshaw** (Architect)	**The Hidden Forest** (Jeannie Baker) **George and Flora's Secret Garden** (Jo Elworthy)

Prior Learning

In Year 2 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.

Key Question(s):

- How does the structure of the leaf support it's functions?
- What are the functions of the stamen, petal, carpel, sepal?
- What are the four stages in the life cycle of a plant?
- What are the four main ways of seed dispersal?
- Describe the two types of roots and functions.

Future Learning

In Year 6 Children will:

- Recognise that living things have changed over time and that fossils provide information about living things
- 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 can lead to evolution.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lessons 2a/2b: Focus on stems Engage lessons 3a/3b: Investigating plant vessels Engage lesson 4: Focus on leaves Innovate: Planning and carrying out	Develop lesson 2: Flower anatomy Develop lesson 4: Seeds and seed dispersal	Engage lessons 2a/2b: Focus on stems Engage lessons 3a/3b: Investigating plant vessels Innovate: Planning and carrying out	Engage lesson 4: Focus on leaves Develop lesson 2: Flower anatomy	Develop lesson 3: Pollination	Innovate: Planning and carrying out

<table>
<tr><th colspan="4">Year 3 – Light and Shadows</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="3">• Recognise that they need light in order to see things and that dark is the absence of light.
• Notice that light is reflected from surfaces.
• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
• Recognise that shadows are formed when the light from a light source is blocked by a solid object.
• Find patterns in the way that the sizes of shadows change.</td>
<td rowspan="3">• Light is a form of energy that travels in straight lines. The Sun is the main natural source of light on Earth. Darkness, like at night time, is the absence of light. Light from the Sun is vital for life on Earth. Plants need light to grow and survive. Light from the Sun creates daytime and provides heat that is essential for all living things. Without the Sun's light, no plants or animals could live on Earth.
• A reflector is an object that reflects light from a light source. Light is not produced by a reflector. The light from a light source hits and then bounces off a reflector's surface. When this happens, the reflector appears to be lit up. Water is an example of a reflector. Reflectors can be natural or artificial. Animals' eyes and the Moon are examples of natural reflectors. Reflective clothing or a bike reflector are examples of artificial reflectors.
• A shadow is an area of darkness. A shadow is made when an object blocks the passage of light from a light source. An object's shadow always forms on the side opposite the light source. The shape of a shadow is the same as the object that created it because light travels in straight lines.
• The Sun gives out harmful light rays called ultraviolet (UV) light that damage our skin and eyes. UV light is invisible. It ages our skin, causes sunburn and increases the risk of skin cancer. There are five ways people can protect themselves from UV light.
• Opaque objects, such as wooden or stone blocks, cast dark shadows. Translucent objects, such as frosted glass or tracing paper, cast light, blurry shadows. Transparent objects, such as glass or water, cast very light shadows.</td>
<td colspan="2">Artificial, block, darkness, light, light source, mirror, Moon, natural, opaque, ray, reflect, reflective, reflector, shadow, shiny, Sun, sun cream, sun protection factor (SPF), translucent, transparent, ultraviolet (UV) light.</td>
</tr>
<tr>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td>James Clerk Maxwell
(Visible and Invisible Waves of Light)
Marie Curie
(Inventor of X-Ray)</td>
<td>The Owl Who Was Afraid of the Dark (Jill Tomlinson)
The Dark (Lemony Snicket)
The Firework-Maker's Daughter (Philip Pullman)</td>
</tr>
</table>

Prior Learning	Key Question(s):	Future Learning
In Year 1 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.	• Draw a diagram to show how light travels to the eyes from a light source and how light travels to the eye via a reflective surface. • What are two natural light sources and two artificial light sources? • What are the five ways that people can protect themselves from UV light? • What are the two natural reflectors, two artificial reflectors and two non-reflective materials? • What is the definition of a shadow?	In Year 6 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lesson 1: Exploring Light Engage lesson 5: Investigating Sun safety Innovate: Reporting and concluding	Engage lesson 2: Identify and classify Engage lesson 3: Investigating reflective materials	Engage lesson 1: Exploring Light Engage lesson 5: Investigating Sun safety Innovate: Reporting and concluding	Engage lesson 3: Investigating reflective materials Develop lesson 2: Opaque, transparent and translucent Develop lesson 3: Observing changes in shadows Innovate: Reporting and concluding	Develop lesson 4: Research about light, reflectors and shadows	Engage lesson 3: Investigating reflective materials

<table>
<tr><th colspan="3">Year 4 – Food and the Digestive System</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td>• 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</td>
<td>• Digestion is the process where food is broken down into small particles that can be absorbed by the body. The digestive organs all work together to digest food. There are five main parts: mouth, oesophagus, stomach, small intestine, large intestine.
• Human teeth begin to grow when a baby is around six months old and continue growing until a child has 20 teeth. These are called primary teeth. These begin to fall out at around six years old and 32 permanent teeth then grow. There are four types of teeth: incisors, canine, premolars, molars.
• A food chain is a diagram that shows how food energy is transferred from one living thing to another. Food chains start with a producer that makes its own food. Primary consumers are herbivores that eat the producers. Secondary consumers can be carnivores or omnivores that feed on primary consumers and producers. Tertiary consumers at the end of the food chain mainly feed on the secondary and primary consumers. They are called apex predators.
• All the different food chains in a specific ecosystem can be linked together to make a food web. Food webs show how different plants and animals in an ecosystem are connected through their interdependence.
• An ecosystem is a community of living organisms and their environments that interact with each other, such as a rainforest, desert or ocean. Ecosystems have biotic, or living, features including plants, animals and microorganisms. They also have abiotic, or non-living, features, such as sunlight, water, air, soil and temperature. All living things depend on the biotic and abiotic features of their ecosystems to survive. This is called interdependence.</td>
<td colspan="2">Abiotic, anus, apex predator, bacteria, biotic, canine, carbohydrate, carnivore, consumer, crown, cusp, dentine, digestion, digestive acid, digestive enzyme, digestive organ, digestive system, ecosystem, excretion, faeces, fluoride, food chain, food energy, food web, frugivore, herbivore, incisor, insectivore, interdependence, large intestine, mandible, maxilla, microorganism, molar, mouth, nutrient, oesophagus, omnivore, oral hygiene, organism, permanent teeth, photosynthesis, piscivore, plaque, predator, premolar, prey, primary consumer, primary teeth, producer, protein, pulp, rectum, root canal, saliva, secondary consumer, stomach, small intestine, tertiary consumer, tongue, tooth, tooth enamel, vitamin.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ivan Pavlov (Digestive System Mechanisms)
Joseph Lister (Discovered Antiseptics)
Gerald Durrell (Conservationist)</td>
<td>Human Body Odyssey (Werner Holzwarth)
Crocodiles Don't Brush Their Teeth (Colin Fancy)
Wolves (Emily Gravett)</td>
</tr>
</table>

Prior Learning	Key Question(s):	Future Learning
In Year 3 children should: • Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. • Know how nutrients, water and oxygen are transported within animals and humans. • Know about the importance of a nutritious, balanced diet. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	· What does a food chain show and what are the different parts? How does a food chain create a food web? · What are the abiotic and biotic features of an ecosystem? · How do animal teeth reflect their diet? · Name the main parts of the digestion system and their specific roles within the system. · Describe the structure of a tooth and the specific features.	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

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Innovate: Planning and carrying out	Develop lesson 1: Purpose and parts Develop lesson 2: Teeth types	Innovate: Planning and carrying out		Engage lesson 1: Ecosystems Develop lesson 3: Healthy teeth	Innovate: Planning and carrying out

<table>
<tr><th colspan="4">Year 4 – Sound</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr><td rowspan="3">• 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.</td><td rowspan="3">• Sound is energy produced by vibrations from a sound source. Sound travels in waves through a medium, such as a solid, liquid or gas, to our ears. Most of the sound waves we hear travel through air, which is a gas. Where there is no medium for sound waves to travel through, such as in space, there is no sound.
• The volume of a sound is how loud it is. It is measured in units called decibels (dB). Energy affects volume. The larger the force of energy put into the sound source, the louder the volume; the smaller the force, the quieter the volume. Distance also affects volume. The nearer the sound source, the louder the volume. The further away the sound source, the quieter the volume.
• The pitch of a sound is how high or low it is. Pitch is measured in units called hertz (Hz). Humans can hear between 20 and 20,000 Hz but dogs can hear higher-pitched sounds. Fast vibrations produce high-pitched sounds, such as the sound of a whistle. Slow vibrations produce low-pitched sounds, such as the sound of a bass drum.
• Sound waves can be represented by a wavy line in a sound wave diagram. Volume is represented by the size of the peaks and troughs; large peaks and troughs represent a loud volume and small peaks and troughs represent a quiet volume. Pitch is represented by the distance between each peak, called the wavelength. A long wavelength represents a low-pitched sound, and a short wavelength represents a high-pitched sound.
• Being exposed to very loud or continuous sounds can damage hearing. It can also lead to increased stress, tiredness and health problems. Materials that muffle sound absorb a lot of sound energy and reduce the volume of sound reaching our ears. Earplugs, ear defenders and soundproofing materials all muffle sound.</td><td colspan="2">Air, brass instrument, cochlea, cochlear nerve, decibel (dB), ear, ear canal, eardrum, gas, hearing, hertz (Hz), inner ear, medium, muffle, musical instrument, liquid, ossicles, particle, percussion, pinna, pitch, solid, sound, sound source, sound wave, stringed instrument, vibrate, volume, wavelength, woodwind instrument.</td></tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr><td>Aristotle
(Sound Waves)
Gailileo Galilei
(Frequency and Pitch of Sound Waves)
Alexander Graham Bell
(Invented the Telephone)
James West & Gerhard M Sessler
(Microphone)</td><td>Horrid Henry Rocks (Francesca Simon)
Moonbird (Joyce Dunbar)
The Pied Piper of Hamelin
(Natalia Vasquez)</td></tr>
</table>

Prior Learning	Key Question(s):	Future Learning
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.	· Explain how we hear sound. · What kind of sound does fast vibrations produce? What kind of sound does slow vibrations produce? · What are the ossicles? · Why is there no sound in space? · Draw and label a representation of a soundwave.	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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 1: Muffling sounds Develop lesson 2: Volume and distance investigation Develop lesson 3: Changing the volume of sounds Innovate: Planning and carrying out			Engage lesson 1: Exploring sound Engage lesson 2: How does sound travel? Develop lesson 1: Muffling sounds. Develop lesson 2: Volume and distance investigation. Develop lesson 3: Changing the volume of sounds. Develop lesson 4: Changing the pitch of sounds	Engage lesson 3: How do we hear sounds?	Develop lesson 1: Muffling sounds

<table>
<tr><th colspan="4">Year 4 – States of Matter</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr><td rowspan="3">• 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.
• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</td><td rowspan="3">• Most matter exists in one of three states: solid, liquid or gas. Each state of matter has its own properties. Water exists in three states on Earth: solid ice, liquid water or gaseous water vapour.
• In a solid, the particles are close together, arranged in a regular pattern and cannot move around each other. This arrangement means that solids keep their shape, always take up the same amount of space and cannot be compressed.
• In a liquid, the particles are close together but arranged randomly, which means they can move around each other. This arrangement means that liquids can flow, take the shape of the container and cannot be compressed.
• In a gas, the particles are far apart, randomly arranged and can freely move. This arrangement means that gases have no fixed shape, fill any container and can be compressed.
• Materials can exist as solids, liquids or gases. However, some materials change state when heat is added or removed. The processes involved in changing state are melting, freezing, evaporation and condensation. These changes are reversible. When solid water (ice) is heated to 0°C, it begins to melt. This is called its melting point. When liquid water is heated to 100°C, it begins to evaporate. This is called its boiling point. Different materials have different melting and boiling points. For example, solid gold melts at 1063°C and liquid argon evaporates at -189°C.</td><td colspan="2">Boiling point, compress, condensation, condense, condensing point, cool, degrees Celsius, evaporate, evaporation, foam, freeze, freezing, freezing point, gas, gel, heat, ice, liquid, material, matter, melt, melting, melting point, particle, powder, process, property, reversible, solid, state of matter, steam, temperature, thermometer, viscous, water vapour.</td></tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr><td>Anders Celsius
(Celsius Temperature Scale)
Daniel Fahrenheit
(Fahrenheit Temperature Scale / Invention of the Thermometer)
Antoine Lavoisier & Joseph Priestley
(Oxygen)
Lord Kelvin
(Absolute zero)</td><td>Once Upon a Raindrop: The Story of Water (James Carter)
Sticks (Diane Alber)</td></tr>
</table>

Prior Learning	Key Question(s):	Future Learning
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.	· What processes are involved in heating? What processes are involved in cooling? · Explain particle theory for solids, give examples of their properties and some examples of solid matter. · Explain particle theory for liquids, give examples of their properties and some examples of liquid matter. · Explain particle theory for gases, give examples of their properties and some examples of gaseous matter. · What does reversible mean in terms of changing states?	In Year 5 children will: • Compare and group together everyday materials based on 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 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Innovate: Observing, measuring and recording	Introductory knowledge: Solids, liquids and gases Engage lesson 1: Classifying solids, liquids and gases	Innovate: Observing, measuring and recording	Develop lessons 3a/3b: Observing, measuring and recording changes over time Develop lesson 4: Melting and boiling points	Develop lesson 4: Melting and boiling points	

<table>
<tr><th colspan="4">Year 4 – Grouping and Classifying</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="3">• 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.</td>
<td rowspan="3">• Classification is the arrangement of living and non-living things into groups or categories. It involves breaking down a large group into smaller groups based on their observable features. There are three types of classification: single-stage classification, multi-stage classification and serial ordering. Single-stage classification involves separating a large group of objects into smaller groups based on a single property, such as size.
• Multi-stage classification involves asking repeated questions about specific properties, to sort groups into subgroups again and again until all the objects in one group are the same.
• Serial ordering involves sorting objects into an order based on a property. For example, these socks can be sorted according to size, with the smallest at one end, leading to the largest at the other end.
• Scientists use classification to put living things into groups. The science of classifying and naming living things is called taxonomy. Classification helps scientists identify and study living things and understand the origins and evolution of a species. New living things are still being discovered today. Classification keys use multi-stage classification to identify living things. They work by observing a living thing then answering the yes or no questions until it is identified. For example, we can identify the animal below by answering the questions in the classification key.
• Scientists divide all living things into five kingdoms. These include the animal kingdom and the plant kingdom. All animals in the animal kingdom are classified as either invertebrates or vertebrates. Invertebrates do not have backbones. Instead, they have soft bodies or a hard outer shell or exoskeleton. They are further classified into three groups: annelid, mollusc and arthropod. Arachnid, crustacean, insect and myriapod are four types of arthropod. Vertebrates have</td>
<td colspan="2">Amphibian, animal kingdom, annelid, arachnid, arthropod, bird, classification, classification key, common name, cone-bearing plant, crustacean, evolution, exoskeleton, fish, flowering plant, insect, invertebrate, mammal, mollusc, myriapod, non-vascular plant, observable feature, plant kingdom, reptile, scientific name, seed, segmented, shell, species, spore, spore-producing plant, taxonomy, vascular plant, vertebrate.</td>
</tr>
<tr>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td>Cindy Looy
(Environmental Change and Extinction)
Jaques Cousteau
(Marine Biologist)
Gerald Durrell
(Conservationist)</td>
<td>The Vanishing Rainforest
(Richard Platt)
The Morning I Met a Whale
(Michael Morpurgo)
Journey to the River Sea (Eva Ibbotson)</td>
</tr>
</table>

	backbones. They are covered with skin, feathers, scales, fur or hair. Vertebrates are further classified into five groups: amphibian, bird, fish, mammal, reptile. Plants are important for life on Earth. All plants in the plant kingdom are classified as either vascular or non-vascular. Vascular plants are further classified into three groups: plants with seeds flowering, plants with seeds cone-bearing, plants with spores.		
Prior Learning	**Key Question(s):**	**Future Learning**	
In Year 2, 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.	• How would you classify a tiger? • How would you classify a crab? • What does vascular mean? • What is the science of classifying and naming living things called? • What are the three types of classification?	In Year 5: • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. • Describe the life process of reproduction in some plants and animals.	

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
	Introductory knowledge: What is classification? Engage lesson 1: Guess who? Engage lesson 2: Understanding classification keys Engage lesson 3: Creating classification keys Develop lesson 1: Animal kingdom Develop lesson 2: Sorting vertebrates Develop lesson 3: Sorting invertebrates Develop lesson 4: Plant kingdom Develop lesson 5: Plant kingdom classification keys Innovate: Reporting and concluding			Innovate: Reporting and concluding	Innovate: Reporting and concluding

<table>
<tr><th colspan="4">Year 4 – Electrical Circuits and Conductors</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="3">• 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.</td>
<td rowspan="3">• Electricity is a form of energy used to power many everyday items, such as kettles and mobile phones. It is essential to our daily lives. Lighting buildings, watching television, using computers, cooking meals and keeping in touch with family and friends all rely on electricity.
• Electricity comes from two sources, mains electricity and cells. Mains electricity is used when we turn on a light switch or plug an electrical appliance into a socket. Cells contain chemicals that create electrical energy. They are usually used to power small, portable devices, such as torches. A battery is made of two or more cells.
• All electrical items are made up of components, which make them work. Components have different jobs. A cell and battery provide electrical power. A wire connects different components and conducts electric current. A lamp emits light. A switch makes or breaks a circuit. A buzzer makes a sound. A motor creates movement.
• A circuit is a collection of components connected by wires through which an electric current can flow. If a circuit forms a complete loop with a single path for electric current to flow, it is called a series circuit. When an electric current flows through all the components of a circuit, it is called a complete circuit. A complete circuit has no gaps and can make a lamp light up, a buzzer sound or a motor move.
• Electrical conductivity is a measure of a material's ability to allow an electric current to pass through it. Materials that allow an electric current to pass through them are conductive. They have low resistance. Materials that do not allow an electric current to pass through them are non-conductive. They have high resistance. Many non-conductive materials, such as plastic, are used as electrical insulators.</td>
<td colspan="2">3-core flexible cable, appliance, battery, battery holder, brass, buzzer, cartridge fuse, cell, circuit, coding, complete circuit, component, conductive, conductor, copper, core, crocodile clip, earth wire, electrical conductivity, electric current, electric shock, electricity, filament, incandescent light bulb, incomplete circuit, insulator, lamp, light bulb, light-emitting diode (LED), live wire, mains electricity, material, micro:bit, motor, neutral wire, non-conductive, power station, programmable, push-to-break switch, push-to-make switch, pylon, rechargeable, reed switch, resistance, rocker switch, sensor, series circuit, socket, source, switch, three-pin plug, toggle switch, tungsten, wire.</td>
</tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr>
<td>Thomas Edison
(First Working Lightbulb)
Joseph Swan
(Incandescent Light Bulb)
Lewis Howard Latimer
(Carbon filament)
Maria Telkes
(Solar power)</td>
<td>Until I Met Dudley (Roger McGough)
Oscar and the Bird: A Book about Electricity (Geoff Waring)
Electrical Wizard: How Nikola Tesla Lit Up the World (Elizabeth Rusch)</td>
</tr>
</table>

Prior Learning	Key Question(s):	Future Learning
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.	· Which metals are the best conductors of electricity? · Draw a complete circuit. · What does electrical conductivity mean? · Why is plastic used as an electrical insulator? · What does resistance mean?	In Year 6 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lesson 2: Making series circuits Develop 1, lesson 2: Investigating conductive and non-conductive materials	Introductory knowledge: Exploring electricity Develop 1, lesson 4: Understanding plugs Develop 2, lesson 1: Programmable technologies			Develop 1, lesson 5: Researching incandescent light bulbs	Engage lesson 3: Fixing circuits Develop 1, lesson 2: Investigating conductive and non-conductive materials Develop 2, lesson 3: Programming traffic lights Innovate: Designing and making a nightlight

<table>
<tr><th colspan="4">Year 5 – Forces and Mechanisms</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="2">
• 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.
</td>
<td rowspan="2">
• A force is a push or a pull that makes something move, change speed or change shape. Forces act in pairs that oppose each other. A force can be either a contact force or a non-contact force. A contact force is a force that acts between two objects that touch. Contact forces include: friction, air resistance, water resistance. A non-contact force acts between two objects that do not touch. Non-contact forces include: magnetism, gravitational force.
• Air resistance is a type of friction that always acts against the direction of movement. It is caused by air particles hitting an object and slowing it down. Objects with a large surface area will hit more particles, and therefore have more air resistance, than objects with a smaller surface area. Water resistance is another type of friction that always acts against the direction of movement. It is caused by water particles hitting an object and slowing it down. Objects with a large surface area will hit more particles, and therefore have more water resistance, than objects with a smaller surface area.
• Mass is the amount of matter that an object or substance contains. It can never be zero and is the same wherever it is, even in space. Mass is measured in grams (g) or kilograms (kg) using a scale or the kg scale on a force meter. Weight is a measure of gravitational force. The weight of an object can vary depending on where it is. Weight is measured in newtons (N) using a force meter.
• Levers are simple machines that can be used to provide a mechanical advantage, so a smaller force can have a greater effect. They consist of a lever arm, a fulcrum, a load to lift and an effort force. Levers make it easier to lift a load.
• Pulleys are simple machines that can be used to provide a mechanical advantage. They consist of one or more grooved wheels and a rope. Pulleys make it easier to lift a load.
</td>
<td colspan="2">Aerodynamic, air resistance, contact force, drag, force, force meter, friction, fulcrum, gear, gravitational force, gravity, lever, lubricant, machine, magnetism, mass, mechanical advantage, mechanism, newton, non-contact force, particle, pull, pulley, push, streamline, surface area, water resistance, weight.</td>
</tr>
<tr>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td>Galileo Galilei
(Gravity and Acceleration)
Isaac Newton
(Gravitation)
Archimedes of Syracuse
(Levers)
John Walker
(The Match)</td>
<td>The Enormous Turnip (Katie Daynes)
Leonardo's Dream (Hans de Beer)
The Aerodynamics of Biscuits (Clare Helen Welsh)</td>
</tr>
</table>

	• Gears are wheels with teeth around their edge. They can be connected directly together, so their teeth mesh and they turn in opposite directions. They can also be connected by a chain to turn in the same direction. Gears of different sizes with different numbers of teeth can create a mechanical advantage.		
Prior Learning	**Key Question(s):**	**Future Learning**	
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.	• What is a contact force, and can you name three? • What is a non-contact force, can you name two? • What is friction and how can it increased and decreased? • How can you increase and decrease water resistance? • What is the difference between a gear, pulley and lever? What are their functions? How can they be affected?	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.	

Comparative tests	**Identify & Classify**	**Observation over time**	**Pattern Seeking**	**Research**	**Problem Solving**
Engage lesson 1: Gravity Develop 1, lesson 1: Friction Develop 1, lesson 2: Air resistance Develop 1, lesson 3: Water resistance Develop 2, lesson 1: Levers Develop 2, lesson 2: Pulleys Innovate: Observing, measuring and recording			Engage lesson 2: Mass and weight Develop 1, lesson 1: Friction Develop 1, lesson 2: Air resistance Develop 1, lesson 3: Water resistance Develop 2, lesson 2: Pulleys	Engage lesson 3: Discovery Develop 2, lesson 4: Researching forces and mechanisms Innovate: Observing, measuring and recording	Develop 1, lesson 1: Friction Develop 1, lesson 2: Air resistance Develop 1, lesson 3: Water resistance Develop 2, lesson 1: Levers Develop 2, lesson 2: Pulleys Develop 2, lesson 3: Gears Develop 2, lesson 4: Researching forces and mechanisms Innovate: Observing, measuring and recording

<table>
<tr><th colspan="4">Year 5 – Earth and Space</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td>
• 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.
</td>
<td>
• The Solar System consists of eight planets that orbit around the Sun. The Sun is a 4.5 billion-year-old star. It is a huge, hot ball of gas that rotates on its axis once every 27 Earth days. The Sun is the only source of light and heat in the Solar System. Without it, life as we know it would not exist on Earth. There are eight planets in the Solar System. The planets closer to the Sun (Mercury, Venus, Earth and Mars) are terrestrial planets because they are made of rock. They are hotter and have a shorter orbit and a shorter year than the planets farther away. Planets that are farther from the Sun (Jupiter, Saturn, Uranus and Neptune) are made of gas and are called gas giants. They are colder and have a larger orbit and a longer year than the closer planets.
• The Earth is the third planet from the Sun in the Solar System and is the only one to support life. The Earth rotates on an axis at a tilt of 23.5°. One rotation takes 24 hours, which is one day. The Earth orbits the Sun once every 365.25 days, which is a year.
• Geocentric model - In the past, many philosophers and scientists believed the Solar System was geocentric, meaning that the Earth was at the centre, orbited by the Sun and the other planets. The observations and common sense of Aristotle, the mathematics of Ptolemy and the scientific methods of Alhazen supported this theory. The geocentric model was accepted for 1500 years. Heliocentric model - In the 16th century, Nicolaus Copernicus suggested the heliocentric model, with the Sun at the centre of the Solar System and the Earth and other planets orbiting around it. Even though this was an unpopular theory at the time, the observations of Galileo Galilei and the scientific laws of Sir Isaac Newton proved that the heliocentric model was correct.
• As the Earth rotates, it is daytime in the places that face towards the Sun, and night time in the
</td>
<td colspan="2">
Atmosphere, axis, block, constellation, daytime, dwarf planet, Earth, first quarter Moon, full Moon, galaxy, gas giant, geocentric model, Goldilocks planet, gravitational force, heliocentric model, horizon, Jupiter, last quarter Moon, lunar, lunar eclipse, Mars, mass, matter, Mercury, Milky Way Galaxy, moon, the Moon, Neptune, new Moon, night time, Northern Hemisphere, orbit, partial lunar eclipse, partial solar eclipse, penumbra, phases of the Moon, planet, Pluto, rotate, satellite, Saturn, Season, shadow, solar, solar eclipse, Southern Hemisphere, space, spacecraft, star, Sun, sundial, sunrise, sunset, terrestrial, the Solar System, total lunar eclipse, total solar eclipse, umbra, universe, Uranus, Venus, waning crescent Moon, waning gibbous Moon, wane, waxing crescent Moon, waxing gibbous Moon, wax, year.
</td>
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<tr>
<td></td>
<td></td>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>
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)
Neil deGrasse Tyson
(Planetary Scientist)
Margaret Hamiliton
NASA Scientist
</td>
<td>
The Skies Above My Eyes (Charlotte Guillain & Yuval Zommer)
George's Secret Key to the Universe (Lucy and Stephen Hawking with Christophe Galfard)
The Way Back Home (Oliver Jeffers)
</td>
</tr>
</table>

	places that face away from the Sun. During the day, the Sun appears to rise in the east, move across the sky in an arc and set in the west. However, this is due to the Earth rotating and not the Sun moving. The changing angle of the sunlight during the day changes the direction and length of shadows cast by objects on Earth. • The tilt of the Earth on its axis, its daily rotation and its yearly orbit also create different day lengths and seasons. When the Northern Hemisphere is tilted away from the Sun, it gets little direct sunlight, so daytime is short, night time is long, and the weather is cold. In the Arctic Circle, it never gets light. At the same time, when the Southern Hemisphere is tilted towards the Sun, it gets a lot of direct sunlight. Daytime is long, night time is short, and the weather is warm. In Antarctica, it is always light. As the Earth continues its orbit, the seasons change throughout the year. During Earth's orbit, countries in the tropics that are on or near the equator have the same amount of direct sunlight all year round.		
Prior Learning	**Key Question(s):**	**Future Learning**	
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	• Which model of the solar system do we use? • Name the planets, in the correct order and their properties. • How does the Earth's orbit affect the weather? • When the Northern Hemisphere is tilted away from the Sun, what happens to the sunlight, daylight hours and the weather? • What is the difference between a solar and a lunar eclipse?	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	

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
		Develop 1, lesson 2: Sundials	Develop 1, lesson 2: Sundials	Engage lesson 1: How do we know that the Sun is at the centre of the Solar System? Develop 1, lesson 4: Times of day around the world Develop 2, lesson 2: Lunar and solar eclipses Innovate: Research	

<table>
<tr><th colspan="4">Year 5 – Human Reproduction and Ageing</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="3">• 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.</td>
<td rowspan="3">• A life cycle is a series of changes that happen to a living thing during its lifespan. The events happen in a set order as the animal or plant grows and develops. A life cycle is presented on a circular diagram to show the main developmental stages of a plant or animal's life and the processes between these stages. All living things eventually die, but reproduction starts the life cycle again. Human life cycle – embryo, juvenile, adolescent, adult.
• Mammals are a group of vertebrate animals, which means they have a backbone. Mammals have several characteristics that make them different from other vertebrates. These include: producing milk to feed their young, being warm blooded, giving birth to live young, having fur or hair, breathing air with lungs. There are four stages (embryo, juvenile (calf), adolescent, adult) and four processes (birth, growth, puberty, reproduction) in the mammalian life cycle.
• The stages of human gestation can be plotted on a timeline for important growth and physical changes for the embryo.
• Puberty is when a child's body changes as they develop into an adult and become able to reproduce. Puberty can start at any time between the ages of 8 and 14 and takes around four years. Chemicals called hormones cause puberty to begin and create physical changes, such as developing acne, sweating more and growing underarm and pubic hair. Puberty also creates emotional changes, including mood swings, low self-esteem, aggression and depression.
• Sexual reproduction is the process of reproduction that involves one female and one male. When humans reproduce, a male sperm fertilises a female egg that has been</td>
<td colspan="2">Acne, adolescent, adult, ageing, aggression, amphibian, bird, birth, blastocyst, breasts, cell, deterioration, development, egg, embryo, emotion, fallopian tube, female, fertilisation, fish, foetus, gestation, growth, growth spurt, hormone, infant, insect, juvenile, larva, life cycle, lifespan, male, mammal, menopause, metamorphosis, mood swing, offspring, ovary, penis, period, preschool, process, puberty, pubic hair, pupa, reaction time, reproduction, reproductive organ, reproductive system, reptile, self-esteem, semen, sexual intercourse, sexually mature, sexual reproduction, sperm, stage, sweat, testicle, umbilical cord, urethra, uterus, vagina, vertebrate, warm blooded.</td>
</tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr><td>James Brodie (Reproduction of Plants by Spores)
David Attenborough (Naturalist)
Eva Crane (Physicist)</td><td>The Land of Neverbelieve (Norman Messenger)
Mummy Laid an Egg (Babette Cole)</td></tr>
</table>

	released from the ovary into the fallopian tube. The fertilised egg divides as it travels down the fallopian tube and becomes a ball of cells called a blastocyst. The blastocyst implants in the wall of the uterus and develops into an embryo.		
Prior Learning	**Key Question(s):**	**Future Learning**	
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.	· Name five physical changes that happen to girls during puberty. · Name five physical changes that happen to boys during puberty. · Describe the embryo at 16 weeks. · What causes puberty to begin? · Name five characteristics of mammals that make them different from other vertebrates.	In Year 6: • 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.	

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Innovate: Reporting and concluding	Engage lesson 1: Animal life cycles Engage lesson 2: Classifying mammals Develop lesson 3: Human adolescent stage		Engage lesson 4: Relationship between mammalian gestation and mass Develop lesson 2: Human juvenile stage Develop lesson 4: Human growth charts Innovate: Reporting and concluding	Engage lesson 4: Relationship between mammalian gestation and mass Develop lesson 2: Human juvenile stage Develop lesson 6: Human adult ageing	Innovate: Reporting and concluding

<table>
<tr><th colspan="3">Year 5 – Properties and Changes of Materials</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr><td rowspan="3">• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
• 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.</td><td rowspan="3">• Thermal conductivity is a measure of a material's ability to conduct heat. Materials can be thermally conductive or thermally non-conductive. Thermally conductive materials allow heat to pass through them. Thermally non-conductive materials do not allow heat to pass through them. Whether a material is thermally conductive or thermally non-conductive depends on its state of matter and how its particles are arranged. Solid metals are good thermal conductors because their particles are closely packed and they have strong, lattice metallic bonds. When heat is applied to a metal, the particles vibrate and the bonds transfer heat energy to adjacent particles. Other solids, such as plastic, wood and glass, do not have these strong metallic bonds so they do not conduct heat. They are thermal insulators. Liquids and gases are thermally non-conductive because their particles are far apart.
• Solubility is a measure of a material's ability to dissolve. When a material dissolves it disappears and becomes incorporated into another material. The material that dissolves is called the solute. The material it dissolves into is called the solvent. When the solute has dissolved in the solvent, it is known as a solution. A material that can dissolve is described as soluble. A material that cannot dissolve is described as insoluble.
• A mixture is a combination of two or more substances that aren't chemically joined and can be separated into their individual substances. There are two types of mixtures: heterogeneous and homogeneous. Heterogeneous mixtures consist of distinctly different substances. This means you can easily see the different parts and they are easy to separate. Soil is an example. It is a mixture of solid, decayed organic matter and eroded rock. Salad is an example. It is a mixture of different solid fruits and vegetables. Substances</td><td colspan="2">Absorbent, bendy, chemical change, condense, conductor, dissolve, electrically conductive, evaporate, filter, filtration, freeze, gas, hard, heterogeneous mixture, homogeneous mixture, innovative materials, insoluble, insulator, irreversible change, liquid, magnetic, material, melt, mixture, particle, physical change, property, reflective, reversible change, rough, rust, saturated solution, sieve, sieving, solid, solubility, soluble, solute, solution, solvent, stretchy, strong, temperature, thermally conductive, transparent, waterproof.</td></tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr><td>Spencer Silver, Arthur Fry and Alan Amron
(Post-It Notes)
Ruth Benerito
(Wrinkle-Free Cotton)
Stephanie Kwolek
(Kevlar)</td><td>Itch (Simon Mayo)
Kensuke's Kingdom (Michael Morpurgo)
The BFG (Roald Dahl)</td></tr>
</table>

	in homogeneous mixtures are evenly distributed and you cannot see the different parts. Homogeneous mixtures are difficult to separate. Coffee is an example. It is a mixture of solid coffee granules dissolved in liquid water. Steel is an example. It is a mixture of iron and carbon. • Heterogenous mixtures can be separated in different ways, including: classifying and grouping, sieving, filtration. Some homogeneous mixtures, such as seawater, can be separated into their different parts by evaporating. Evaporating involves heating a solution until the solvent changes states from a liquid to a gas. When all the solvent has evaporated, the solute is left behind. The solvent is usually lost during evaporation. Other techniques are used to separate homogeneous mixtures, such as air, metals and oil in water. For example, different gases in air can be separated using cooling. The separated gases can then be used in industries, such as hospitals and manufacturing. • There are two types of changes, reversible and irreversible changes. Reversible changes can be reversed or changed back to recover the original materials. They are physical changes, which means no new materials are formed, and recovered materials are the same, even if they look or feel different. Reversible changes happen between the three main states of matter: solids, liquids and gases. Melting, freezing, evaporation, condensation and dissolving are all reversible changes. Irreversible changes cannot be reversed or changed back to recover the original materials. They are chemical changes that form new materials. Several processes cause irreversible changes, including cooking, burning, rusting, decaying and chemical reactions. Signs of irreversible changes include the production of a gas, a sound, a smell or light. The temperature, colour and smell can also change.		

Prior Learning	Key Question(s):	Future Learning
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.	• What does solubility mean and give an example? • What is a heterogeneous mixture and give an example? • What is a homogeneous mixture and give an example? • What does thermal conduction mean and name a good thermal conductor? • Name an irreversible change.	In Year 6 children will: • Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Give reasons based on evidence from comparative and fair tests, for the 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

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lesson 1: Testing properties Engage lesson 2: Thermal conductivity Engage lesson 3: Measuring change in temperature Engage lessons 4a/4b: Testing thermal insulators Engage lesson 5: Solubility	Engage lesson 1: Testing properties Engage lesson 2: Thermal conductivity Engage lesson 5: Solubility Develop 1, lesson 1: Exploring mixtures - sieving Develop 2, lesson 1: Reversible and irreversible changes	Engage lesson 3: Measuring change in temperature Engage lessons 4a/4b: Testing thermal insulators Develop 1, lessons 2a/2b: Exploring mixtures - filtering Develop 1, lessons 3a/3b: Exploring mixtures - evaporating Develop 2, lesson 2: Irreversible changes Innovate: Planning and carrying out	Engage lesson 2: Thermal conductivity Engage lesson 3: Measuring change in temperature Engage lessons 4a/4b: Testing thermal insulators	Develop 1, lesson 4: Researching reversible mixtures Express: Innovative materials	Engage lesson 1: Testing properties Engage lessons 4a/4b: Testing thermal insulators Develop 1, lesson 1: Exploring mixtures - sieving Develop 1, lessons 2a/2b: Exploring mixtures - filtering Develop 1, lessons 3a/3b: Exploring mixtures - evaporating Innovate: Planning and carrying out

<table>
<tr><th colspan="4">Year 6 – Circulatory System</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td>• 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.</td>
<td>• The heart is a muscular organ that acts as a pump. It pumps blood around the body through the blood vessels. Deoxygenated blood enters the right atrium through the vena cava. It passes through a valve and into the right ventricle. From there, it is pumped through a valve into the pulmonary artery. The pulmonary artery carries the blood to the lungs, where it absorbs oxygen. The pulmonary veins carry the oxygenated blood back from the lungs to the left atrium. It passes through a valve to the left ventricle and is pumped out through a valve into the aorta. Then the blood travels to the rest of the body. The heart – vena cava, aorta, pulmonary artery, left atrium, right atrium, valve, left ventricle, right ventricle, septum, pulmonary vein.
• There are three types of blood vessels. Arteries carry oxygenated blood from the heart to the body. Capillaries connect arteries to the veins. They deliver oxygen and other nutrients to the body's tissues and carry deoxygenated blood and waste products to the veins. Veins move blood back to the heart, where it is pumped to the lungs and oxygenated.
• The main function of blood is to transport the things the body needs, such as oxygen, other nutrients, hormones, antibodies and heat, around the body. It also transports carbon dioxide and other waste products for excretion. Blood has four components: plasma, red blood cells, white blood cells and platelets.
• The pulse can be felt each time the arteries expand as blood is pumped through them from the heart. It is especially noticeable where the arteries are close to the skin's surface, such as at the wrist and neck. Heart rate is measured in beats per minute (bpm). The resting heart rate is the number of times your heart beats per minute when you are at rest. Heart rate increases during exercise.</td>
<td colspan="2">Aerobic exercise, antibody, aorta, artery, atrium, blood, blood pressure, blood vessel, bone marrow, capillary, carbohydrate, carbon dioxide, cell, cholesterol, circulatory system, clot, deoxygenate, digestive system, endocrine system, excretion, excretory system, haemoglobin, heart, heart rate, hormone, immune system, immunity, lumen, muscular system, nervous system, nutrient, organ, oxygen, oxygenate, oxygenated, plasma, platelet, processed food, protein, pulmonary artery, pulmonary vein, pulse rate, red blood cell, reproductive system, respiratory system, resting heart rate, saturated fat, septum, skeletal system, tissue, unsaturated fat, valve, vein, vena cava, ventricle, white blood cell.</td>
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<td></td>
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<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Justus von Liebig (Theories of Nutrition and Metabolism)
Sir Richard Doll (Linking Smoking and Health Problems)
Leonardo Da Vinci (Anatomy)
Libbie Hyman (Zoologist)
Marie Maynard Daly (Chemist)
Dr Daniel Hale Williams (Open heart surgery)</td>
<td>Pig-Heart Boy (Malorie Blackman)
Skellig (David Almond)
A Heart Pumping Adventure (Heather Manley)</td>
</tr>
</table>

	• Nutrition labels on pre-packaged foods tell us what each food contains. Nutrition labels are often displayed using a traffic light system, so consumers can easily see whether the food has high (red), medium (orange) or low (green) amounts of sugar, salt and saturated fat. It also gives other useful information.		
Prior Learning	**Key Question(s):**	**Future Learning**	
In Year 5 children should: • Describe the changes as humans develop to old age.	• What are the three different types of blood vessels, their roles and structures? • Label the different parts of a heart. • What are the four components of blood, their roles and structures? • Name five things that can have a harmful effect on the body. • How can we check that the food we are eating is healthy?	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.	

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop 1, lesson 2: Proving a hypothesis Develop 1, lesson 3: Heart rate investigation Innovate: Reporting and concluding	Engage lesson 2: Structure and function of the heart Develop 2, lesson 1: Classifying foods	Innovate: Reporting and concluding	Develop 1, lesson 1: Measuring heart rate Develop 1, lesson 2: Proving a hypothesis Innovate: Reporting and concluding	Engage lesson 1: Role of the circulatory system Engage lesson 3: The function of blood Develop 2, lesson 2: The effects of smoking, alcohol and drugs	Develop 1, lesson 1: Measuring heart rate Develop 1, lesson 3: Heart rate investigation Develop 2, lesson 1: Classifying foods

<table>
<tr><th colspan="3">Year 6 – Electrical Circuits and Components</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="2">• 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.</td>
<td rowspan="2">• A circuit is a collection of components connected by wires through which electricity can flow. If a circuit forms a loop with a single path for the current to take, it is called a series circuit. When electricity flows through all the components of a circuit, it is called a complete circuit. When electricity cannot flow through all the components of a circuit, it is called an incomplete circuit. Loose wires, damaged components and flat cells or batteries can all stop the flow of electricity around a circuit.
• Materials that allow electricity to flow through them are called conductors. Most metals are conductors. Materials that do not allow electricity to flow through them are called insulators.
• An electric current is the flow of electric charge through a circuit. For an electric current to flow, a circuit must be complete. The electric current flows from the cell through the components and back to the cell. In a circuit, the cell acts like a pump, pushing electric charge around the circuit. This pushing force can be measured using a voltmeter or multimeter. The pushing force is known as voltage, which is measured in volts (V). Cells have different names, such as AA, AAA and D. They are labelled with the voltage they supply to a circuit. For example, an AA cell is labelled with 1.5V. As cells are used, their voltage, or pushing force, decreases.
• Many devices, such as nightlights, burglar alarms and thermostats, use sensors to monitor environmental variables, such as light, movement or temperature. These devices are programmed to give a response by switching on or off if the environment changes. For example, some nightlights have sensors that cause them to switch off when light levels rise.
• Micro:bits are small, programmable computers with an LED display and sensors. Micro:bits can be programmed to respond to environmental</td>
<td colspan="2">Appliance, battery, battery holder, buzzer, cell, circuit, circuit diagram, coding, component, conductor, crocodile clip, data logger, electric current, electricity, environmental variable, insulator, lamp, light-emitting diode (LED), light meter, mains, micro:bit, motor, multimeter, sensor, series circuit, source, switch, symbol, terminal, volt, voltage, voltmeter, wire.</td>
</tr>
<tr>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alessandro Volta
(Electrical Battery)
Nicola Tesla
(Alternating Currents)</td>
<td>Goodnight Mister Tom (Michelle Magorian)
Blackout (John Rocco)
Hitler's Canary (Sandi Toksvig)</td>
</tr>
</table>

	variables and are used to make a wide variety of different devices.		

Prior Learning	Key Question(s):	Future Learning
In Year 4, 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. • Know the difference between a conductor and an insulator, giving examples of each. • Safety when using electricity.	• Draw a circuit diagram and include a cell, an open switch, a lamp and a buzzer. • What is a conductor and an insulator? • What is the pushing force and how is it measured? • How can the pushing force be decreased? • Name two ways in which a sensor can be used on a circuit.	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 • The idea of electric field, forces acting across the space between objects not in contact

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Engage lesson 3: Exploring circuit components Develop lesson 3: Investigating voltage	Introductory knowledge: Naming circuit components Engage lesson 1: Recognised circuit symbols		Develop lesson 1: Voltage and cells Develop lesson 3: Investigating voltage	Develop lesson 2: Researching batteries and cells	Engage lesson 3: Exploring circuit components Develop lesson 5: Sensors and monitoring

<table>
<tr><th colspan="4">Year 6 – Light Theory</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr><td rowspan="2">• 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.</td><td rowspan="2">• A light source is something that produces light. This can be a natural source, such as the Sun or a glow-worm, or an artificial source, such as a light bulb or candle. Most objects do not produce light. Instead, they either reflect, absorb or scatter the light given out by a light source. Light can also travel through transparent objects. Light is a form of energy that travels as waves in straight lines. In diagrams, light waves are drawn as straight lines with arrowheads that show the direction of travel. Light continues to travel when it is reflected off the surface of an object. When light hits a mirror, it reflects off the surface in a straight line. All mirrors reflect light at an angle equal to the angle of impact.
• For us to see any object, light must enter our eyes. Light rays can travel to our eyes directly from a light source, so we can see the light source. Light can also travel to our eyes after it has been scattered or reflected. Light rays reach the eye and travel through the cornea before entering the eye through the pupil. The lens focuses the light onto the back of the eye, called the retina. The retina turns this light information into electrical signals, which travel through the optic nerve to the brain, where the signals are 'seen' as an image. Without light, we cannot see.
• The electromagnetic spectrum shows all the different types of light, from gamma rays with waves that are close together, to radio waves with waves that are far apart. Visible, or white light is the only light the human eye can see and is only a small part of the electromagnetic spectrum. Visible light is made up of a continuous spectrum of different colours of light, from violet to red. All the colours of light mix together to create white light. The way objects reflect or absorb light determines their colour. Some objects reflect all the colours of light, so we see those as white. Other objects absorb some of the colours in white</td><td colspan="2">Absorb, afterimage, beam, concave, cone, convex, cornea, darkness, electromagnetic spectrum, iris, lens, light meter, light source, light wave, lux, opaque, optic nerve, optical fibre, perceive, plane mirror, prism, pupil, ray, reflect, reflector, refract, retina, rod, scatter, shadow, spectrum, translucent, transparent, ultraviolet (UV) light, visible light, wavelength, white light.</td></tr>
<tr><td>Key Scientists</td><td>Possible Texts</td></tr>
<tr><td></td><td></td><td>Thomas Young
(Wave Theory of Light)
Ibn al-Haytham (Alhazen)
(Light and our Eyes)
Percy Shaw
(The Cats Eye)</td><td>Letters from the Lighthouse
(Emma Carroll)
The Gruffalo's Child (Julia Donaldson)
The King Who Banned the Dark
(Emily Haworth-Booth)</td></tr>
</table>

	light, but some colours are reflected. We see these objects as the coloured light that is reflected. Black objects absorb all the colours of white light. • Light enters our eyes through the pupil and is focused onto light-sensitive cells called rods and cones that cover the retina at the back of the eye. Rods help us to see light and dark and cones help us to see different colours. Once the cone cells have been stimulated, a signal is sent to the brain through the optic nerve. The brain interprets the signal as a particular colour, giving us colour vision. Red, green and blue are the primary colours of light. When the red and green cones in our eyes are stimulated, we perceive a yellow colour. When the blue and green cones are stimulated, we perceive a cyan colour. When the red and blue cones are stimulated, we perceive a magenta colour. If the red, green and blue cones are all stimulated, we see white. • There are three main types of mirror: plane, concave and convex. A plane mirror has a flat reflective surface, so perpendicular light rays are reflected back along the same path. This means the reflected image is the same size and the same way up as the object, but the image is reversed. The surface of a concave mirror curves inwards, so light rays are reflected inwards to a focal point. Images appear larger and brighter in a concave mirror, but they reflect a narrower view. Dental mirrors and torches use concave mirrors. The surface of a convex mirror curves outwards, so light rays are reflected outwards and dispersed. Convex mirrors make images smaller, but they reflect a wider view. Shop security mirrors and car wing mirrors are convex.		
Prior Learning	**Key Question(s):**	**Future Learning**	
In Year 3 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.	· How are rainbows created? · What is the difference between a concave and convex mirror? · Label the different parts of the eye. · Draw four diagrams to show reflected light, scattered light, absorbed light, and transmitted light.	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	

• 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.	· What are the primary colours of light and how do we perceive colours of light?	• 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 3: Measuring light Innovate: Planning and carrying out		Develop lesson 2: Reflections Develop lesson 4: Refraction	Engage lesson 4: Colour perception Develop lesson 1: Shadows Develop lesson 3: Measuring light Innovate: Planning and carrying out	Engage lesson 2: How do we see? Develop lesson 4: Refraction	Develop lesson 2: Reflections Innovate: Planning and carrying out

<table>
<tr><th colspan="4">Year 6 – Evolution and Inheritance</th></tr>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td rowspan="2">• 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</td>
<td rowspan="2">• Grouping living things based on their characteristics is called classification. The first classification system developed by the Swedish scientist Carl Linnaeus (1707–1778) divided all living things into two kingdoms, animals and plants. Today, scientists classify all living things into five kingdoms. The members of each kingdom have specific features in common.
• A microorganism is a living thing. It is too small to be seen without a microscope. Microorganisms can be found in the fungus, protista and monera kingdoms. Most microorganisms are beneficial. For example, cyanobacteria make oxygen, and a unicellular fungus called yeast is added to bread to make it rise. Some microorganisms are pathogens, which means they cause disease in other living things. Viruses are not microorganisms as they are not living and need a host to survive. They are not part of any of the kingdoms. Some viruses can be beneficial and others harmful. For example, the virus SARS-CoV-2 causes the illness COVID-19.
• Fossils are the remains of once-living things or traces of life, such as footprints, tracks, dung or burrows, that have been preserved as rock. Preserved remains and traces of life are called fossils if they are over 10,000 years old. The fossil record was created by scientists to group and make sense of the vast amount of fossils that have been discovered. It is ordered from the oldest fossils found deepest in the ground to the newest fossils found closest to the surface. It provides a history of the Earth. The fossil record tells us about: the living things that have inhabited Earth, the Earth's environment over time, how species have evolved, extinction events. However, the fossil record is incomplete because soft-bodied animals decayed too quickly to be fossilised and fossils are still buried in the Earth's rocky layers.</td>
<td colspan="2">Adaptation, ancestor, animal kingdom, artificial selection, asexual reproduction, bacteria, characteristic, classification, deoxyribonucleic acid (DNA), dinosaur, evolution, evolve, extinct, fossil, fungus kingdom, gene, genetics, host, inheritance, kingdom, microorganism, monera kingdom, multicellular, natural selection, naturalist, origin, palaeontologist, pathogen, plant kingdom, protista kingdom, sexual reproduction, species, theory, unicellular, variation, virus.</td>
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<tr>
<td>Key Scientists</td>
<td>Possible Texts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Charles Darwin and Alfred Russel Wallace
(Theory of Evolution by Natural Selection)
Jane Goodall
(Chimpanzees)
Mary Leakey
(Scientist)</td>
<td>One Smart Fish (Christopher Wormell)
The Molliebird (Jules Pottle)
Our Family Tree (Lisa Westberg Peters)</td>
</tr>
</table>

	• The theory of evolution was first developed by the naturalists Charles Darwin and Alfred Russel Wallace in 1858. The theory states three assumptions: All life on Earth has evolved from simple life forms to more complex ones over time. All life on Earth has common ancestors and is therefore related. Living things with characteristics most suited to their environment are more likely to survive and reproduce. At first, the theory was controversial. Some saw it as an explanation for the variety of species on Earth, but others saw it as blasphemous as it challenged the Christian belief that God created the Earth and all living things. Today, the fossil record and DNA evidence support the theory of evolution. • Natural selection is the process behind the theory of evolution. Variation within a species is caused by small, natural changes in DNA between individuals and the random mixing of parent DNA following sexual reproduction. If a variation positively affects a living thing's ability to survive, they are more likely to live long enough to reproduce and pass on the attribute to their offspring. This process naturally selects those individuals who are better able to survive in their habitat, and is known as 'survival of the fittest.' Over time, positive attributes become common among a species and are seen as adaptations. For example, ancestors of the giraffe had shorter necks, but due to variation and natural selection, individuals with longer necks became common in the species. There are three different types of plant adaptation: Structural: Cacti have modified leaves called spines to deter animals from eating them. Behavioural: Mature sunflowers face the rising Sun in the east because pollinators prefer warm flowers. Chemical: Stinging nettles have hairs containing chemicals that sting when touched to deter animals.		
Prior Learning	**Key Question(s):**	**Future Learning**	
From Key Stages 1 & 2, children should: • Understand there is a variety of life on Earth	· What are the five kingdoms and their features? · What is deoxyribonucleic acid or DNA? · What are the three types of adaptations in plants?	In Key Stage 3 children will learn about: • heredity as the process by which genetic information is transmitted from one generation to the next	

• Know that some animal's differences are important to their survival • Know how animals and plants reproduce • Know how fossils form over time	· What is a microorganism and where can they found? · What is the difference between natural selection and artificial selection?	• 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.

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	Problem Solving
Develop lesson 2: Natural selection and survival of the fittest Develop lesson 3: Exploring plant adaptations	Introductory knowledge: Five kingdoms Engage lesson 1: Classifying fossils		Develop lesson 1: Inheritance Develop lesson 3: Exploring plant adaptations Innovate: Observing, measuring and recording	Develop lesson 4: Artificial selection	Develop lesson 4: Artificial selection