This resource has been put together by PSTT Fellow, Claire Loizos, who has experience in science subject leadership and has created these materials for schools that she supports on the Isle of Wight. We believe that other teachers will find this document useful and we are very pleased that she is happy to share these resources much more widely.

PRIMARY SCIENCE CURRICULUM PROGRESSION

Aligned with the National Curriculum for England (2013)

Year 1 to Year 6

Index

Year 1 – Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.** • **Identify and describe the basic structure of a variety of common flowering plants.** • **Identify and name the roots, trunk, branches and leaves of trees.**	• Plants grow from seeds/bulbs • Plants need light and water to grow and survive • Plants are important • We can eat lots of plants	Leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen

Key Scientists	Linked Texts
Beatrix Potter (Author & Botanist)	***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)*

Prior Learning	Key Question(s):	Future Learning
In EYFS Children should: • **Make observations of plants** • **Know some names of plants, trees and flowers** • **May be able to name and describe different plants, trees and flowers** • **Show some care for their world around them**	• How do Plants grow? • What do Plants need to grow? • Do all plants need water? • Are all plants green? • Why do seeds look different? • Can plants grow as big in the shade? • What is the biggest/smallest/smelliest (etc) tree/flower/plant on the planet?	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
Which type of compost grows the tallest sunflower? **Which tree has the biggest leaves?**	How can we sort the leaves that we collected on our walk?	How does a daffodil bulb change over the year? How does my sunflower change each week? How does the oak tree change over the year?	Do trees with bigger leaves lose their leaves first in autumn? Is there a pattern in where we find moss growing in the school grounds?	What are the most common British plants and where can we find them? How did Beatrix Potter help our understanding of mushrooms and toadstools?	How many types of plant are there?

Year 2 – Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Observe and describe how seeds and bulbs grow into mature plants.** • **Find out and describe how plants need water, light and warmth to grow and stay healthy.**	• Plants grow from seeds/bulbs • Plants need light, water and warmth to grow and survive • Flowers make seeds to make more plants (reproduce) • Plants are important • We need plants to survive (to clean air, to eat) • We can eat different parts of the plants (leaves, stems, roots, seeds, fruit)	Leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen, observe, grow, compare, record, temperature, predict, measure, diagram, germinate, warmth, sunlight.

Key Scientists	Linked 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	Key Question(s):	Future 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.**	• Do cress produce seeds, how could we find out? • Do all plants produce flowers and seeds? • What is different between freshly cut and planted flowers? • Do plants flower all year round? • What are flowers for? • What happens to a plant after it has produced seeds?	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

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Do cress seeds grow quicker inside or outside?	How can we identify the trees that we observed on our tree hunt?	What happens to my bean after I have planted it?	Do bigger seeds grow into bigger plants?	How does a cactus survive in a desert with no water?	What should I do to grow a healthy plant?

Year 3 – Plants

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify and describe the functions of different parts of the flowering plant: roots, stem/trunk/leaves and flowers** • **Explore the part flowers play in a flowering plants 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**	• Plants are producers, they make their own food. • Their leaves absorb sunlight and carbon dioxide • Plants have roots, which provide support and draw water from the soil • Flowering plants have specific adaptations which help it to carry out pollination, fertilisation and seed production • Seed dispersal improves a plants chances of successful reproduction • Seeds/bulbs require the right conditions to germinate and grow. • Seeds contain enough food for the plant's initial growth	Air, light, water, nutrients, soil, support, anchor, reproduction, pollination, dispersal, transportation, flower, energy, growth, seedling, carbon dioxide, oxygen, sugar, material, photosynthesis, chlorophyll

Key Scientists	Linked Texts
Jan Ingenhousz (Photosynthesis) **Joseph Banks** (Botanist)	***The Hidden Forest*** *(Jeannie Baker)* ***George and Flora's Secret Garden*** *(Jo Elworthy)*

Prior Learning	Key Question(s):	Future 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.**	• How do plants reproduce? • Do all flowers look the same? • How do insects know which flowers to pollinate? • Why do flowers smell? • What do seeds do? • Can a plant live without its leaves? • Do grass/trees make flowers? • What conditions are perfect for a seed to grow? • Where do weeds come from? • How does the space between seeds affect how well they grow? • Does seed size match plant size? • Do plants take in water through their roots? • How does water move through the plant? • How do plants make their food? • How does light affect plant growth? • How does a plant get carbon dioxide?	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.

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>
How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals? **Which conditions help seeds germinate faster?**	How many ways can you group our seed collection?	What happens to celery when it is left in a glass of coloured water? How do flowers in a vase change over time?	What colour flowers do pollinating insects prefer?	What are all the different ways that seeds disperse?	Why do plants have flowers?

Year 1 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.** • **Identify and name a variety of common animals that are carnivores, herbivores and omnivores**	• There are many different animals with different characteristics. • Animals have senses to help individuals survive. When animals sense things they are able to respond. • Animals need food to survive. • Animals need a variety of food to help them grow, repair their bodies, be active and stay healthy.	Amphibians, birds, fish, mammals, reptiles, carnivores, herbivore, omnivore, sight, hearing, touch, taste, smell, head, neck, ear, mouth, shoulder, hand, fingers, leg, foot, thumb, eye, nose, knee, toes, teeth, elbow

Key Scientists	Linked Texts
Chris Packham (Animal Conservationist)	***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 do animals eat? • Do all animals eat the same food? • Which of our senses is the most accurate at identifying food? • Do all animals hunt? • Why are animals different colours and patterns?	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Is our sense of smell better when we cannot see?	How can we organise all the zoo animals? What are the names for all the parts of our bodies?	How does my height change over the year?	Do you get better at smelling as you get older?	Do all animals have the same senses as humans?	What are animals like?

Year 2 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Know that animals, including humans, have offspring which grow into adults** • **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.**	• Animals move in order to survive. • Different animals move in different ways to help them survive. • Exercise keeps animal's bodies in good condition and increases survival chances. • All animals eventually die. • Animals reproduce new animals when they reach maturity. • Animals grow until maturity and then do not grow any larger.	Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, seashore, woodland, ocean, rainforest, conditions, desert, damp, shade,

Key Scientists	Linked Texts
Steve Irwin (Crocodile Hunter) Robert Winston (Human Scientist) Joe Wicks (Personal Trainer)	***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.**	• How long do should my pets live for? • Do all animals grow and live the same way? • Do bigger animals live longer? • Why are we all different heights? • How and why do we grow and change?	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:

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Do amphibians have more in common with reptiles or fish? **Do bananas make us run faster?**	Which offspring belongs to which animal? How would you group things to show which are living, dead, or have never been alive?	How does a tadpole change over time? How much food and drink do I have over a week?	Which age group of children wash their hands the most in a day?	What food do you need in a healthy diet and why? What do you need to do to look after a pet dog/cat/lizard and keep it healthy?	Do living things change or stay the same?

Year 3 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify that animals, including humans, need the right types and amount of nutrition, and 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:**	• Different animals are adapted to eat different foods. • Many animals have skeletons to support their bodies and protect vital organs. • Muscles are connected to bones and move them when they contract. • Movable joints connect bones.	Nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax, **Key Scientists** **Adelle Davis** (20th Century Nutritionist) **Marie Curie** (Radiation / X-Rays) **Linked Texts** ***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)*

Prior Learning	Key Question(s):	Future Learning
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.**	• Why do we need a skeleton? • What types of skeleton are there? • Are all skeletons the same? • Can something survive without a skeleton? • What happens if we break a bone? • How do we move? • Are bones that are bigger, stronger? • Why do we need joints? • Why do muscles get tired? • Can we 'break' muscles?	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

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh? **How does the skull circumference of a girl compare with that of a boy?**	How do the skeletons of different animals compare?	How does our skeleton change over time? (from birth to death)	Do male humans have larger skulls that female humans?	Why do different types of vitamins keep us healthy and which foods can we find them in?	Why do animals have skeletons? What is a healthy diet and why is it important?

Year 4 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Describe the simple functions of the basic parts of the digestive system in humans.** • **Identify the different types of teeth in humans and their simple functions.** • **Construct and interpret a variety of food chains, identifying producers, predators and prey**	• Animals have teeth to help them eat. • Different types of teeth do different jobs. • Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood. • The blood takes nutrients around the body. • Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.	Herbivore, Carnivore, Digestive system, tongue, mouth, teeth, oesophagus, stomach, gall bladder, small intestine, pancreas, large intestine, liver, tooth, canine, incisor, molar, premolar, producer, consumer. Key Scientists: **Ivan Pavlov** (Digestive System Mechanisms) **Joseph Lister** (Discovered Antiseptics) Linked Texts: ***Human Body Odyssey*** *(Werner Holzwarth)* ***Crocodiles Don't Brush Their Teeth*** *(Colin Fancy)* ***Wolves*** *(Emily Gravett)*

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 different types of food are there? • Why do we need a variety of different foods? • Do all organisms eat the same things? • Why do some people need different diets? (weightlifter vs marathon runner) • Why are teeth important? • What happens to our food? • What is our digestive system? • How does our food turn into poo and wee?	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

Teaching Ideas

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

Year 5 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Describe the changes as humans develop to old age.**	• Different animals mature at different rates and live to different ages. • Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction • Hormones control these changes, which can be physical and/or emotional.	Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty, Hormone, Physical, Emotional, .

Key Scientists	Linked Texts
Dr Steve Jones (Geneticist) Prof Robert Winston (Human Scientist)	***Hair in Funny Places*** *(Babette Cole)* ***Giant*** *(Kate Scott)* ***You're Only Old Once!*** *(Dr. Seuss)*

Prior Learning	Key Question(s):	Future Learning
In Year 4 children should: • **Describe the simple functions of the basic parts of the digestive system in humans.** • **Identify the different types of teeth in humans and their simple functions.**	• What do humans look like? • Do all animal embryos look the same? • How do humans change? • Why do humans change? • What causes puberty? • What changes do we go through during puberty? • Are there any patterns between vertebrate animals and their gestation periods?	In Year 6: • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans.

Teaching Ideas

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

Year 6 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.** • **Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.** • **Describe the ways in which nutrients and water are transported within animals, including humans.**	• The heart pumps blood around the body. • Oxygen is breathed into the lungs where it is absorbed by the blood. • Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)	Oxygenated, Deoxygenated, Valve, Exercise, Respiration Circulatory system, heart, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, digestive, transport, gas exchange, villi, nutrients, water, oxygen, alcohol, drugs, tobacco. Key Scientists: **Justus von Liebig** (Theories of Nutrition and Metabolism); **Sir Richard Doll** (Linking Smoking and Health Problems); **Leonardo Da Vinci** (Anatomy) Linked Texts: ***Pig-Heart Boy*** *(Malorie Blackman)*; ***Skellig*** *(David Almond)*; ***A Heart Pumping Adventure*** *(Heather Manley)*

Prior Learning	Key Question(s):	Future Learning
In Year 5 children should: • Describe the changes as humans develop to old age. Yea	• Why do we need oxygen? • How do we breathe? • Do fish and plants breathe? • Do all living things need oxygen? • How does the size of a person's lungs affect their lung capacity? • Are there ways to increase/decrease our lung capacity? Is lung capacity fixed? • Why do we have blood? • How does our heart work? • How does size of muscle affect our pulse rate? • How does exercise effect our pulse rate? • How might the circulatory system of an elephant, a hummingbird, or a polar bear differ? • Is the air you breathe out, the same as that you breathe in?	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.

Teaching Ideas

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

Year 6 – Evolution & Inheritance

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Know about evolution and can explain what it is.** • **Know how fossils can be used to find out about the past.** • **Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents** • **Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago**	• Life cycles have evolved to help organisms survive to adulthood. • Over time the characteristics that are most suited to the environment become increasingly common. *NB: The following could be duplicated in Year 6 Living things and their habitats.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Variation exists within a population (and between offspring of some plants) • Competition exists for resources and mates	Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence, Key Scientists: **Charles Darwin and Alfred Russel Wallace** (Theory of Evolution by Natural Selection); **Jane Goodall** (Chimpanzees) Linked Texts: ***One Smart Fish*** *(Christopher Wormell)*; ***The Molliebird*** *(Jules Pottle)*; ***Our Family Tree*** *(Lisa Westberg Peters)*

Prior Learning	Key Question(s):	Future Learning
From Key Stages 1 & 2, children should: • **Understand there is a variety of life on Earth** • **Know that some animal's differences are important to their survival** • **Know how animals and plants reproduce** • **Know how fossils form over time**	• Why are we all different? • What is variation, and why is it important? • How did life begin on Earth? • How do we change? • What is evolution? • What evidence is there for evolution? • How does evolution happen? • What reasons do animals become extinct? • Polar Bears' habitat is rapidly changing, what possible futures do they face, and can we predict which is most likely? • How did Darwin come up with the theory? • Why was his theory not initially accepted?	In Key Stage 3 children will learn about: • heredity as the process by which genetic information is transmitted from one generation to the next • the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Teaching Ideas

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

Year 2 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Explore and compare the difference between things that are living, dead and things that have never been alive.** • **Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.** • **Identify and name a variety of plants and animals in their habitats, including micro habitats.** • **Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name the different sources of food.**	• Some things are living, some were once living but now dead and some things never lived. • There is variation between living things. • Different animals and plants live in different places. Living things are adapted to survive in different habitats. • Environmental change can affect plants and animals that live there.	Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, seashore, woodland, ocean, rainforest, conditions, desert, damp, shade, Key Scientists: Terry Nutkins (TV Presenter); Liz Bonnin (Conservationist) Linked Texts: ***The Gruffalo*** *(Julia Donaldson)*; ***Meerkat Mail*** *(Emily Gravett)*; ***No Place Like Home*** *(Jonathon Emmett)*

Prior Learning	Key Question(s)	Future 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.**	• How to animals eat? • Do all animals eat the same thing? • Which animals hunt, and which animals are hunted? Why? • What animals live in our school environment? • How are animals and plants 'adapted' to live in their habitats • Why do animals and plants like to live in different places? • How do seasons affect our animals and plants? • Which animals hibernate and why? • Why do snails hibernate, but slugs do not? • How to habitats change over our school year?	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.

Teaching Ideas

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

Year 4 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Recognise that living things can be grouped in a variety of ways.** • **Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.** • **Recognise that environments can change and that this can sometimes pose danger to living things.**	• Living things can be divided into groups based upon their characteristics • Environmental change affects different habitats differently • Different organisms are affected differently by environmental change • Different food chains occur in different habitats • Human activity significantly affects the environment	Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Key Scientists: **Cindy Looy** (Environmental Change and Extinction); **Jaques Cousteau** (Marine Biologist) Linked Texts: ***The Vanishing Rainforest*** *(Richard Platt)*; ***The Morning I Met a Whale*** *(Michael Morpurgo)*; ***Journey to the River Sea*** *(Eva Ibbotson)*

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.**	• What food chains and webs are there in our local habitat? • How does energy move through the food chain? • How does removal of one species from an environment, affect others? (keystone species) • How does environmental change affect different organisms? • What are the most important things we could do to improve our outside area? (big hotels, pond, compost, wildflowers) • How does human activity affect our environment (ferries on the Solent? Sandown Airport? KFC?)	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.

Teaching Ideas

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

Year 5 – Living things and their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird. • Know the process of reproduction in plants. • Know the process of reproduction in animals.	• Different animals mature at different rates and live to different ages. • Some organisms reproduce sexually where offspring inherit information from both parents. • Some organisms reproduce asexually by making a copy of a single parent. • Environmental change can affect how well an organism is suited to its environment. • Different types of organisms have different lifecycles.	Reproduction, Sexual, Asexual, Pollination, Dispersal, reproduction, cell, fertilisation, pollination, male, female, pregnancy, young, mammal, metamorphosis, amphibian, insect, egg, embryo, bird, plant .

Key Scientists	Linked Texts
James Brodie of Brodie (Reproduction of Plants by Spores) **David Attenborough** (Naturalist and Nature Documentary Broadcaster)	***The Land of Neverbelieve*** *(Norman Messenger)* ***Mummy Laid an Egg*** *(Babette Cole)*

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.**	• What is a life cycle? What types of life cycles are there? • Are life cycles the same? • Do plants reproduce in the same ways as us? • How do plants spread their seeds?	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.

Teaching Ideas

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

Year 6 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Classify living things into broad groups according to observable characteristics and based on similarities and differences.** • **Give reasons for classifying plants and animals based on specific characteristics.**	• Variation exists within a population (and between offspring of some plants) – *NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. • Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Competition exists for resources and mates.	Variation Organisms Populations. Classification Characteristics Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean.

Key Scientists	Linked Texts
Carl Linnaeus (Identifying, Naming and Classifying Organisms)	***Beetle Boy*** *(M G Leonard)* ***Insect Soup*** *(Barry Louis Polisar)* ***Fur and Feathers*** *(Janet Halfmann)*

Prior Learning	Key Question(s):	Future Learning
In Year 4, children should: • **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.**	• Why do we need to classify living things? • How do we classify? • What are the difficulties with classification? (penguins, whales, platypus) • How do animals change over time? • Why does variation exist? • What happens if animals of different species breed? (hybrids) • What happens to house plants outside? • What are microorganisms? • How can we prevent the spread of disease? • Why do animals and plants compete – and what for?	In Key Stage 3 children will learn about: • the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • the adaptations of leaves for photosynthesis. • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Teaching Ideas

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

Year 4 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify common appliances that run on electricity.** • **Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.** • **Identify whether a lamp will light in a simple series circuit, based on whether the lamp is part of a complete loop with a battery.** • **Recognise that a switch opens and closes the circuit and associate this with whether a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors.** • **Know the difference between a conductor and an insulator, giving examples of each.** • **Safety when using electricity.**	• A source of electricity (mains of battery) is needed for electrical devices to work. • Electricity sources push electricity round a circuit. • More batteries will push the electricity round the circuit faster. • Devices work harder when more electricity goes through them. • A complete circuit is needed for electricity to flow and devices to work. • Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are called insulators.	Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, component. Key Scientists: Thomas Edison (First Working Lightbulb) Joseph Swan (Incandescent Light Bulb) Linked Texts: 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)
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.**	• What would life be like without electricity? • What sorts of things use/need electricity? • What electricity do I use? • In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) • How do we make electricity? • How do batteries work? • How quickly can batteries run out? Does this make a difference depending on number of components? • How does the number of batteries added to the circuit affect a device? • What materials can carry electricity? (conductors/insulators)	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the thickness of a conducting material affect how bright the lamp is? **Which metal is the best conductor of electricity?**	How would you group these electrical devices based on where the electricity comes from?	How long does a battery light a torch for?	Which room has the most electrical sockets in a house?	How has electricity changed the way we live? How does a light bulb work?	What can we do with electricity?

Year 6 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	• Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' • The greater the current flowing through a device the harder it works. • Current is how much electricity is flowing round a circuit. • When current flows through wires heat is released. The greater the current, the more heat is released.	Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.

Key Scientists	Linked Texts
Alessandro Volta (Electrical Battery) Nicola Tesla (Alternating Currents)	Goodnight Mister Tom (Michelle Magorian) Blackout (John Rocco) Hitler's Canary (Sandi Toksvig)

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.**	• Do all batteries push as hard as each other? • What is electricity? • How does the voltage of a batters affect how much current is pushed? • How does the length of time I leave the current flowing for affect the brightness of the bulb? • How does number of bulbs affect the brightness of a bulb? • Are all types of wires as good as conducting electricity? • Why are wires insulated in plastic? Does type of material make a difference? • Does length of wire make a difference? • Does the type of circuit affect how the components work/long the battery lasts? • What renewable ways can we generate electricity? • How does current affect heat? • What are the dangers of a short 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.

Teaching Ideas

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

Year 2 – Forces

National Curriculum Objectives	Sticky Knowledge	Vocabulary
There are no specified National Curriculum Objectives for forces at KS1	• Pushing and pulling can make things move faster or slower. • Pushing and pulling can make things move or stop. • Things can move in different ways. • Larger masses take bigger pushes and pulls to move or stop them. • Pushing and pulling can change the shape of things. • Bigger pushes and pulls have bigger effects	Force, push, pull, surface, attract, repel, compass Key Scientists: The Wright Brothers (Aeroplanes); Henry Ford (Cars) Linked Texts: Traction Man (Mini Grey); Three Little Pigs (Lesley Sims)

Prior Learning	Key Question(s):	Future Learning
In Early Years children should: • **know about similarities and differences in relation to places, objects, materials and living things.** • **talk about the features of their own immediate environment and how environments might vary from one another.** • **make observations of animals and plants, explain why some things occur, and talk about changes.**	• How can we move objects? • How can we change the way an object moves? • How does a material affect how fast a ball rolls down a slope? • How does the length/steepness of a slope affect how far a ball/car/tin will roll off the end? • What it a push or a pull that makes it go further? • How does how hard/long I press a pop-up toy for affect how high it jumps? • On what surface do objects roll the best on? Is it the same for sliding? • Which material would be best for a teddy bungee cord? • How does length of an elastic band affect how elastic it is? • Which sock is the most elastic? • Which tights are the most elastic (denier)? • Which recipe play dough needs the greatest push to squash it? • How does the height an egg is dropped from affect how big the splat pattern is? (you could use wet tissue paper balls)	In Year 3 children will: • 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. •

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Which material would be best for the roof of the little pig's house?	Which materials will float and which will sink?	Would a paper boat float forever?	How does changing the force change the speed of a toy car?	Why do objects float or sink?	How can we change how things move?

Year 3 – Forces (& Magnetism)

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Compare how things move on different surfaces.** • **Know how a simple pulley works and use making lifting an object simpler** • **Notice that some forces need contact between two objects, but magnetic forces can act at a distance.** • **Observe how magnets attract and repel each other and attract some materials and not others.** • **Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials.** • **Describe magnets as having two poles.** • **Predict whether two magnets with attract or repel each other, depending on which poles are facing.**	• Magnets exert attractive and repulsive forces on each other. • Magnets exert non-contact forces, which work through some materials. • Magnets exert attractive forces on some materials. • Magnet forces are affected by magnet strength, object mass, distance from object and object material.	Force, push, pull, friction, surface, magnet, magnetic, magnetic field, pole, north, south, attract, repel, compass **Key Scientists** William Gilbert (Theories on Magnetism) Andre Marie Ampere (Founder of Electro-Magnetism) **Linked Texts** The Iron Man (Ted Hughes) Mrs Armitage: Queen of the Road (Quentin Blake) Mr Archimedes' Bath (Pamela Allen)

Prior Learning	Key Question(s):	Future Learning
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.**	• What are magnetic materials? How can we find out? • Can I make a magnetic material non-magnetic? • How far away does a magnet have to be before it attracts a magnetic material? • How far away can the magnetic attraction between two magnets be experiences? • Is the repulsive force the same size? • How is the magnetic attraction of repulsion force affected by putting materials between the magnets? • Are bigger magnets stronger? • How could you use magnets to measure the number of pages in a book?	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.

Teaching Ideas

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

Year 5 – Forces

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives.** • **Identify the effects of air resistance, water resistance and friction, which act between moving surfaces.** • **Recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect.**	• Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way. • Friction is a force against motion caused by two surfaces rubbing against each other. • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move	Air resistance, Water resistance, Friction, Gravity, Newton, Gears, Pulleys, force, push, pull, opposing, streamline, brake, mechanism, lever, cog, machine, pulley.

Key Scientists	Linked Texts
Galileo Galilei (Gravity and Acceleration) Isaac Newton (Gravitation) Archimedes of Syracuse (Levers) John Walker (The Match)	The Enormous Turnip (Katie Daynes) Leonardo's Dream (Hans de Beer) The Aerodynamics of Biscuits (Clare Helen Welsh)

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 force? • How can a force act on an object? • How can we see forces? • How can we measure forces? • How does the saltiness (salinity) of water affect the water resistance? • How does the length of a piece of a paper helicopter's wings affect the time it takes to fall? • How does the changing the shape of a piece of plasticine affect water resistance? • How does adding holes to a parachute affect the time it takes to fall? • How does the amount/depth of tread affect the friction between a shoe and a surface? • How can we use levers to lift heavy objects? • What is the most effective way to move an object? • How do see-saws work? • Can you create a pulley system to life a given load?	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.

Teaching Ideas

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

Year 5 – Earth & Space

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Describe the movement of the Earth, and other planets, relative to the Sun in the solar system** • **Describe the movement of the Moon relative to the Earth** • **Describe the Sun, Earth and Moon as approximately spherical bodies** • **Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.**	• Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. Gravity works over distance. • Objects with larger masses exert bigger gravitational forces. • Objects like planets, moons and stars spin. • Smaller mass objects like planets orbit large mass objects like stars. • Stars produce vast amounts of heat and light. • All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.	Earth, Sun, Moon, Axis, Rotation, Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent, gibbous. Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric.

Key Scientists	Linked Texts
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)	***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)*

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**	How does temperature/size/day length/year length change as you get closer/further to the sun? How does distance from a light source affect how much light hits an object? Does having more moons result in more light hitting a planet? How could you test this? How does speed/size of a meteorite affect the size of the moon crater formed? If the moon became heavier as a result of meteorite collisions what would happen to its position relative to Earth? If the mass of the Earth is 80x that of the moon, why is the gravity at the Earth's surface only 6x greater than at the surface of the moon? Why do we have day/night/months/years/seasons? Why does day length change? Why does shadow size change over the course of a day?	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

Teaching Ideas

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

Year 1 – (ENERGY) Seasons and How they Change

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Observe changes across the four seasons** • **Observe and describe weather associated with the seasons and how day length varies.**	• Weather can change • There are lots of different types of weather: Rain, Sun, Cloud, Wind, Snow, etc • Days are longer and hotter in the summer • Days are shorter and colder in the winter • There are four seasons: Spring, Summer, Autumn, Winter	Seasons, spring, summer, autumn, winter, windy, sunny, overcast, snow, rain, temperature

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

Prior Learning	Key Question(s):	Future 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.**	• Why do more frequent days of rain saturate the ground? • How long does it take for the ground to dry after it has been raining? • Does more rain take longer to dry? • Do countries with higher temperatures have less rain? • How does rainfall and temperature change over time in our school grounds? • Which leaf is the strongest/best shade cover/best at directing water? • What do you notice about different leaves? • What purpose to leaves serve for a tree? • Why do you think leaves turn brown in Winter? • What colours can we find outside? Does this change across the seasons? • What effect does rain have on the environment? • What would happen if there was too much rain? • What would happen if there wasn't enough rain?	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.

Teaching Ideas

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

Year 3 – (ENERGY) Light & Sight

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Recognise that they need light in order to see things and that dark is the absence of light.** • **Notice that light is reflected from surfaces.** • **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.** • **Recognise that shadows are formed when the light from a light source is blocked by a solid object.** • **Find patterns in the way that the sizes of shadows change.**	• There must be light for us to see. Without light it is dark. • We need light to see things even shiny things. • Transparent materials let light travel through them, and opaque materials don't let light through. • Beams of light bounce off some materials (reflection). • Shiny materials reflect light beams better than non-shiny materials. • Light comes from a source	Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent.

Key Scientists	Linked Texts
James Clerk Maxwell (Visible and Invisible Waves of Light)	The Owl Who Was Afraid of the Dark (Jill Tomlinson) The Dark (Lemony Snicket) The Firework-Maker's Daughter (Philip Pullman)

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.**	• A coin is lost, what would be the best way to find it? (Turn the lights out and see it shine? Use a torch to see it reflect?) • How does distance from a light source affect how bright it looks? • How does being in darkness affect your sense of hearing? • What colour would be the best to make a safety jacket from? • How does the colour of a material affect how reflective it is? • What would be the best material to make a blind for a baby's room? • How does thickness of a material affect how much light can pass through it? • How many pieces of tracing paper are as translucent as a single piece of white paper? • How does the shape of a mirror affect how the light reflects? • How can we change the darkness, size and shape 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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the distance between the shadow puppet and the screen affect the size of the shadow? **Which pair of sunglasses will be best at protecting our eyes?**	How would you organise these light sources into natural and artificial sources?	When is our classroom darkest? Is the Sun the same brightness all day?	Are you more likely to have bad eyesight and to wear glasses if you are older?	How does the Sun make light?	What is a shadow?

Year 4 – (ENERGY) Sound

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Know how sound is made associating some of them with vibrating.** • **Know what happens to a sound as it travels from its source to our ears.** • **Know the correlation between the volume of a sound and the strength of the vibrations that produced it.** • **Know how sound travels from a source to our ears.** • **Know the correlation between pitch and the object producing a sound.**	• Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Sound spreads out as it travels. • Changing the shape, size and material of an object will change the sound it produces. • Sound is produced when an object vibrates. • Sound moves through all materials by making them vibrate. • Changing the way an object vibrates changes its sound. • Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds	Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave. Key Scientists: **Aristotle** (Sound Waves); **Gailileo Galilei** (Frequency and Pitch of Sound Waves); **Alexander Graham Bell** (Invented the Telephone) Linked Texts: ***Horrid Henry Rocks*** *(Francesca Simon)*; ***Moonbird*** *(Joyce Dunbar)*; ***The Pied Piper of Hamelin*** *(Natalia Vasquez)*

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.**	• How can you change the volume of a sound? • How does the size of an ear trumpet affect the volume of sound detected? • How does the type of material affect how well is blocks a sound? • How does thickness of material affect how well it blocks a sound? • Which materials vibrate better and produce louder sounds? Can we identify any patterns? • Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic – predict and test) • How does length of the tube (when making a straw oboe) affect the pitch and volume? • Can you predict the relative pitch of tuning forks from the patterns of ripples they make in the water?	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.

Teaching Ideas

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

Year 6 – (ENERGY) Light and Sight

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Recognise that light appears to travel in straight lines.** • **Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.** • **Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.** • **Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.** • **Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.**	• Animals see light sources when light travels from the source into their eyes. • Animals see objects when light is reflected off that object and enters their eyes. • Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light, so we do not see the beam. • Light travels in straight lines.	Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent. Reflect Absorb Emitted Scattered Refraction

Key Scientists	Linked Texts
Thomas Young (Wave Theory of Light) **Ibn al-Haytham (Alhazen)** (Light and our Eyes) Percy Shaw (The Cats Eye)	***Letters from the Lighthouse*** *(Emma Carroll)* ***The Gruffalo's Child*** *(Julia Donaldson)* ***The King Who Banned the Dark*** *(Emily Haworth-Booth)*

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.** • **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.**	• How does the size of an object affect the size of a shadow? • How does the distance between the light and the object change the size of a shadow? • How does the distance between the object and the size of the screen affect the size of a shadow? • How would a solar eclipse be different if: - The moon was a different size? - The earth span faster or slower? - The sun was larger or smaller? - If the earth and moon where the same size but further away in the solar system? • How does the amount of aluminium foil scrunched affect how much light is scatters? • How does the amount of polishing affect how well a piece of metal scatters light? • How perfect are our mirrors? Do some scatter light more than others? • What happens to light when it is shone through water? How is this affected by putting glitter, salt or talc in the water? • How does a periscope/microscope/telescope work?	In Key Stage 3, children will learn about: • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative), the human eye • light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

Teaching Ideas

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

Year 1 – Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Distinguish between and object and the material from which it is made.** • **Identify and name a variety of everyday materials, including wood, metal, plastic, glass, water and rock,** • **Describe the simple physical properties of a variety of everyday materials.** • **Compare and group together a variety of everyday materials based on their simple properties**	• There are many different materials that have different describable and measurable properties. • Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic and ceramics (including glass). • The properties of a material determine whether they are suitable for a purpose.	Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy/not bendy, waterproof/not waterproof, absorbent, opaque, Key Scientists: William Addis (Toothbrush Inventor); Charles Mackintosh (Waterproof coat); John McAdam (roads) Linked Texts: ***The Great Paper Caper*** *(Oliver Jeffers)*; ***Who Sank the Boat*** *(Pamela Allen)*; ***The Story of Cinderella*** *(Walt Disney)*

Prior Learning	Key Question(s):	Future 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.**	It is recommended that materials be taught three times through KS1. Give a theme for each topic e.g. buildings, exploration, toys, the seaside. Plan to investigate a couple of classes of materials and properties in each topic so children get a depth of experience each topic and cover all the classes of materials over the key stage Buildings • Which rocks are the least crumbly? • Which materials absorb the most water? • Which type of brick would be the easiest to drag to make a pyramid? • Which material would be the strongest to use as a floor tile? Toys & Nice things • Which fabric would make the softest blanket? • The baby has spilt her drink, which material would absorb the drink the best? • We want to make a really slippery slide; which liquid would be best to use? • Which chocolate will melt the fastest on a warm plate (a model of a warm hand) • Which wrapping papers are strong enough to wrap and send a present? Clothing & Materials • Which material could be used to make a waterproof hat for the teacher when she is on the playground at playtime? • Which plastic would be flexible enough to make a belt? • Which material could I wrap my ice egg / snowman in to stop it melting, or would it make it melt quicker? • What could I wrap a chicken egg in to keep it warm when it is waiting to hatch? • What could you paint on the runaway gingerbread man that would allow him to swim the river and get away from the fox and not turn to mush?	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Which materials are the most flexible? **Which materials are the most absorbent?**	We need to choose a material to make an umbrella. Which materials are waterproof?	What happens to materials over time if we bury them in the ground? What happens to shaving foam over time?	Is there a pattern in the types of materials that are used to make objects in a school?	How are bricks made? Which materials can be recycled?	What are the things I use made from?

Year 2 – Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.** • **Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.**	• Materials can be changed by physical force (twisting, bending, squashing and stretching)	Waterproof, fabric, rubber, cars, rock, paper, cardboard, wood, metal, plastic, glass, brick, twisting, squashing, bending, matches, cans, spoons,

Key Scientists	Linked 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.**	It is recommended that materials be taught three times through KS1. Give a theme for each topic e.g. buildings, exploration, toys, the seaside. Plan to investigate a couple of classes of materials and properties in each topic so children get a depth of experience each topic and cover all the classes of materials over the key stage Buildings • Which rocks are the least crumbly? • Which materials absorb the most water? • Which type of brick would be the easiest to drag to make a pyramid? • Which material would be the strongest to use as a floor tile? Toys & Nice things • Which fabric would make the softest blanket? • The baby has spilt her drink, which material would absorb the drink the best? • We want to make a really slippery slide; which liquid would be best to use? • Which chocolate will melt the fastest on a warm plate (a model of a warm hand) • Which wrapping papers are strong enough to wrap and send a present? Clothing & Materials • Which material could be used to make a waterproof hat for the teacher when she is on the playground at playtime? • Which plastic would be flexible enough to make a belt? • Which material could I wrap my ice egg / snowman in to stop it melting, or would it make it melt quicker? • What could I wrap a chicken egg in to keep it warm when it is waiting to hatch? • What could you paint on the runaway gingerbread man that would allow him to swim the river and get away from the fox and not turn to mush?	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Which shapes make the strongest paper bridge? **Which material would be best for the roof of the little pig's house?**	Which materials will float and which will sink? Which materials will let electricity go through them, and which will not? Which materials are shiny and which are dull?	How long do bubble bath bubbles last for? What will happen to our snowman?	How do materials change with heat? *leave outside in sunshine/windowsill/radiator* How does amount of water affect the strength of a kitchen towel?	How have the materials we use changed over time? How are plastics made?	Can we change materials? How do we choose the best material?

Year 3 – Materials

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Compare and group together different kinds of rocks based on their appearance and simple physical properties** • **Describe in simple terms how fossils are formed when things that have lived are trapped within rock** • **Recognise that soils are made from rocks and organic matter**	• There are different types of rock. • There are different types of soil. • Soils change over time. • Different plants grow in different soils. • Fossils tell us what has happened before. • Fossils provide evidence. • Palaeontologists use Fossils to find out about the past. • Fossils provide evidence that living things have changed over time.	Rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, topsoil, sub soil, base rock. Key Scientists: **Mary Anning** (Discovery of Fossils); **Inge Lehmann** (Earth's Mantle) Linked Texts: ***The Pebble in My Pocket*** *(Meredith Hooper)*; ***Stone Girl, Bone Girl*** *(Laurence Anholt)*; ***The Street Beneath My Feet*** *(Charlotte Guillain & Yuval Zommer)*

Prior Learning	Key Question(s):	Future Learning
In Year 2 children should: • **Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.** • **Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.** **Children may:** • **May have some understanding of a variety of different rocks in the natural world.** • **Some understanding of what soil is. (how to identify soil etc)** • **May have some knowledge of what a fossil is.**	• How are the soils different? • Which do you think has best drainage? • Which is more likely to lead to flooding? • How many soil types have we found? • Where might you find more? • How might the soil be different in different countries? • What rock is best for a kitchen chopping board? What might be the issues with various materials and what they must withstand? • What types of rocks are there? • How do rocks change? • What would grow best in your soil? • Why do you think worms are important to the creation of soil? • How can we use composting to make our own soil? • Does it currently look like real soil? • How long do you think this process will take and why? • How are fossils created? • Why do fossils help us find out about historical events? • If you could fossilise an object what would it be?	In Year 4 children will: • 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. In Year 6 children will: • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Teaching Ideas

<u>Comparative tests</u>	<u>Identify & Classify</u>	<u>Observation over time</u>	<u>Pattern Seeking</u>	<u>Research</u>	<u>BIG Question – Assessment Opportunity</u>
How does adding different amounts of sand to soil affect how quickly water drains through it? **Which soil absorbs the most water?**	Can you use the identification key to find out the name of each of the rocks in your collection?	How does tumbling change a rock over time? What happens when water keeps dripping on a sandcastle?	Is there a pattern in where we find volcanos on planet Earth?	Who was Mary Anning and what did she discover?	What are rocks and soils like?

Year 4 – Materials - Solids, Liquids & Gases

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Compare and group materials together, according to whether they are solids, liquids or gases.** • **Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius.** • **Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.**	• Solids, liquids and gases are described by observable properties. • Materials can be divided into solids, liquids and gases. • Heating causes solids to melt into liquids and liquids evaporate into gases. d) Cooling causes gases to condense into liquids and liquids to freeze into solids. • The temperature at which given substances change state are always the same.	Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection, Key Scientists: **Anders Celsius** (Celsius Temperature Scale); **Daniel Fahrenheit** (Fahrenheit Temperature Scale / Invention of the Thermometer) Linked Texts: ***Once Upon a Raindrop: The Story of Water*** *(James Carter)*; ***Sticks*** *(Diane Alber)*

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.**	• How does the amount of water added to flour affect its state? • How does the amount of detergent added to water affect how slippery it is? • How does the temperature affect how viscous a liquid is (use cooking oil)? • Place a peach in a glass of lemonade and watch it spin. Why does it behave that way, and can you prove it? • How does the material sprinkled on ice and snow affect how quickly it melts? • What chocolate would be best to smuggle? How does the type of chocolate affect its melting temperature? • What is the melting temperature of ice and how does it compare with the freezing temperature of water? • Is the melting temperature of wax the same as its freezing temperature?	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.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the mass of a block of ice affect how long it takes to melt? **How does the surface area of water affect how long it takes to evaporate?** **Does seawater evaporate faster than fresh water?**	Can you group these materials and objects into solids, liquids, and gases? How would you sort these objects/materials based on their temperature?	Which material is best for keeping our hot chocolate warm? How does the level of water in a glass change when left on the windowsill?	Is there a pattern in how long it takes different sized ice lollies to melt? How does evaporation rate change as you add more salt to your water?	What are hurricanes, and why do they happen?	Where do ice cubes go when they disappear? Why does it rain and hail?

Year 5 – Materials (Mixtures & Separation)

National Curriculum Objectives

- **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.**

Sticky Knowledge

- When two or more substances are mixed and remain present the mixture can be separated.
- Some changes can be reversed, and some cannot.
- Materials change state by heating and cooling.

Separating technique	Difference in property required
Filtration and sieving	A solid that does not dissolve in a liquid. Different sized solid bits
Magnets	Some materials magnetic others not
Evaporation	A solid dissolved in water and the solid has a high boiling temperature
Floating	Some materials float and other sink

Vocabulary

Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection,

Key Scientists	Linked Texts
Spencer Silver, **Arthur Fry and Alan Amron** (Post-It Notes) **Ruth Benerito** (Wrinkle-Free Cotton)	***Itch*** *(Simon Mayo)* ***Kensuke's Kingdom*** *(Michael Morpurgo)* ***The BFG*** *(Roald Dahl)*

Prior 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.**

Key Question(s):

- What are mixtures?
- What does dissolve mean?
- Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax?
- How does the amount of water used affect how much sugar will dissolve in it?
- Which sweets dissolve in water?
- How can we separate mixtures?
- How can we clean our dirty water?

Future Learning

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.
- 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

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
How does the temperature of tea affect how long it takes for a sugar cube to dissolve? **Which type of sugar dissolves the fastest?**	Can you group these materials based on whether they are transparent or not?	How does a container of saltwater change over time? How does a sugar cube change as it is put in a glass of water?	Do all stretchy materials stretch in the same way? How does temperature affect how much solute we can dissolve?	What are microplastics and why are they harming the planet?	How can we separate a mixture of water, iron filings, salt and sand?

Year 5 – Materials (Changes)

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.** • **comparative and fair tests, for the uses of everyday materials, including wood, metals and plastic.** • **Demonstrate that dissolving, mixing and changes of state are reversible changes.** • **Explain that some changes result in the formation of new materials, and this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda**	• All matter (including gas) has mass. • Sometimes mixed substances react to make a new substance. These changes are usually irreversible. • Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. • Indicators that something new has been made are: The properties of the material are different (colour, state, texture, hardness, smell, temperature) • If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)	Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversable, separate, mixture, insulator, transparent, flexible, permeable, soluble, property, magnetic, hard.

Key Scientists	Linked Texts
Spencer Silver, Arthur Fry and Alan Amron (Post-It Notes) **Ruth Benerito** (Wrinkle-Free Cotton)	***Itch*** *(Simon Mayo)* ***Kensuke's Kingdom*** *(Michael Morpurgo)* ***The BFG*** *(Roald Dahl)*

Prior Learning	Key Question(s):	Future Learning
In Year 4 children should: • **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.**	• The key question we want children to interrogate is "have we made a new substance?" - Wet clay → air-dried clay → fired clay. - Flour and water → dough → bread • Add sugar to fizzy water; it fizzes up. Has a new substance been made? (No, the gas was dissolved in the water and adding sugar made it become undissolved) • Add baking powder to vinegar, it fizzes up. Has a new substance been made? (Yes, the gas was not in the vinegar as it was not fizzy, so it must have been made) • Add water to instant snow. • Use lemon juice as an invisible ink, heating gently makes the ink visible. Is this a new substance? • When water is added to jelly and it is set, is it a new substance. • When materials are heated or mixed with other materials they sometimes can be made to turn into new materials. The question is how would we know if it was a new material or the same material mixed differently?	In KS3 children will learn about: • the concept of a pure substance mixtures, including dissolving • diffusion in terms of the particle model • simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography • the identification of pure substances

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question – Assessment Opportunity
Which material rusts fastest/slowest? **How can we change the 'jelly-ness' of jelly?**	Can you identify and classify these reactions and changes into reversible, and irreversible? Can you describe their groups similarities and differences?	How does a nail in saltwater change over time?	What patterns can you notice in different reactions? How does the amount of bicarbonate of soda, washing up liquid and vinegar affect the reaction?	What are smart materials and how can they help us?	How can we change materials reversibly and irreversibly?