Sedgeberrow C.E. First School

Whole School Science Curriculum Design

	Substantive National Curriculum knowledge statements	**Disciplinary** National Curriculum working scientifically statements
Conceptual Things pupils need to understand	Knowledge statements from National Curriculum in England	• Asking scientific questions • Planning an enquiry • Observing closely • Drawing conclusions • Making predictions • Evaluating an enquiry
Procedural Things pupils need to be able to do	• Circuit diagrams • Light ray diagrams • Labelled diagrams • Venn diagrams • Carroll diagrams • Separating mixtures • Making circuit • Planting seeds • Food chains • Life-cycle diagrams • Changing the pitch of an instrument • Changing the size of a shadow • Changing the shape of an object	• Taking measurements • Gathering and recording results • Presenting results • Interpreting results

Comparative & fair testing:

- children identify the effect of changing one variable on another whilst attempting to keep other variables constant.
- children need to decide how they will measure/ observe the effects and choose a suitable way to collect the data, but have control over all of the other variables to ensure a fair test

Identifying, classifying & grouping:

- children identify features or tests that help them distinguish between different things
- enables children to learn the names of things, their characteristics, similarities and differences
- enables things to be grouped by observable features

Observing over time:

- identify, observe or measure changes over time
- can take place over a span of time from minutes and hours to weeks and months
- enables children to identify a pattern that may emerge from observations
- facilitates making predictions based on these observations
- may involve understanding natural sequences and cycles

Pattern seeking:

- children observe, measure and record events, systems or phenomena
- variables cannot be controlled
- survey or collect data from secondary sources
- identify relationships or patterns in observations or measurements
- can involve learning about causal relationships/cause and effect

Research using secondary sources:

- children use secondary sources of evidence
- often used when the question raised is impossible or unsafe for children to answer first hand
- enables children to compare and evaluate the information they gather from a range of sources
- enables children to see that questions don’t always have definite answers

Year 1

Year 1: Seasonal Changes:		
National Curriculum:	Knowledge:	Key Questions:
Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies	• Weather can change. (Hot, Cold, Rain, Snow) Winter is cold, Spring is warmer, Summer is hot and autumn is cooler. • The weather includes the temperature outside, wind direction and strength, as well as rain, cloud, snow and sun. • Daylight is when it is light outside. • The amount of daylight changes with the seasons. Longest day light in the summer and shortest in the winter. • There are four seasons: spring, summer, autumn, winter	• How long does it take for the ground to dry after it has been raining? • Do countries with higher temperatures have less rain? • How does rainfall and temperature change over time in our school grounds? • What do you notice about different leaves? • Why do you think leaves turn brown in autumn? • 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 or not enough rain?

Previous learning	Next learning
• Developing and 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.	• 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 an opaque object. • Find patterns in the way that the size of shadows change. • Space in Y5 • 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. • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Big Question:	Key Vocab:	Key Scientists:
What is it like in spring, summer, autumn and winter?	autumn, changes, day length, overcast, rain, seasons, snow, spring, summer, Sun, sunny, temperature, weather, wind, winter	George James Symons (Meteorologist) Anders Celsius (Astronomer, Physicist & Mathematician)

Working Scientifically Ideas:

In which month does it rain the most?	How would you identify and record the weather over a week or month?	How does a tree change over a year?	Does the wind always blow the same way?	Which countries in the world have different types of weather to us?

Common Misconceptions:	Texts:
• it always snows in winter it is always sunny in the summer • there are only flowers in spring and summer • it rains most in the winter.	*Tree: Seasons Come, Seasons Go* *(Patricia Hegarty and Britta Teckentrup)* *After the Storm* *(Nick Butterworth)*

Year 1: Materials		
National Curriculum:	Knowledge:	Key Questions:
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 & group together a variety of everyday materials on the basis of their simple physical properties.	• To name objects and mae what they are made of wood, plastic, glass, paper. • There are many different materials that have different describable and measurable properties. Colour, Hardness, strength, flexible, stretchy (Pliable) see through. • Group materials into into metals, rocks, fabrics, wood, plastic, ceramics and glass. Name/describe the materials properties. • The properties of a material determine whether they are suitable for a purpose. i.e. Waterproof, hard, flexible, strong, absorbent	It is recommended that materials be taught twice times in Y1. 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. • When is a wooden spoon more suitable than a plastic spoon? • Are all metals the same? • Is glass only used for windows? • Is all glass transparent? • Which materials can be recycled?

Previous learning:	Next learning:
• 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. • Manipulate materials to achieve a planned effect.	In Year 2 pupils will be taught to: Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. In Year 4 Pupils will be taught to: Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. In Year 5 pupils will be taught to: Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity and response to magnets. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. demonstrate that dissolving, mixing and changes of state are reversible changes. Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Big Question:	Key Vocab:	Key Scientists:

What are the things I have used in my model made from? Why are they the best choice for the job?	absorbent, bendy, dull, glass, hard, material, metal, object, opaque, plastic, properties, rock, rough, shiny, smooth, soft, stiff, stretchy, transparent, water, waterproof, wood	Charles Mackintosh (Chemist & Inventor) Ole Kirk Christiansen (Inventor)

Working Scientifically Ideas:				
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? Which materials are magnetic?	What happens to materials over time if we bury them in the ground? What happens to ice over time?	Is there a pattern in the types of materials that are used to make objects in a school?	How is glass made? What happens to our recycling?

Common Misconceptions:	Texts:
• only fabrics are materials • only building materials are materials • only writing materials are materials • the word ‘rock’ describes an object rather than a material • ‘solid’ is another word for hard.	*The Great Paper Caper* *(Oliver Jeffers)* *Who Sank the Boat* *(Pamela Allen)*

Year 1: Plants		
National Curriculum:	Knowledge:	Key Questions:
Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees.	• Name common plants daisy, tulip, and buttercup. • Name trees oak, sycamore, popular, spruce and pine • Understand that deciduous trees shed their leaves and evergreen keep their leaves during the winter. • Plants grow from seeds/bulbs. • Plants need light and water to grow and survive. • Name the structure of a tree –roots, trunk, braches and leaves • Name the flowering plant Roots, stem, leaves, petals	• 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 tree/flower/plant on the planet?
Previous learning • Develop an understanding of growth. • Shows care and concern for living things and the environment. • Make observations of plants and explain why some things occur, and talk about changes. • Can talk about some of the things they have observed, such as plants.		Next learning In Year 2 pupils will be taught to: Observe and describe how seeds and bulbs mature into plants. Find out and describe how plants need water, light and a suitable temperature to grow. In Year 3 pupils will be taught to: Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
Big Question:	Key Vocab:	Key Scientists:
How many types of plants are there?	blossom, branch, bud, bulb, deciduous, evergreen, flower, flowering, fruit, garden, leaf, leaves, petals, roots, seed, stem, trunk, vegetables, wild	Beatrix Potter (Botanist & Natural Scientist) John Ray (Naturalist)
Working Scientifically Ideas:		

Which type of compost grows the tallest sunflower? Which variety of potato grows best in our outdoor area?	How can we sort the leaves that we collected on our walk? What is this plant's name?	How does a daffodil bulb change over the year? How does my sunflower change each week?	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?

Common Misconceptions:	Texts:
• plants are flowering plants grown in pots with coloured petals and leaves and a stem • trees are not plants • all leaves are green • all stems are green • a trunk is not a stem • blossom is not a flower.	*A Little Guide to Wild Flowers* *(Charlotte Voake)* *The Things That I LOVE about TREES* *(Chris Butterworth)* *Harry's Hazelnut* *(Ruth Parsons)*

Year 1: Animals Incl. Humans		
National Curriculum:	Knowledge:	Key Questions:
• Identify and name a variety of common animals including • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	• Name the animal groups fish, amphibians, reptiles, birds and mammals. • Name animals from the groups • Describe their features (breath air) skin type (scales feathers,) how they give birth • Understand that animals have different diets. • 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 have different animals have different diets. carnivores, herbivores and omnivores • Name body parts for each sense.	• Name the animal groups? • Do all animals eat the same foods? • Which of our senses is the most accurate at identifying food? • Do all animals hunt? • Why are animals different colours and patterns?

• Previous learning • 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.	Next learning In Year 2 pupils will be taught to: Notice that animals, including humans, have offspring, which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival. Describe the importance for humans to exercise, eating the right amounts of different types of food, and hygiene. In Year 3 pupils will be taught to: Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Identify that humans and some other animals have skeletons and muscles for support, protection and movement. In Year 4 pupils will be taught to: Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey. In Year 5 pupils will be taught to: Describe the changes as humans develop to old age. In Year 6 pupils will be taught to: Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. describe the ways in which nutrients and water are transported within animals, including humans.

Big Question:	Key Vocab:	Key Scientists:
What are animals like?	arm, ears, elbow, eyes, face, fingers, foot, hair, hand, head, hearing, human body, knee, leg, mouth, neck, nose, sense, shoulder, sight, smell, sound, taste, teeth, texture, thumb, toes, touch, amphibians, animals, birds, carnivores, fish, habitat, herbivore, mammals, omnivore, pets, reptiles	Jane Goodall (Primatologist) Joan Beauchamp Procter (Zoologist)

Working Scientifically Ideas:				
Is our sense of smell better when we can't see?	How can we organise all the zoo animals? What are the names for all the parts of our bodies? Which sense do I use for…?	How does my height change over the year? How many animals can be found under a rock at different times of the year?	Do you get better at smelling as you get older? Do bigger animals have bigger poo?	Do all animals have the same senses as humans? How do we look after animals?

Common Misconceptions:	Texts:
• only four-legged mammals, such as pets, are animals • humans are not animals • insects are not animals • all 'bugs' or 'creepy crawlies', such as spiders, are part of the insect group • amphibians and reptiles are the same.	RSPB: My First Book of Garden Birds (Mike Unwin and Sarah Whittley) Snail Trail (Ruth Brown) Superworm (Julia Donaldson & Axel Scheffler)

Year 2

Year 2: Living Things and Their Habitat		
National Curriculum:	Knowledge:	Key Questions:
• Explore and compare the differences between things that are living, dead, and things that have never been alive • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • Identify and name a variety of plants and animals in their habitats, including micro-habitats • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	• Some things are living, some were once living but now dead and some things never lived. • All living things move, breathe, sense, grow, make babies, get rid of waste and get their energy from food. • 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. • Arrows in a food chain show the flow of energy.	• Do all animals eat the same thing? • Which animals hunt, and which animals are hunted? • 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 don't? • How do habitats change over our school year?

• Previous learning • 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.	• Next learning • In Year 4 pupils will be taught: • To recognise that living things can be grouped in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose dangers to living things. • In Year 5 pupils will be taught: • To describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals. • In Year 6 pupils will be taught: • To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. give reasons for classifying plants and animals based on specific characteristics.

Big Question:	Key Vocab:	Key Scientists:
Why do different animals live in different places?	alive, animals, basic needs, characteristics, conditions, dead, depend on, environment, food, food chain, habitat, healthy, living, micro-habitat, plants, provide, shelter, sources, suited	Rachel Carson (Marine Pollution) Liz Bonnin (Conservationist)

Working Scientifically Ideas:				
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 period of a 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 India different to the ones that we find in Britain? How does the habitat of the Arctic compare with the habitat of the rainforest?

Common Misconceptions:	Texts:
• an animal's habitat is like its 'home' • plants and seeds are not alive as they cannot be seen to move • fire is living • arrows in a food chain mean 'eats'.	*The Gruffalo (Julia Donaldson)* *Meerkat Mail (Emily Gravett)* *No Place Like Home (Jonathon Emmett)*

Year 2: Plants		
National Curriculum:	Knowledge:	Key Questions:
• Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• Name plant parts Roots Stem, Petals, leaves, seeds, sepal, stigma, stamen • 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).	• 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? • How does light affect plant growth? • How does warmth affect plant growth? • What does the life cycle of a blackberry look like?
Previous learning • Children should know how to identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • They should be able to identify and describe the basic structure of a variety of common flowering plants, including trees.	Next learning In Year 3 pupils will be taught to: • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. explore the requirements of plants for life and growth and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. In Year 5 pupils will be taught: • To describe the life process of reproduction in some plants	•

Big Question:	Key Vocab:	Key Scientists:
What should I do to grow a healthy plant?	bulbs, environment, germination, grow, healthy, light, mature plants, reproduction, seeds, store of food, survival, temperature, water	Captain Cook (Botanist) Agnes Arber (Botanist) Alan Titchmarsh (Botanist & Gardener)

Working Scientifically Ideas:				
Do cress seeds grow quicker inside or outside? What conditions are needed for a seed to grow?	Can we identify and group different seeds and bulbs?	What happens to my bean after I have planted it? How long does it take for a seed to grow?	Do bigger seeds grow into bigger plants?	How does a cactus survive in a desert with no water?

Common Misconceptions:	Texts:
• plants are not alive as they cannot be seen to move • seeds are not alive • all plants start out as seeds • seeds and bulbs need sunlight to germinate.	*Jack and the Beanstalk* *(Richard Walker)* *Ten Seeds* *(Ruth Brown)* Tiny Seed (Eric Carle)

Year 2: Animals Including Humans		
National Curriculum:	Knowledge:	Key Questions:
• Notice that animals, including humans, have offspring which grow into adults. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	• Animals reproduce new animals when they reach maturity. • Some animals give birth to live young and some animals lay eggs. • Animals grow until maturity and then don't grow any larger. All animals eventually die. • Different animals move in different ways to help them survive. • Exercise and a good diet keeps animals' bodies in good condition and increases survival chances. • To stop illness and infection we need to maintain a healthy lifestyle and keep ourselves clean.	• 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? • What do we 'want' and what do we 'need'? • Why do we need to eat different types of food? • Do all babies look like their parents?
Previous learning •Should be able to name a variety of common animals including fish, amphibians, reptiles, birds and mammals •Can name a variety of common animals that are carnivores, herbivores and omnivores. • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) •Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	Next learning In Year 3 pupils will be taught to: Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Identify that humans and some other animals have skeletons and muscles for support, protection and movement. In Year 4 pupils will be taught to: Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey. In Year 5 pupils will be taught to: Describe the changes as humans develop to old age. In Year 6 pupils will be taught to: Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans.	

Big Question:	Key Vocab:	Key Scientists:
Do living things change or stay the same?	adult, air, animals, baby, basic needs, child, exercise, food, growth, humans, hygiene, maturity, nutrition, offspring, reproduction, survival, teenager, toddler,	Florence Nightingale (Pioneer of modern nursing in GB) Steve Irwin (Wildlife expert)

	water, egg/chick/chicken, spawn/tadpole/frog, egg/caterpillar/pupa/butterfly, lamb/sheep	

Working Scientifically Ideas:				
Do bananas make us run faster?	Which offspring belongs to which animal?	How does a tadpole/butterfly 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?

Common Misconceptions:	Texts:
• an animal's habitat is like its 'home' • all animals that live in the sea are fish • respiration is breathing • breathing is respiration.	*The Disgusting Sandwich* *(Gareth Edwards and Hannah Shaw)* *Tadpole's Promise* *(Jeanne Willis and Tony Ross)*

Year 2: Materials		
National Curriculum:	Knowledge:	Key Questions:
• 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). • Materials can be used for more than one thing e.g. metal: coins, cans, cars, table legs. • Different materials can be used for the same thing e.g. a spoon made from wood, metal, plastic. • Suitability means having the right properties for a particular purpose.	• Which rocks are the least crumbly? • Which materials absorb the most water? • Which material would be the strongest to use as to make a roof on a model? • How long do plastics last for? • What types of bricks can you see in our village? • Which material makes the bounciest ball? • What are aeroplane wheels made out of and why?
Previous learning • 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 on the basis of their simple physical properties.	Next learning In Year 4 Pupils will be taught to: Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. In Year 5 pupils will be taught to: Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. demonstrate that dissolving, mixing and changes of state are reversible changes. Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	

Big Question:	Key Vocab:	Key Scientists:
Would a house of cardboard be suitable for the Three Little Pigs?	bending, brick, cardboard, changed, glass, materials, metal, paper, plastic, properties, purpose, rock, shapes, squashing, stretching, suitability, suitable, twisting, unsuitable, uses, wood	John Dunlop (Inventor) Robert Gair (Inventor)

Working Scientifically Ideas:				
Are all objects made out of metal rigid?	Can you group different types of paper and cardboard? How can we group the materials based on how they can be changed?	How do different types of paper/card change over time when they are buried in the ground?	How does water affect the strength of different types of paper or cardboard?	How is corrugated cardboard made?

Common Misconceptions:	Texts:
• only fabrics are materials • only building materials are materials • only writing materials are materials • the word rock describes an object rather than a material • solid is another word for hard.	*The Tin Forest* *(Helen Ward)* *Traction Man (Mini Grey)* *Three Little Pigs* *(Lesley Sims)*

Year 3

Year 3: Plants		
National Curriculum:	Knowledge:	Key Questions:
• Identify and describe the functions of different parts of flowering plants: roots; stem/trunk; leaves; and flowers. • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. • Investigate the way in which water is transported within plants. • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	• To name the function of the Roots, Stem, petals, leaves, stigma sepal stamen. • Plants are producers, they make their own food. • Water is transported from the roots through the stem and out through the leaves. • Their leaves absorb sunlight and carbon dioxide. (Photosynthesis) • Plants have roots, which provide support and draw water from the soil. • To state how a flowering plant is pollinated. • Observe how seeds are dispersed (Dandelion Clock) • Flowering plants have specific adaptations, which help it to carry out pollination, (Coloured and scented petals) fertilisation and seed production. • Seed dispersal improves a plant's chances of successful reproduction. • Seeds/bulbs require the right conditions to germinate and grow. • Seeds contain enough food for the plant's initial growth.	• How do plants reproduce? • How do insects know which flowers to pollinate? • Why do flowers smell? • What do seeds do? • Can a plant live without its leaves? • 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? • Do plants take in water through their roots? • How does water move through the plant?

Previous learning	Next learning
• Children should know how to identify and name a variety of common wild and garden plants, including deciduous and evergreen trees •They should be able to identify and describe the basic structure of a variety of common flowering plants, including trees. •Children should be taught to observe and describe how seeds and bulbs grow into mature plants	In Year 5 pupils will be taught: To describe the life process of reproduction in some plants

•Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	

Big Question:	Key Vocab:	Key Scientists:
Why do plants have flowers?	air, anchor, fertiliser, flowering plants, flowers, functions, growth, leaves, life, life cycle, light, nutrients, nutrition, plants, pollination, reproduction, requirements, room to grow	Stephen Hales (Botanist) Anna Atkins (Botanist & Photographer)

Working Scientifically Ideas:				
How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals? Does the amount of fertiliser affect how a plant grows?	How many different ways can you group our seed collection? Can you identify all the parts of a flowering plant?	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? How is a cactus the same/different to a birch tree?

Common Misconceptions:	Texts:
• plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem.	*The Story of Frog Belly Rat Bone* *(Timothy Basil Ering)* *The Hidden Forest* *(Jeannie Baker)*

Year 3: Animals Including Humans		
National Curriculum:	Knowledge:	Key Questions:

• Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food – they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	• Different animals are adapted to eat different foods. (Carbohydrates, sugar, Protein, fats & vitamins) • To stay healthy, humans need to exercise, eat a healthy diet and be hygienic. • Many animals have skeletons to protect vital organs inside the body, allow movement and support the body and stop it from falling on the floor. • Muscles are connected to bones and move them when they contract. • Movable joints connect bones.	• Why do we need a skeleton? • What types of skeletons 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?

Previous learning •Should be able to notice that animals, including humans, have offspring which grow into adults. •Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). •Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Next learning In Year 4 pupils will be taught to: Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey. In Year 5 pupils will be taught to: Describe the changes as humans develop to old age. In Year 6 pupils will be taught to: Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans.

Big Question:	Key Vocab:	Key Scientists:
Why do animals have skeletons? What is a healthy diet and why is it important?	amount, animals, body parts, carbohydrates, diet, eat, endoskeleton, exoskeleton, fats, fibre, food, food groups, functions, healthy, humans, invertebrates, joints, meals, minerals, movement, muscles, nutrition, protection, protein, skeletons, support, types, vertebrates, vitamins	Marie Curie- Radiation Wilhelm Rontgen - X rays Adelle Davis -Nutritionist
Working Scientifically Ideas:		

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? Can bones be grouped? How?	How does our skeleton change over time (from birth to death)?	Do all animals have a [name of bone] e.g. tibia?	Why do different types of vitamins keep us healthy and which foods can we find them in?

Common Misconceptions:	Texts:
• certain whole food groups like fats are 'bad' for you • certain specific foods, like cheese are also 'bad' for you • diet and fruit drinks are 'good' for you • snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.	*Funnybones* *(Janet and Allan Ahlberg)* *I Will Never Not Ever Eat a Tomato* *(Lauren Child)*

Year 3: Rocks		
National Curriculum:	Knowledge:	Key Questions:
• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Recognise that soils are made from rocks and organic matter.	• Some rocks are natural and some are human-made. • There are 3 types of naturally occurring rock.(Sedimentary, Metamorphic, Igneous) • Soil is the uppermost layer of the earth and is made up of different things. • soils are made from rocks and organic matter • Different plants grow in different soils. • Fossils tell us what has happened before (they give us evidence) and show that living things have changed over time. • Fossils are most commonly found in sedimentary rock. • Palaeontologists use Fossils to find out about the past.	• How are the soils different? • Which do you think has the best drainage? • Which is more likely to lead to flooding? • How many soil types have we found? • How might the soil be different in different countries? • What rock is best for a kitchen chopping board? • 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? • How are fossils created? • Why do fossils help us find out about historical events?

Previous learning	Next learning
•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.	In Year 6 pupils will be taught to: Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Big Question:	Key Vocab:	Key Scientists:
What are rocks and soils like?	appearance, buildings, crystals, formed, fossils, grains, gravestones, organic matter, physical properties, rocks, sedimentary rock, soils, trapped, igneous, metamorphic	Mary Anning (Palaeontologist) Florence Bascom (Geologist)

Working Scientifically Ideas:

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 volcanoes on planet Earth?	Who was Mary Anning and what did she discover?

Common Misconceptions:	Texts:
• rocks are all hard in nature • rock-like, man-made substances such as concrete or brick are rocks • materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural' • certain found artefacts, like old bits of pottery or coins, are fossils • a fossil is an actual piece of the extinct animal or plant • soil and compost are the same thing.	*The Pebble in My Pocket* *(Meredith Hooper)* *Stone Girl, Bone Girl* *(Laurence Anholt)* *The Street Beneath My Feet* *(Charlotte Guillain & Yuval Zommer)*

Year 3: Light

National Curriculum:	Knowledge:	Key Questions:
• 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 an opaque object. • Find patterns in the way that the size of shadows change.	• There must be light for us to see; without light, it is darkness. • We need light to see things, even shiny things. • Transparent materials let light through them and opaque materials don't let light through. • Shadow is form by blocked light. • Translucent blocks some light but not all. • Beams of light bounce off some materials (reflection). • Smooth, shiny materials reflect light beams better than bumpy, non-shiny materials.	• 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?) • What colour would be the best to make a safety jacket? • How does the colour of a material affect how reflective it is? • How does the 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?

	• Light comes from a source. • Light travels in straight lines • Light reflects from surfaces. • Reflective materials can be very useful e.g. cat's eyes, hi-vis jacket.	

Previous learning	Next learning
•May have some knowledge of were light comes from. •Will most likely have seen their shadows and may know they appear when it is sunny. •Some understanding of a reflection. •May understand they need light to be able to see things.	In Year 6 pupils will be taught to: Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because 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.

Big Question:	Key Vocab:	Key Scientists:
What is a shadow? How does light affect a shadow?	Absence, beam, blocked, danger, dark, distance, glare, light, light source, mirror, opaque, patterns, protect, ray, reflect, shadows, Sun, surfaces, translucent.	Ibn al-Haytham "Alhazen" (Inventor) Justus Von Liebig (Mirrors)

Working Scientifically Ideas:				
How does the distance between the shadow puppet and the screen affect the size of the shadow? Which is the best material for a mirror?	How would you organise these light sources into natural and artificial sources?	Is the Sun the same brightness all day? How does my shadow change over a day/month/year?	Do all dark fabrics block out a light source?	Do cats eyes light up in the dark? Why can we see fireworks better at night?

Common Misconceptions:	Texts:

• we can still see even where there is an absence of any light • our eyes 'get used to' the dark • the moon and reflective surfaces are light sources • a transparent object is a light source • shadows contain details of the object, such as facial features on their own shadow • shadows result from objects giving off darkness.	*The Owl Who Was Afraid of the Dark* *(Jill Tomlinson)* *The Dark* *(Lemony Snicket)* *The Firework-Maker's Daughter* *(Philip Pullman)*

Year 3: Forces and Magnets		
National Curriculum:	Knowledge:	Key Questions:
• Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing.	• Forces can be pushes or pulls. • Friction is a force that acts between two surfaces or objects that are moving (or trying to move) across each other. • 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 (iron) which are affected by magnet strength, object mass, distance from object and object material. • Metals with Iron is are attracted to a magnet and no other metals. (Apart from some ceramics) • Magnets have two pole and opposites repel, like attracts. • Magnets have a polarity	•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 experienced? •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?

Previous learning	Next learning
•May have an awareness of how to make things stop and start.	In Year 5 pupils will be taught to: Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Big Question:	Key Vocab:	Key Scientists:
How can we move magnets?	attract, compass, contact, distance, forces, magnetic, materials, move, objects, poles, properties, pull, push, repel, strength, surface, uses	John McAdam (Civil Engineer & Road Builder) Isaac Newton (Physicist)

Working Scientifically Ideas:				
How do different surfaces affect the distance the car travels? Which magnet is strongest?	Which materials are magnetic?	If we magnetise a pin, how long does it stay magnetised for?	Do magnets need to touch to work? Are all shiny materials magnetic?	How have our ideas about forces changed over time? How does a compass work?

Common Misconceptions:	Texts:
• the bigger the magnet the stronger it is • all metals are magnetic.	*The Iron Man* *(Ted Hughes)* *Mrs Armitage: Queen of the Road* *(Quentin Blake)*

Year 4

Year 4: Living Things and Their Habitat		
National Curriculum:	Knowledge:	Key Questions:
• 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. • Animals, plants, microorganisms • Vertebrates, - Mammals, birds, amphibians, reptiles, fish (and their characteristics) • Invertebrates - Insects, arachnids, molluscs • To use classification Keys • To classify animals into groups (family, order) • Environmental change can positively or negatively affect a habitat; changes can be natural or caused by humans. • Organisms are affected in different ways by environmental change. • Conservationists work to help promote the protection of the environment.	• 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? (pond, compost, wildflowers, litter picking) • How does human activity affect our environment? (new house buildings, use of pesticides, deforestation)

Previous learning	Next learning
• 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. • Explore and compare the differences between things that are living, dead, and things that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	In Year 5 pupils will be taught: To describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals. In Year 6 pupils will be taught: To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. give reasons for classifying plants and animals based on specific characteristics.

Big Question:	Key Vocab:	Key Scientists:
Are living things in danger?	amphibians, birds, change, classification key, danger, deforestation, development, environment, fish, flowering, habitat, human impact, invertebrates, litter, living things, mammals, nature reserve, negative, non-flowering, population, positive, reptiles, vertebrate	Jacques Cousteau (Marine Biology) Cindy Looy (Environmental Change and Extinction)

Working Scientifically Ideas:				
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?	Has the use of insecticides affected the bee population?	Why are people cutting down the rainforests and what effect does that have?

Common Misconceptions:	Texts:
• the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative.	*The Vanishing Rainforest* *(Richard Platt)* *The Morning I Met a Whale* *(Michael Morpurgo)* *Journey to the River Sea* *(Eva Ibbotson)*

Year 4: Animals Including Humans		
National Curriculum:	Knowledge:	Key Questions:
• 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.	• To name the teeth and their function. Teeth (including humans) are designed to eat different foods depending on the diet of the animal. • 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; this flow of energy is shown on a food chain.	• 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 faeces and urine?

Previous learning	Next learning
• Should be able to notice that animals, including humans, have offspring which grow into adults. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	In Year 5 pupils will be taught to: Describe the changes as humans develop to old age. In Year 6 pupils will be taught to: Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans.

Big Question:	Key Vocab:	Key Scientists:

What do our bodies do with the food we eat?	canine, carnivore, consumers, damages, digestive system, food chain, functions, herbivore, humans, incisor, large intestine, molar, mouth, oesophagus, predators, premolar, prey, producers, small intestine, stomach, teeth, tongue	Ivan Pavlov (Digestive System Mechanisms) Joseph Lister (Discovered Antiseptics)

Working Scientifically Ideas:				
In our class, are omnivores taller than vegetarians?	What are the names for all the organs involved in the digestive system? Look at examples of teeth. Can we organise them into groups?	How does an egg shell change when it is left in cola, milk, water, vinegar? What does this tell us about oral hygiene?	Are foods that are high in energy always high in sugar?	How do dentists fix broken teeth?

Common Misconceptions:	Texts:
• arrows in a food chains mean 'eats' • the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain • there is always plenty of food for wild animals • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another • the food you eat becomes "poo" and the drink becomes "wee".	*Human Body Odyssey* *(Werner Holzwarth)* *Crocodiles Don't Brush Their Teeth* *(Colin Fancy)* *Wolves* *(Emily Gravett)*

Year 4: States of Matter		
National Curriculum:	Knowledge:	Key Questions:
• Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).	• Materials can be divided into solids, liquids and gases. • Name the properties of Solid Liquid and gas. • Some materials can change from one state to another and back again. (Reversible) • Heating causes solids to melt into liquids and liquids evaporate into gases.	• 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? • Are all liquids the same? • How does the material sprinkled on ice affect how quickly it melts? • How does the type of chocolate affect its melting temperature?

• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• 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. • Condensation and evaporation occur within the water cycle. • Draw the water cycle.	• 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?

Previous learning	Next learning
• 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 on the basis of their simple physical properties. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	In Year 5 pupils will be taught to: Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate that dissolving, mixing and changes of state are reversible changes. explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Big Question:	Key Vocab:	Key Scientists:
How can water change?	change state, condensation, condense, cooled, degrees Celsius, escape, evaporation, everyday materials, gases, heated, liquids, melt, pool, shape, solids, substance, temperature, water cycle	Daniel Gabriel Fahrenheit (Physicist) Antoine Lavoisier (Chemist)

Working Scientifically Ideas:

How does the mass of a block of ice affect how long it takes to melt? Where is the best place to dry laundry?	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 the evaporation rate change as you add more salt to your water?	What are hurricanes, and why do they happen?

Common Misconceptions:	Texts:
• 'solid' is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms – steam, water, ice – are all different substances • all liquids boil at the same temperature as water (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen)	*Charlie and the Chocolate Factory* *(Roald Dahl)* *Once Upon a Raindrop: The Story of Water* *(James Carter)* *Sticks* *(Diane Alber)*

Year 4: Sound

National Curriculum:	Knowledge:	Key Questions:
• Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.	• Sound is a type of energy created by vibrations; the louder the sound, the bigger the vibration. • Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Changing the shape, size and material of an object will change the sound it produces. • Sound moves through all materials by making them vibrate; changing the way an object vibrates changes it's sound. • Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds.	• 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/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) • How does the 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?

Previous learning	Next learning	
●May have some understanding that objects make different sounds. ●Some understanding that they use their ears to hear sounds. ●Know about their different senses.	Not revisited until KS3	

Big Question:	Key Vocab:	Key Scientists:
How can we make different sounds?	distance, ear, fainter, features, high, instruments, insulation, loud, low, pitch, quiet, sound, sound source, strength, travel, vibrating, volume	James West (Inventor & Acoustician) Alexander Graham Bell (Inventor & Engineer)

Working Scientifically Ideas:				
How does the volume of a drum change as you move further away from it? How does the length of a guitar string affect the pitch of the sound?	Which material is best to use for muffling sound in ear defenders? Can you make a guitar that makes 4 different sounds?	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?

Common Misconceptions:	Texts:
• sound is only heard by the listener • sound only travels in one direction from the source • sound can't travel through solids and liquids • high sounds are load and low sounds are quiet.	

Year 4: Electricity		
National Curriculum:	Knowledge:	Key Questions:
• Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors.	• Identify common appliances that run on electricity. • A primary cell or secondary cell source of electricity (mains of battery or battery) is needed for electrical devices to work. • Electricity sources push (Volt) electricity round a circuit. • More batteries (Voltage) will push the electricity more power. • 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. • To produce a circuit with bulb and switch. • Draw a circuit diagram. • To recognise a circuit diagram , cell, bulb, switch	• What would life be like without electricity? • What sorts of things use/need electricity? • 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 the number of components? • How does the number of batteries added to the circuit affect a device? • What materials can carry electricity? (conductors/insulators)
Previous learning • May have some understanding that objects need electricity to work. • May understand that a switch will turn something on or off.	Next learning In Year 6 pupils will be taught to: Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. Use recognised symbols when representing a simple circuit in a diagram.	

Big Question:	Key Vocab:	Key Scientists:

What can we do with electricity?	appliances, battery, brighter, bulb, buzzer, cell, components, conductor, device, electricity, insulator, lamp, loop, metals, motor, parts, series circuit, switch, wire	Hertha Ayrton (Engineer, Physicist & Inventor) Joseph Swan (Physicist, Chemist & Inventor)

Working Scientifically Ideas:				
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? Why?	How has electricity changed the way we live? How does a light bulb work?

Common Misconceptions:	Texts:
• electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • electricity works by simply coming out of one end of a battery into the component.	*Oscar and the Bird: A Book about Electricity (Geoff Waring)* *Electrical Wizard: How Nikola Tesla Lit Up the World (Elizabeth Rusch)*

Year 5

Year 5: Living Things and Their Habitats		
National Curriculum:	Knowledge:	Key Questions:
• 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.	• 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 life cycles • To name the life cycle of a amphibian, insect and bird • To state the life cycle of a human • To state the lifecycle of flower plants – understand full cycle of pollination. Insect transfer from plant to plant to exchange material reproduction to replace itself. • To state the life cycle of non-flowering plants	• Do all animal embryos look the same? • Are all life cycles the same? • Are there any patterns between vertebrate animals and their gestation periods? • Do plants reproduce in the same ways as humans? • How do plants spread their seeds?

Previous learning	Next learning
• 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. • Explore and compare the differences between things that are living, dead, and things that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including microhabitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. • 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.	In year 6 pupils will be taught to: To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. give reasons for classifying plants and animals based on specific characteristics.

• Recognise that environments can change and that this can sometimes pose dangers to living things.	

Big Question:	Key Vocab:	Key Scientists:
Do all plants and animals reproduce in the same way?	amphibians, animals, asexual, birds, bulb, changes, cuttings, differences, dispersal, fertilisation, gestation, habitats, insects, life cycle, life process, mammals, parent plant, plants, pollination, reproduction, root, seed, sexual, similarities, stem, tuber	Mary Agnes Chase (Botanist) David Attenborough (Broadcaster & Natural Historian)

Working Scientifically Ideas:				
Which seed shape takes the longest time to fall?	Can you create a classification key for a group of plants?	How does a flower bud change as it opens? How does an animal change over time (e.g. hatching chicks)?	Is there a relationship between a mammal's size and its gestation period?	What are the differences in the life cycles of an insect and a mammal?

Common Misconceptions:	Texts:
• all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds • only birds lay eggs.	*Whales* *(Kelsey Oseid)* *Life Cycles* *DK and Sam Falconer*

Year 5: Animals Including Humans		
National Curriculum:	Knowledge:	Key Questions:
• Describe the changes as humans develop to old age.	• 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. • Humans reproduce sexually where offspring inherit information from both parents. • The average length of gestation in humans is 280 days, or 40 weeks.	• What do humans look like at each stage? • How and why do humans change? • What causes puberty? • What changes do we go through during puberty? • How do the gestation periods of other animals compare to humans?

Previous learning	Next learning
• Should be able to notice that animals, including humans, have offspring which grow into adults. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement. • Describe the simple functions of the basic parts of the digestive system in humans. • Identify the different types of teeth in humans and their simple functions. • Construct and interpret a variety of food chains, identifying producers, predators and prey.	In Year 6 pupils will be taught to: Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans.

Big Question:	Key Vocab:	Key Scientists:
How do humans change across their lifetime?	adolescent, adult, animals, baby, changes, develop, embryo, foetus, gestation, growth, hormones, humans, old age, puberty, teenager, timeline, toddler	Elizabeth Blackwell (Doctor) Patrick Steptoe, Robert Edwards & Jean Purdy (Obstetrician, Physiologist & Embryologist)

Working Scientifically Ideas:

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 and put it on a timeline?	How does the mass of a baby change over time?	Is there a relationship between a mammal's size and its gestation period?	What are the longest and shortest gestation periods in mammals? Why do people get grey/white hair when they get older?

Common Misconceptions:	Texts:
• a baby grows in a mother's tummy • a baby is "made".	*If All The World Were* *(Joseph Coelho and Allison Colpoys* *Hair in Funny Places* *Babette Cole*

Year 5: Properties and Changes of Materials		
National Curriculum:	Knowledge:	Key Questions:
• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	• All matter (including gas) has mass. • To group materials based on their properties hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • Sometimes mixed substances react to make a new substance. • To know some materials dissolve to create a solution. Some materials do not dissolve • Dissolving is a reversible change and can be reversed by sieving, filtering, evaporating. • Design an investigation and carry out a fair test through materials. • 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).	• How would we know if we have made a new material or the same material just mixed differently? • Add baking powder to vinegar, it fizzes up. Has a new substance been made? (Yes the gas was not in the vinegar as it wasn't fizzy, so it must have been made). • 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?
Previous learning To identify a variety of everyday materials including wood, plastic, glass, metal, water and rock. To understand the physical properties of a variety of everyday materials (including those that are transparent) and to compare and group materials on the basis of these properties How materials are suitably used based on their properties. How magnets and electrical circuits work.	Next learning Revisited in KS3	

Some materials which are magnetic. To explain how shapes of solid objects can be changed by squashing, bending, twisting and stretching. To describe materials that are solids, liquids and gases and their particle structure. To explain that some materials change state when they are heated or cooled and the temperature at which this happens. To describe the roles of melting, evaporation and condensation in the water cycle and the role temperature has on the rate of evaporation. To describe that some rocks are permeable.	

Big Question:	Key Vocab:	Key Scientists:
How can we change materials?	acid, bicarbonate of soda, burning, chemical changes, chemists, dissolve, electrical conductivity, evaporate, everyday materials, filter, formation, gas, hardness, irreversible, liquid, magnets, melt, metal, mixtures, new materials, plastic, properties, reactions, reversible changes, rusting, separate, sieve, solid, solubility, solution, suspension, thermal conductivity, transparency, wood	Spencer Silver & Arthur Fry (Chemist & Inventor) Stephanie Kwolek (Chemist)

Working Scientifically Ideas:				
Which material rusts fastest/slowest? How can we change how wobbly jelly is?	Can you identify and classify these reactions and changes into reversible and irreversible? Can you describe their group's similarities and differences?	How does a nail in salt water change over time? How can you get the salt back from the water?	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?

Common Misconceptions:	Texts:
• thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.	*George's Marvellous Medicine* *Roald Dahl* *Itch* *(Simon Mayo)*

Year 5: Earth and Space

National Curriculum:	Knowledge:	Key Questions:
• 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. • Use 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. • Know why night and day occur due to rotation. • Know sessions occur due to orbit of the earth around the sun. • Name the planets of our solar system in order and show their orbit around the sun • The earth takes 365 to rotate the sun, 24 hours to rotate (day) other planets have different years and days. • Objects with larger masses exert bigger gravitational forces. • Smaller mass objects like planets orbit large mass objects like stars. • Stars produce vast amounts of heat and light. (Suns) • All other objects are lumps of rock, metal or ice and can be seen because they reflect the light where as suns have their own light source.. • Describe the movement of the Moon relative to the Earth -28 days cycle and the moon always faces the earth on one face.	• How does temperature/size/day length/year length change as you get closer/further to the Sun? • 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? • 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?

Previous learning	Next learning
•May have some knowledge about space.	In Year 7 pupils will be taught: The composition of the Earth and the structure of the Earth. The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. Earth as a source of limited resources and the efficacy of recycling. The carbon cycle and the composition of

•Have some understanding about how the earth orbits the sun.	the atmosphere The production of carbon dioxide by human activity and the impact on climate. Gravity forces between the earth and the moon and the earth and the sun. Sun as a star, and stars in other galaxies. Seasons and the earths tilt, day length. Light years.

Big Question:	Key Vocab:	Key Scientists:
Sun, Earth & Moon: What is moving and how do we know?	Orbit, rotation, axis, astronomical clock, axis, celestial body, day, Earth, geocentric, heliocentric, Jupiter, Mars, Mercury, Moon, movement, Neptune, night, orbit, phases, planets, , Saturn, shadow clock, solar system, spherical, star, Sun, sundial, Uranus, Venus	Galileo Galilei (Astronomer, Physicist & Engineer) Tim Peake (Astronaut)

Working Scientifically Ideas:				
How does the number 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?	s there a pattern between the size of a planet and the time it takes to travel around the Sun?	How have our ideas about the solar system changed over time?

Common Misconceptions:	Texts:
• the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.	*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)*

Year 5: Forces

National Curriculum:	Knowledge:	Key Questions:
• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	• Gravity is a force (measured in N) • Gravity is 9.9N and is constant (each object will fall at the same rate (Minus resistance) • Air resistance and water resistance are forces against motion caused by	• What actually is a force? • How can a force act on an object? • How can we see/measure forces? • How does the saltiness (salinity) of water affect the water resistance?

	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. • Some objects/animals are streamlined to minimise the effects of air/water resistance. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. • Understand FxD = FxD on a seesaw. • To create gears to reduce load.	• How does 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 more? • What is the most effective way to move an object? • How do see-saws work? • Can you create a pulley system to lift a given load?

Previous learning •May have an awareness of how to make things stop and start. •Compare how things move on different surfaces. •Notice that some forces need contact between two objects, but magnetic forces can act at a distance. •Observe how magnets attract or repel each other and attract some materials and not others. •Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet,and identify some magnetic materials. •Describe magnets as having two poles. •Predict whether two magnets will attract or repel each other, depending on which poles are facing.	Next learning Revisited in KS3	

Big Question:	Key Vocab:	Key Scientists:
How and why do objects move?	air resistance, Earth, fall, faster, force, friction, gear, gravity, greater, level, machines, mechanism, movement, object, opposing, parachute, pulley, slow down, smaller, stop, surface, theory of gravitation, unsupported, water resistance	Albert Einstein (Theoretical Physicist) Archimedes (Mathematician, Engineer & Inventor)
Working Scientifically Ideas:		

What size makes the best helicopter wing? How does the size of an object affect the time it takes to fall?	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 the surface area of a parachute affect the time it takes to fall?	How do submarines sink if they are full of air? Where do you find gears in the world?

Common Misconceptions:	Texts:
• the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float.	Stick and Stone Beth Ferry & Tom Lichtenheld Aerodynamics of Biscuits Clare Helen Walsh & Sophia Touliatou