Waltham Leas Primary Academy **Subject: Science** **Leader: S Connell / A Allenson**

Statements in black: Guidance of skills and knowledge to cover within each unit of work.
Statements in Blue: Taken directly from the National Curriculum.
Assessment opportunities in red : Activities that will be used during and at the end of the topic to assess the children's knowledge and skills development. Teachers will assess over time through listening to children verbalise knowledge and use games, quizzes and prior learning checks to assess their understanding. Assessment indicators are to guide teachers when assessing whether a child is working towards the objective, at or can go further.

The **intent** of our Science Curriculum at Waltham Leas Primary Academy:

At Waltham Leas Primary Academy, our teachers and children are enthused and excited by science. We create an inclusive environment where every child feels valued, supported, and confident to contribute their ideas. By fostering collaboration and teamwork, children learn that science is not only about discovery but also about community—working together, respecting diverse perspectives, and celebrating shared achievements.

We want every child to feel a deep sense of **belonging** in science—knowing they are part of a community of learners who are curious, confident, and connected. This belonging ensures that science is not just a subject they study, but a shared journey that shapes their identity, their future, and their place in the wider world.

We ensure that staff are confident in their own knowledge and understanding so that lessons are cross-curricular, interactive, enjoyable, and immersive. We give children the opportunity to learn through hands-on activities and investigations. Our curriculum is designed so that children talk about science, share ideas, challenge, explore, experiment, and question each other's knowledge and opinions.

We **empower** our children to develop enquiring minds and explain, report, and conclude using scientific vocabulary and terminology. Throughout their time at Waltham Leas, our children are taught to use the different enquiry types, enabling them to work scientifically; relating practical activities to real-life contexts. This approach helps them develop an understanding, respect, and appreciation of the world they live in.

Our goal is for our children to **grow with purpose** and to be equipped with essential scientific skills for life. We encourage them to develop a curiosity and interest in science by exploring various scientific fields. We invite parents to engage with our children by discussing their jobs in science and by utilizing the facilities at our local secondary school to enhance our curriculum. This collaboration enriches our students' experiences and fosters their ability to question the world around them while seeking answers to those questions.

Progression is planned carefully from FS to Year 6 to develop both scientific skills and scientific knowledge. We aim to develop a greater independence in all aspects of: observations over time; pattern seeking; identifying, classifying, and grouping; collaborative and fair testing and research from secondary resources to consider and answer a range of scientific questions.

In recent years, Waltham has expanded rapidly from a village to become a small town. There are a great many amenities enjoyed by the residents and it has developing industry and trade. As such we believe it is important for the children to develop their understanding and knowledge of science so that they are able to take advantages of the many opportunities presented.

The **aims for implementation** of the National Curriculum and the Science curriculum at Waltham Leas is to develop:

- positive attitudes and a deep curiosity towards science
- an understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- an ability to reason, think logically and to communicate scientifically
- the ability and understanding to use and apply science in real life
- the scientific knowledge required to understand the uses and implications of science, today and for the future.
- high aspirations for their careers and their future.

Foundation Stage

During the Early Years Foundation Stage, the children at Waltham Leas will develop their scientific understanding throughout the year as part of story-based projects. A large emphasis is placed upon developing children's vocabulary through texts and first-hand experiences. Areas of provision, both indoors and outdoors, will support children to develop their scientific understanding e.g. by exploring changes of state with playdough or exploring the flow of water using gutters and pipes. Regular Outdoor Learning will provide opportunities for children to explore the changing seasons, different weather conditions, plants and animals within the school grounds. Children will be given multiple opportunities to explore scientific concepts such as changes of state and floating and sinking through play-based activities over the course of the year. They will be able to use a range of sources to support their enquiries including use of a variety of texts and first-hand observations, in relation to both core stories and the children's own interests. The development of these enquiry skills will prepare children for learning about different scientific processes as they progress onto the National Curriculum in Year 1. The Early Years Foundation Stage Framework (2021) Educational Programmes: Understanding the World Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting the park, library and farms / museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension. ELG: The Natural World : Children at the expected level of development will: - Explore the natural world around them, making observations and drawing pictures of animals and plants; - Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

EYFS Possible Prior Experiences

Knowledge and Understanding of the World-

- *Explored the natural world around them, making observations and drawing pictures of animals and plants*
- *Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experience*

Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter

Autumn term	**Spring term**	**Summer term**
Seasonal changes- Autumn and Winter **Autumn 1- Marvellous ME!** Naming and identifying human body parts Describe people who are familiar to the child, using photographs to describe them and compare similarities and differences. Opportunities to learn how to take care of themselves. *Enquiry opportunities:* *Classification* • *Sort images of people according to their characteristics.* *Researching using secondary sources* • Find out information from visitors (dentist, nurse etc.). *Pattern seeking* • *Are taller children faster?* • *Are taller children stronger?* **Autumn 2- Party Party!** **Halloween- WOW science- magic potions** Vinegar and bicarbonate of soda - What can you observe happening? How can more bubbles be created? What can you tell me using your senses?	Seasonal changes - Spring **Spring 1- To Infinity and Beyond** Visit from the mobile planetarium Names of the planets Moon landings Being an astronaut (tasting freeze-dried foods) The sun, asteroids, stars etc Forces (gravity) bottle rocket experiment Observing that the Sun appears to move across the sky • Observing that it is warmer and brighter when the Sun is shining than when it is behind the clouds • Observing that they can see the Moon at night and sometimes in the day • Observing that they can only see the stars at night •Sharing books and video clips about the Earth, Sun, Moon, planets and stars • Talking about what happens and what they can see and hear in the daytime and at night *Enquiry opportunities:* *Comparative testing* • Make and testing air-propelled rockets to find out	Seasonal changes - Summer **Watch me grow!** Lifecycle of a caterpillar and frog- observing live caterpillars over time Sorting and classifying insects Observing minibeasts in their natural habitats Growing and caring for our vegetable garden How we have grown and changed Healthy eating and oral hygiene Opportunities to explore the plants in the surrounding natural environment • Taking photographs of the plants they find in the school grounds • Observing closely and drawing the plants in the school grounds • Finding plants in the school grounds to match with photographs of them Opportunities to explore the animals in the surrounding natural environment • Finding minibeasts in the school grounds • Taking photographs of the minibeasts they find in the school grounds • Matching the minibeasts they find to pictures that identify them

Enquiry opportunities *Observations over time* What happens to bath bombs when they are placed in water? What can you see when raisins are put in fizzy water/lemonade and watching them float and sink? What happens to coloured sweets dissolving in milk or water? How does a cake mixture change when it is heated? **Freezing and melting- penguins in ice eggs** Enquiry opportunities *Comparative testing* • How quickly do ice cubes melt in different areas of the playground? *Observing over time* • How does the block of ice change over time? • How does a snowman/ice egg change over time?	which is the 'best'. *Pattern seeking* • Find simple patterns in how light levels and temperature change with the movement, or obscuring of, the Sun. *Research using secondary sources* • Find out about the Solar System, stars and space travel. • Find out about nocturnal animals - Sorting small world animals into those that are active in the daytime and those that are active at night **Spring 2-Amazing Animals** **Seasonal changes- Spring** Sorting and classifying Recycling- oceans- sea creatures Floating and sinking (Noah's Ark- making a boat that will float) Sharing books about animals in the local area and animals in other countries e.g. jungle, polar regions, desert, ocean • Looking at pictures of animals in different habitats • Watching videos of animals in different habitats • Playing games involving matching animals to their habitats • Playing with small world animals in different habitats Encourage children to choose from a range of materials, including natural materials, when making models and identify a key property that was required. • Encourage children to reuse materials and talk	• Observing the minibeasts closely, using a magnifying glass or app on a tablet • Drawing pictures of the minibeasts • Creating a map to show where they found each type of minibeast • Sharing books about minibeasts • Playing with small world minibeasts • Building minibeast homes *Enquiry opportunities* *Classification* • Name and describe plants and animals they find in the school grounds. *Pattern seeking* • Look for minibeasts in different areas of the school grounds. • Look for plants in different areas of the school grounds. **Summer 2- Superheroes!** **Seasonal changes- Summer- keeping safe in the sun** superhero experiments involving magnets and ice (freezing and melting revisited) Forces- ramps and vehicles Encourage children to talk about how they changed how the cars rolled down ramps/gutters. Encourage children to talk about how toys containing springs and elastics work. • Encourage children to talk about how wind-up toys, pulleys and gear toys work. Encourage children to play with the magnets talking

	about what can be recycled to care for the natural world. • Support children to list the properties the material has. • Encourage children to test that their model is fit for purpose and that the materials are suitable. • Encourage children to compare and describe how materials change over time and in different conditions. Encourage children to predict whether objects will float or sink. • Encourage children to talk about how they change the shape of objects. Encourage children to talk about how they changed objects to make them float or sink. • Encourage children to count and record how small objects different 'boats' can hold before they sink. Encourage children to describe how sand or water moves down pipes or gutters, or marbles travel down a marble run, and how they changed this. Encourage children to explore and talk about what they observe when turning bottles filled with different liquids and a marble upside down. • Encourage children to ask questions about forces, such as "What happens if I … Enquiry Opportunities *Classification* Sorting animals by where they live and simple characteristics	about how they push away or pull towards each other. • Encourage children to use bikes and scooters on different surfaces. • Encourage children to ride scooters and bikes up and down ramps. • Encourage children to drop objects into water and observe what happens. Enquiry Opportunities *Comparative testing* Compare how cars move down ramps and how this can be changed. • Compare the path of different wind-up toys. • Compare how far different wind-up toys move. • Compare the speed and direction of gears. • Compare how easy or hard it is to lift an object with or without a pulley. • Compare how easy it is to ride a scooter or bike on different surfaces. *Classification* • Sort objects according to whether they float or sink. • Sort objects/materials according to whether their shape can be changed.

	Research using secondary sources Learning about animals from a different habitat and how they are cared for.	
Key Vocabulary Model and encourage children to use vocabulary such as: • hair (black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (blue, brown, green, grey), skin (black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman Expose children to supplementary vocabulary such as: bald, elderly, wrinkles, male, female, freckles ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest. Expose to: solid, liquid, gas.	**Key Vocabulary** Sun, Moon, Earth, star, planet, sky, day, night, space, round Expose to: sunrise, sunset, astronaut, astronomer, constellation, orbit, nocturnal, slow-motion, magnify float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, water, names of animals, live, on land, in water,, sea, hot, cold, wet, dry, ocean. Expose to: environment, camouflage	**Key Vocabulary** Minibeast, insect, lifecycle, metamorphosis, hive, habitat, caterpillar, cocoon, butterfly, ladybird, spider, bee, snail, beetle, worm, centipede, dragonfly, wasp, woodlouse, ant, slug, plant, tree, bush, flower, vegetable, herb, weed, animal, lifecycle, frog spawn, tadpole, froglet, frog, material, waterproof, non-waterproof up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow Expose to: rising, falling, attract, repel, faster, slower, pulley, gear, elastic

Year 1

Over the course of the year children in Year 1 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed below.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topic: **Animals including Humans** (**Seasonal Changes** taught in each term)	Spring Topic **Everyday materials** (**Seasonal Changes** taught in each term)	Summer Topic **Plants** (**Seasonal Changes** taught in each term)
Seasonal Changes **Prior Learning:** ● Explore the natural world around them. (Reception – Seasonal changes) ● Describe what they see, hear and feel whilst outside. (Reception – Seasonal changes) ● Understand the effect of changing seasons on the natural world around them. (Reception – Seasonal changes) **Future Learning:** ● Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) ● Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. (Y5 - Earth and space) ● The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)		
Prior Learning: ● Name and describe people who are familiar to them. (Reception - Humans)	**Prior Learning:** Children may have: ● Used all their senses in hands-on exploration of natural materials. ● Explored collections of materials with similar and/or different properties. ● Talked about the differences between materials and changes they notice.	**Prior Learning:** ● Explore the natural world around them. (Reception – Living things and their habitats) ● Recognise some environments that are different to the one in which they live. (Reception – Living things and their habitats)
Future Learning: ● 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. (Y2 - Living things and their habitats) ● 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. (Y6 - Living things and their habitats)	**Future Learning:** ● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) ● Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	**Future Learning:** ● Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) ● Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants) ● Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats) ● Identify and describe the functions of different parts of

• Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)		flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 Plants)
<u>Animals including Humans</u> **Observing over time** • Use non-standard units and simple equipment to record changes • Record in words or pictures or in simple prepared formats such as tables and / or charts • Make comparisons between simple features of objects, materials or living things • Record observations in words or pictures or simple tables **Sorting and classifying** • Sort objects by observable and behavioural features • Record my sorting in sorting circles or tables **Pattern seeking** • Use non-standard units and simple equipment to record events that might be related • Record in words or pictures or in simple prepared formats such as tables, tally charts and maps Research • Use simple books and electronic media to find things out • Ask questions to find out what people do and how things work • Record in words and pictures what you find out Fair testing • Use non-standard units and simple equipment to record data • Record in words or pictures or in simple prepared formats such as tables or tally charts.	<u>Uses of everyday materials</u> **Observing over time** • Use non-standard units and simple equipment to record changes • Record in words or pictures or in simple prepared formats such as tables and / or charts • Make comparisons between simple features of objects, materials or living things • Record observations in words or pictures or simple tables **Sorting and classifying** • Sort objects by observable and behavioural features • Record my sorting in sorting circles or tables **Pattern seeking** • Use non-standard units and simple equipment to record events that might be related • Record in words or pictures or in simple prepared formats such as tables, tally charts and maps **Research** • Use simple books and electronic media to find things out • Ask questions to find out what people do and how things work • Record in words and pictures what you find out **Fair testing** • Use non-standard units and simple equipment to record data • Record in words or pictures or in simple prepared formats such as tables or tally charts	<u>Plants</u> **Observing over time** • Ask questions about how and why things change • Ask questions about how and why things are similar or different • With help identify changes to observe and measure and suggest how to do it **Sorting and classifying** • Decide what to observe to identify or sort things Pattern seeking • Ask questions about why and how things are linked • With help decide what patterns to observe and measure and suggest how to do it. **Research** • Ask questions about how things are and the way they work • With help make suggestions about how to find things out **Fair testing** • Ask questions about why and how • With help notice links between cause and effect • With help identify simple variables to change and measure **Vocabulary:** **Leaves, blossom, petals, roots, buds, bulb, trunk, branches, stem, evergreen, garden plants, deciduous, wild plants, seeds, wild plants,**

Vocabulary : **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.**	**Vocabulary:** **Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy/not bendy, waterproof/not waterproof, absorbent, opaque.** **Vocabulary : Seasonal Change** **Seasons, spring, summer, autumn, winter, windy, sunny, overcast, snow, rain, temperature**	
National Curriculum Coverage: Living things Pupils should be taught to: ▪ identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals ▪ identify and name a variety of common animals that are carnivores, herbivores and omnivores • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) • identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Seasonal changes Pupils should be taught to: ▪ observe changes across the four seasons ▪ observe and describe weather associated with the seasons and how day length varies. Working Scientifically • Asking simple questions and recognising that they can be answered in different ways	**National Curriculum coverage:** Everyday materials Pupils should be taught to: ▪ 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. Seasonal Changes Pupils should be taught to: ▪ observe changes across the four seasons ▪ observe and describe weather associated with the seasons and how day length varies. Working Scientifically • Asking simple questions and recognising that they can be answered in different ways • Observing closely, using simple equipment	**National Curriculum coverage**: Plants Pupils should be taught to: ▪ 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. Seasonal changes Pupils should be taught to: ▪ observe changes across the four seasons ▪ observe and describe weather associated with the seasons and how day length varies. Working Scientifically • Asking simple questions and recognising that they can be answered in different ways • Observing closely, using simple equipment • Performing simple tests • Identifying and classifying. • Using their observations and ideas to suggest answers to questions • Gathering and recording data to help in

• Observing closely, using simple equipment • Performing simple tests • Identifying and classifying. • Using their observations and ideas to suggest answers to questions • Gathering and recording evidence **Assessments :** Living things - Match body parts to different animals / humans (labels) Snap game - snap and name the animal. Sorting animals into groups according to their classification - photograph. **Activity** : Give children a small selection of pictures or plastic toys of different animals from all of the main vertebrate groups (ensure that these represent a true image of the animal). Children to identify and classify into fish, amphibian, reptile, bird and mammal and explain why they belong to that group. Prompt children to name animals and discuss their choices. Using a prepared chart or labels, children sort under the headings fish, amphibian, reptile, bird and mammal. Either take photo of classifying or stick pictures onto template. Using mammals only, identify one example that is a carnivore, a herbivore and an omnivore. **Not yet met:** Names some common animals. Needs support to sort or limited to common mammals, birds and fish. **At:** Name a variety of common animals including fish /amphibians /reptiles / birds/mammals. Uses	• Performing simple tests • Identifying and classifying. • Using their observations and ideas to suggest answers to questions • Gathering and recording data to help in answering questions. **Assessments :** Odd one out games - children explain thinking about different materials and their properties. See ideas below and scribe verbal responses. **Activity :** Explore a range of materials e.g. foil, shiny fabric, glossy acetate, shiny paper, brightly coloured paper, netting… list words to describe their properties on a whiteboard (e.g. shiny/dull, transparent/opaque & translucent). Explain that a material is transparent if we can see details through it and opaque if we cannot see anything at all. Ask children to look through a translucent material (e.g. bubble wrap) and explain that this is translucent because we can see light but not details. Discuss how to test which are the most transparent, e.g. look through the material at a window or at a lamp, or shine torchlight through or take a photo through it. What can you see? Groups test and sort a range of materials (could be for a purpose, e.g. to find the best material for making a windscreen for a car). Children return to sit in a circle and consider one group's sorting / ordering – do you agree? Would you move any? Why? Adult collect children's ideas or ask target children or those who have not worked with an adult.	answering questions. **Assessments :** Use laminated labels and part of plant in groups to put them together into a diagram. **Activity**: Go on a 'welly walk' in school grounds to collect leaves *(with clear instructions about where they are allowed to go and what they are allowed to collect/pick e.g. try to collect fallen leaves, do not over-pick from one plant, warn to look for prickles and stinging nettles etc – check with an adult if unsure)*. Use magnifiers to look closely at the leaves and ask pairs to discuss what is the same/what is different. Draw a leaf, labelling with support. At an appropriate point, you could include a mini-plenary in which you show a drawing by the class teddy/puppet. Ask the children to give advice on how to improve the drawing e.g. *what colour is the leaf stalk? Where do the veins really go?* Children could then improve their own or do another drawing. Wash hands. **Not yet met:** Describe what they can see using everyday language. With support, label the basic structure of a plant.

observations to classify into given scientific groupings including animal groups or omnivore/herbivore/carnivore and can explain how they are similar, *e.g. birds have feathers, frogs go in the water and out of water, they are all mammals because they are hairy.* **Possible ways of going further:** Can classify according to a range of features and give reasons for their choices*, e.g. some mammals live underwater, include other insect groups.* Names and classifies other animals which are not pictured. <u>Seasonal changes</u> - scribe quotes of children's verbal responses of changes seen. Use register time to notice changes in the morning - note responses. **Activity** (each season) Go on a 'welly walk' to the same place, observe a deciduous and an evergreen tree. Look at the signs of the season and make collections. Identify and take photos of each tree and the signs of the season. Back in class, explore and discuss collections and scribe comments. Plot the changes using the photographs of a deciduous tree and an evergreen tree on a seasonal display – use photos of the walk, collections and data **Autumn** - falling leaves, seeds, fruits, changing colours, dew on grass, temperature, mini beasts, temperature, clothing **Winter** – bare trees, hard ground, lack of plants, temperature, clothing **Spring** – buds on trees, new growth, blossom, bird	**Not yet met:** Can sort materials into two groups but not clear or gives a reason for the sorting that doesn't link to a particular feature. May not use a single criterion to sort: "these are colourful, these are shiny". May confuse one property with other properties **At:** Describe how they sorted the materials according to how transparent they are, and how other groups used different ways to sort the materials. **Possible ways of going further:** E.g. Able to order the materials from most to least transparent and explain how the test helped them decide on this sequence. Can comment on effectiveness of different ways to test or compare the objects.	**At:** Can describe and point to the basic structure of a plant and a tree using scientific language, *e.g. leaves, flowers, petals, fruit, roots, bulb, seed, trunk, branch, stem.* May begin to explain what the parts of the plant are for. **Possible ways of going further:** Can use their observations to make comparisons between different plants or between different plant parts, *e.g. that plant has a thicker/taller stem than that one, the petals are smaller than the leaves.*

song, grass, warmth, temperature, clothing **Summer** –full trees, colours, mini beasts, wild flowers, temperature, clothing **End of school year:** revisit initial elicitation to add new observations or create new drawings/descriptions/comparisons of four seasons. Not yet met: With support, children can observe and record what they see at the time. At : Observe, record and describe changes in e.g. plants, temperature and the weather across the four seasons. Possible ways to go further: Use records of data from previous sessions to begin to make links between their observations and to offer explanations for seasonal change, *e.g. I saw more flowers in spring because it is getting warmer, it is colder in the winter because we get less sunlight.* (See ideas below)		
Planning ideas: <u>Living things and their habitats</u> Link to snails? • Show the children labelled diagrams of snails and learn the anatomy of a snail, names and functions of its parts. • Look at the life cycle of a snail, its habits and activities, explore its habitat and its place in common food chains using high quality information texts. • Explore in greater detail all the creatures that live in the seaside habitat and how the habitat supports life.	**Planning Ideas:** <u>Uses of everyday materials</u> 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. <u>Buildings: Rocks, wood, ceramics, metals:</u> Which rocks are the least crumbly? Which materials absorb the most water?	**Planning Ideas:** <u>Plants</u> Provide a range of seeds, bulbs and objects Children predict what they think might be real seeds and bulbs and then plan how they could check. Go on a seed hunt trying to identify any seeds from a key (you will need to construct one for the kinds of seeds they may find). Plant the seeds they have found and tried to identify and see if they grow into the plants they predicted. Plant a seed in a jar so it is possible to see it

Hunt for snails in the school grounds describing / photographing where they were found and what other plants and animals were also there. Predict from this what snails might eat and test predictions. Children keep food diaries for themselves and a pet to tackle the question: “Do all animals eat the same food?” Use what they find to predict what hyenas (dogs) and tigers (cats) and field mice (hamsters) might eat. Show short videos of animals hunting or trying to avoid being predated. Children describe how predators and prey move similarly and differently. Then show some unknown animals and children predict if they think they are predators or prey. Explore habitats in the local environment identifying the plants and minibeasts that live there. Children predict what might eat what and why they think that. Check their ideas through Internet research and construct a simple food chain from what is found. (An excellent longitudinal study would investigate how populations in these food chains vary as a result of the seasons). Which of our senses is the most accurate at identifying food? Make different coloured and flavoured jellies (make sure the colour does not match the flavour), they then test each jelly using their sight, taste and smell separately. Spiders prey on woodlice; what senses do woodlice use to detect the spiders and how do they avoid being eaten (they could test their ideas). Children take photos of a part of the school grounds and make a camouflage coat that a teddy could wear to protect from being eaten by the great teddy bear eating monster.	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? <u>Toys and nice things: Fabric, plastic, wood,metals</u> 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 slippy 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? <u>Clothing: Fabrics, plastics</u> 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? <u>Seasonal changes</u> Explore school grounds for signs of Spring. Continue to create a seasonal calendar showing the four seasons through a tree.	germinate. As it germinates children observe and describe and predict what they think each bit emerging from the seed is for. Continue observing and describing over a few weeks and refine their ideas. Using quick growing plants like mustard, cress, fast growing grass and beans to test if light, water and warmth are needed. (Do the test on already growing plants as seeds need often different conditions to germinate and we don’t need to confuse children) How does the amount of light or warmth affect how well my plant grows? What are the perfect conditions for my cress to grow? Which direction do shoots and roots grow after germination? If a seed is planted upside down will the roots pop out of the soil? How long does a stem need to be before it produces leaves and is it the same for all plants? If plants need water could we grow cress in water but no soil? (Let them grow cress in water and on wet cotton wool and examine the differences) Do all plants have roots, how could we find out? Do all plants have leaves, how could we find out? If plants need water to grow, then surely the more the better. How does the amount of water affect how well a plant grows? <u>Seasonal changes</u> Explore school grounds for signs of Summer. Continue to create a seasonal calendar showing

<u>Seasonal changes</u> Explore school grounds for signs of Autumn. Create a seasonal calendar showing the four seasons through a tree. 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 water take longer to dry?) Do countries with a higher temperature have less rain? (compare UK and one other country as a minimum) Track rain fall and temperature in different areas of the school grounds.	Investigate the properties of leaves (Which leaf is strongest? Which is most effective at shade cover? Which is most effective at directing water? Which turns brown quickest? What do you notice about the different leaves? (Use ID cards to identify trees in grounds) What purpose to leaves serve for the tree? Why do you think leaves turn brown in Winter?) Collect colours from the outdoors (Why did you choose to select that object to add to your card? Why did you choose to select that colour to add to your card? Will you be able to collect that in a different season?)	the four seasons through a tree. And down came the rain (What effect does rain have on the environment? How might it be change on different soil types? How does it differ in the nature trail? What would the effect on the environment be if there was too much rain? What would the effect on the environment be if there was not enough rain?)

Year 2

Over the course of the year children in Year 2 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed in the medium term planning.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topics: **Uses of everyday materials** **Animals including Humans**	Spring Topic **Animals including Humans** **Living Things and their Habitats**	Summer Topic **Plants**
Uses of Everyday Materials **Prior Learning:** ● Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) ● Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) ● Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) ● Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)	**Animals including Humans** **Prior Learning:** ● Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) ● Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans).	**Plants** **Prior Learning:** ● Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) ● Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)
Future Learning: ● Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks & Soils) ● Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) ● 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. (Y5 - Properties and changes of materials) ● Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials).	**Future Learning:** ● 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. (Y3 - Animals, including humans) ● Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) ● Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) ● Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)	**Future Learning:** ● Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) ● 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. (Y3 - Plants) ● Investigate the way in which water is transported within plants. (Y3 - Plants) ● Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)
Animals including Humans **Prior Learning:** See above	**Living Things and their Habitats** **Prior Learning:** ● Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) ● Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)	

	• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Observe changes across the four seasons. (Y1 - Seasonal changes)	
Future Learning: See above	**Future Learning:** • Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans)	**Future Learning:** • Compare how things move on different surfaces. (Y3 - Forces) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces) • 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. (Y3 - Forces) • Describe magnets as having two poles. (Y3 - Forces) • Predict whether two magnets will attract or repel each other, depending on which poles are facing.(Y3 - Forces)

Uses of everyday materials **Observing over time** • Use non-standard units and simple equipment to record changes • Record in words or pictures or in simple prepared formats such as tables and / or charts • Make comparisons between simple features of objects, materials or living things • Record observations in words or pictures or simple tables **Sorting and classifying** • Sort objects by observable and behavioural features • Record my sorting in sorting circles or tables Pattern seeking • Use non-standard units and simple equipment to record events that might be related • Record in words or pictures or in simple prepared formats such as tables, tally charts and maps **Research** • Use simple books and electronic media to find things out • Ask questions to find out what people do and how things work • Record in words and pictures what you find out Fair testing • Use non-standard units and simple equipment to record data • Record in words or pictures or in simple prepared formats such as tables or tally charts **Vocabulary:** **Waterproof, fabric, rubber, cars, macadamisation,** **rock, paper, cardboard, wood, metal, plastic, glass, brick, twisting, squashing, bending, matches, cans, spoons**	**Animals including Humans** **CONTINUE FROM PREVIOUS TERM- SEE LOs AND SKILLS PROGRESSION IN PREVIOUS TERM.** **Vocabulary : Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade.** **Living Things and their habitats** **Observing over time** Use non-standard units and simple equipment to record changes Record in words or pictures or in simple prepared formats such as tables and / or charts Make comparisons between simple features of objects, materials or living things Record observations in words or pictures or simple tables **Sorting and classifying** Sort objects by observable and behavioural features Record my sorting in sorting circles or tables **Pattern seeking** Use non-standard units and simple equipment to record events that might be related Record in words or pictures or in simple prepared formats such as tables, tally charts and maps **Research** Use simple books and electronic media to find things out Ask questions to find out what people do and	**Plants:** **Observing over time** Ask questions about how and why things change Ask questions about how and why things are similar or different With help identify changes to observe and measure and suggest how to do it **Sorting and classifying** Decide what to observe to identify or sort things **Pattern seeking** Ask questions about why and how things are linked With help decide what patterns to observe and measure and suggest how to do it. **Research** Ask questions about how things are and the way they work With help make suggestions about how to find things out **Fair testing** Ask questions about why and how With help notice links between cause and effect With help identify simple variables to change and measure **Vocabulary:** **Observation, growth, compare, record, seeds, bulbs, temperature, roots, stem, predict, leaf, flower, measure, diagram, measure, comparative tests, life cycle, life process, germinate, grain.** **Forces : Key ideas** Pushing and pulling can make things move faster or slower.

<u>Animals including Humans</u> **Observing over time** • Use non-standard units and simple equipment to record changes • Record in words or pictures or in simple prepared formats such as tables and / or charts • Make comparisons between simple features of objects, materials or living things • Record observations in words or pictures or simple tables **Sorting and classifying** • Sort objects by observable and behavioural features • Record my sorting in sorting circles or tables **Pattern seeking** • Use non-standard units and simple equipment to record events that might be related • Record in words or pictures or in simple prepared formats such as tables, tally charts and maps **Research** • Use simple books and electronic media to find things out • Ask questions to find out what people do and how things work • Record in words and pictures what you find out **Fair testing** • Use non-standard units and simple equipment to record data • Record in words or pictures or in simple prepared formats such as tables or tally charts **Vocabulary:** **Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade**	how things work Record in words and pictures what you find out **Fair testing** Use non-standard units and simple equipment to record data Record in words or pictures or in simple prepared formats such as tables or tally charts **Vocabulary:** **Leaves, blossom, petals, roots, buds, bulb, trunk, branches, stem, evergreen, garden plants, deciduous, wild plants, seeds, wild plants,**	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.

National Curriculum Coverage :

Uses of everyday materials.

• 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

Working Scientifically

• Asking simple questions and recognising that they can be answered in different ways

• Observing closely, using simple equipment

• Performing simple tests

• Identifying and classifying.

• Using their observations and ideas to suggest answers to questions

• Gathering and recording data to help in answering questions.

Animals including Humans

• 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

Working Scientifically

• Asking simple questions and recognising that they can be answered in different ways

• Observing closely, using simple equipment

• Performing simple tests

• Identifying and classifying.

• Using their observations and ideas to suggest answers to questions

• Gathering and recording data to help in answering questions.

National Curriculum Coverage :

Living things and their habitats.

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

Working Scientifically

Asking simple questions and recognising that they can be answered in different ways
Observing closely, using simple equipment
Performing simple tests
Identifying and classifying.
Using their observations and ideas to suggest answers to questions
Gathering and recording data to help in answering questions.

National Curriculum Coverage :

Plants

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.

Working Scientifically

Asking simple questions and recognising that they can be answered in different ways
Observing closely, using simple equipment
Performing simple tests
Identifying and classifying.
Using their observations and ideas to suggest answers to questions
Gathering and recording data to help in answering questions.

(No KS1 objectives for Forces - Introduce Key ideas at Year 2)

Assessment : Plants

Show children pre-grown plants, discuss what children think these plants need to keep healthy.
Raise questions they would like to investigate, e.g.
How long can plants last without water / light?
Does it matter if the plant is inside or outside? How will less light affect the plant?
Use pre-grown plants
to explore conditions for growth, e.g.
Compare NORMAL CONDITIONS (on window sill + water + light + warm) with:

Assessment : Everyday materials
Ask groups of children to go on a materials hunt around a designated section of the school/grounds, collecting their findings for different areas on a pre-prepared table and/or using a camera.
Collate class results, noting with the children different ways to record data clearly.
Discuss the uses of different materials around school and consider why different materials are used for different purposes.

Not yet met: Describes some materials or objects, but finds it difficult to categorise into types of materials or explain what they recorded.

At: Records their observations of a range of objects made from different materials. In discussion, makes links between properties of materials and their uses.

Possible ways of going further: Notes findings which are similar or different to their own. Continues to 'hunt' materials at other times and/or in other locations.

Animals inc Humans :
Ask the children to compare the size of their hand with that of another child. As a class create a list of questions e.g. Do older children have bigger hands? Do taller children have bigger hands? Can bigger hands pick up more cubes? *('Handspan grab' can create a graph of cubes).*
Discuss how hand spans could be measured and agree as a class (e.g. draw around hands, spread/closed fingers, start and end place of measurement, to nearest centimetre). With a partner to help, ask each child to measure their own hand.
Record results together as a class.
Ask the children to compare hand spans and suggest reasons / answers to the class questions.

Assessment : Living things and their habitats

Provide a range of objects and pictures to explore, including some plants. Use sorting hoops or similar to explore ideas about which are alive now, which used to be alive and which have never been alive.
Ask the children to explain how they decide, drawing out characteristics of living things. Ask them to continue sorting and add their own ideas.
Not yet met: Children can sort items with adult support but are unsure when working independently, or they have not yet developed/able to express their ideas about living/non-living.

At: Children meeting the objective would be able to explain why they had sorted in this way e.g. *"because it moves on its legs and it would probably go and get something to eat and drink if it was hungry", "it's living because it can be pregnant and it can get a husband or wife", "the rock doesn't grow, eat, move or have babies".*

Possible ways of going further: Children explore ideas further e.g. *the seeds can't grow at the moment, but they will if you give them a drink* (seeds can be dormant).

No/less/more WATER or No/less/more LIGHT or No/less/more WARMTH.
Discuss what they think will happen to plants without water/sun/warmth and how to record observations e.g. labelled drawings every few days to make plant diaries.
Children need to observe and measure the plants over time using simple equipment e.g. cameras, rulers, measuring tape, magnifiers.
Discuss what the class results show about what a plant needs to grow and to stay healthy.

Not yet met: Describes observable differences at the time of asking e.g. which plant is the tallest and shortest.

At: Observes and records the appearance of the plants over time (drawing or annotated photo). Can compare the height and/or features of the plants over time e.g. *this one was fine to start with but now it's much smaller.*

Possible ways of going further: Make a range of comparisons between the plants in different conditions, e.g. colour, droopiness, height, number of leaves.

Not yet met: Can make simple comparisons, saying which hand is smallest or biggest. **At:** Can make comparisons using their observations/results to say which hands are bigger and smaller. Suggests reasons for differences in results *e.g. his hand is bigger because he has had longer to grow, she holds more cubes because she spreads out her fingers far to grab them.* **Possible ways of going further:** Can make predictions relating hand span to height, *e.g. a Year 6 will have bigger hands / will hold more cubes because....* Can raise further questions related to height that could be tested, *e.g. when do your hands stop growing?*		
Planning Ideas: <u>Uses of everyday materials</u> Exploring materials and their properties: Ideas are explored through testing materials to see if they are appropriate for particular jobs. Topics need to be arranged so that all the main groups of materials are explored and important properties are investigated (strength, flexibility, waterproofness, absorbency, softness, slippiness, stretchiness, brittleness) Materials needed for a walk in the forest (rain, cold etc). Animals including humans Link to fairy tale characters. Finding suitable material for on the moon or carrying food/clothes in Exploring animals' needs and why not on the moon. How do astronauts stay healthy? Sort and explore the properties of the space junk Bob has collected at work, tidying up after	**Planning ideas:** <u>Living things and their habitats:</u> Each group chooses a small area of the school grounds and collects and identifies the plants and minibeasts that live there. Construct a food chain that might exist between these organisms. Test the food chain by completely removing the plants from the small area and monitor what happens to the minibeasts over a few weeks Place sizeable pieces of material e.g. wood or brick, over a patch of grass and carefully monitor what happens every few days. Many questions flow from this e.g. will all the plants grow back or will different ones grow back when we lift the materials? Does the type of material we put on the grass make a difference?	**Planning Ideas :** **<u>Plants:</u>** Grow some flowers, let them pollinate and show children where the seed grows. They then go on a walk looking for plants and flowers, taking pictures and deciding if a seed could form from the plant and if it has yet formed. Does cress produce seeds, how could we find out? Do all plants produce flowers and seeds? Pupils choose a few plants in the school grounds and keep simple diaries of how they change over the year in order to answer the question Do all plants produce flowers and seeds and what happens to them after they have flowered? Pupils choose a few plants in the school grounds and keep simple diaries of how they change over the year in order to answer the question.

the visitors (link to PoR) Experiment which material would be best to make an umbrella for Beegu (or an alien) visiting Earth. It doesn't rain where they come from and they don't like getting wet. <u>Animals Including Humans:</u> Construct a large bar chart for the wall of person's height against ages. Add in details of the class, teachers, parents and grand parents. Children use this to try and work out at what age people typically stop growing and relate this to when they are able to reproduce and why humans need to be big in order to have babies. Create a large time line on the wall from 0-100 years. Children bring in pictures of pets their parents had when they were younger with information about how old the pet was when it died. Hang the pets on the time line at the age they were when they died. Do the same for great grand parents (or a relative that died long before the child was born). Children use the time line to try and spot any patterns for how long animals live (e.g. do bigger animals live longer?). Show children some examples of animals they don't know (e.g. whale, elephant, desert mice, chimpanzees) and ask them to predict how long they might live for. Repeat the time line process with the age at which the pet or relative had their first baby. Encourage children to use the time line to come up with questions and look for patterns.	Find a piece of wild ground with lots of weeds. Remove the tall weeds and keep them cut, what happens to the other plants? Children choose or are allocated a small habitat area. They identify all the minibeasts they can over a few days. Which ones do they think will hibernate and why? Check again a few times over the year to see what happens. Be aware that some animals don't hibernate but are only active above certain temperatures e.g. slugs are only active above 5oC whereas snails hibernate. Steve the stick insect wants to visit from Australia. Where in the school grounds will he find most friends and will they be there all year? (If you do a longitudinal study this is what needs to be assessed for this topic)	From this information pupils group plants into those that die after flowering and those that carry on living, are there any patterns? What happens to a daffodil (or other such flower) if it is left outside to form a seed and how is this different if it is cut and placed in water inside?

Year 3

Over the course of the year children in Year 3 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed below.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topic **Light / Forces and Magnets**	Spring Topic: **Rocks and soils / Animals including Humans**	Summer Topic : **Animals including Humans / Plants**
Light **Prior Learning:** ● Describe what they see, hear and feel whilst outside. (Reception - Light) ● Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans) ● Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)	**Rocks and Soils** **Prior Learning:** ● Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) ● Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) ● Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) ● Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) ● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)	**Animals including Humans** **Prior Learning:** See Spring Term
Future Learning: ● Recognise that light appears to travel in straight lines. (Y6 - Light) ● 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. (Y6 - Light) ● 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. (Y6 - Light) ● Use the idea that light travels in straight lines to explain	**Future Learning:** ● Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance) ● The composition of the Earth. (KS3) ● The structure of the Earth. (KS3) ● The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)	**Future Learning:** See Spring Term

why shadows have the same shape as the objects that cast them. (Y6 - Light)		
Forces and Magnets **Prior Learning:** Children may have experienced: • Explore how things work. • Explore and talk about different forces they can feel. • Talk about the differences between materials and changes they notice. • Describe what they see, hear and feel whilst outside. (Reception - Forces) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	**Animals including Humans** • **Prior Learning:** • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)	**Plants** **Prior Learning:** • Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)
Future Learning: • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces) • Magnetic fields by plotting with compass, representation by field lines. (KS3) • Earth's magnetism, compass and navigation. (KS3)	**Future Learning:** • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)	**Future Learning:** • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)
Light : **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions	Rocks & Soils : Pupils will work scientifically by: • observing rocks, including those used in buildings and gravestones, and exploring how and why they	Plants : Pupils will work scientifically by: • comparing the effect of different factors on plant growth, for example, the amount of light, the

What children need to know:

- *that light travels in straight lines*
- *that objects are seen because they emit light (sources) or reflect light into the eye*
- *that we see things because light travels from light sources to our eyes or from light sources to objects and then (is reflected) to our eyes*

Common misconceptions – often children will think that:

- *sight is purely an active human process 'I am looking at something, which is why I can see it' or that eyes give out a form of light to enable us to see*
- *reflective surfaces emit light*
- *only shiny surfaces or water reflect light*
- *opaque objects do not reflect light*
- *opaque surfaces give out colour or 'darkness'*

Pupils will work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.

The shiny coin problem. A coin is lost what would be the best way to find it, turn out the lights and see it shine or use a torch to see it reflect?
How does the distance from a light source affect how bright it looks?
How does being in darkness affect your sense of hearing? Is this how nocturnal animals survive?

Give children lots of objects and they decide if they are transparent, translucent, opaque or reflective (Do they notice that many materials exhibit more than one property or partial properties. Encourage them to think about how they might display this information).
What colour would be best to make a safety jacket from? How does the colour of a material affect

might have changed over time;
• using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them.
• researching and discussing the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed.
• exploring different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed.

Vocabulary:
Rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, top soil, sub soil, base rock.

National Curriculum Coverage:

Rocks :
Pupils should be taught to:
• 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.

Working scientifically lower KS2
• Ask relevant questions and use different types of scientific enquiries to answer them
• Set up simple practical enquiries, comparative and fair tests

amount of fertiliser
• discovering how seeds are formed by observing the different stages of plant life cycles over a period of time
• looking for patterns in the structure of fruits that relate to how the seeds are dispersed.
• observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

Vocabulary:
Air, Light, Water,Nutrients,Soil, Reproduction, Transportation, Dispersal, Pollination, Flower. Photosynthesis Energy Growth Carbon dioxide Oxygen Sugar material

National Curriculum Coverage:
Plants (Year 3 curriculum)
Pupils should 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 (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

Animals Inc Humans :
Vocabulary:

how reflective it is?
What would be the best material to make a blind for a baby's room? How does the thickness or colour 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 size of a candle affect its brightness?
How does the shape of a mirror affect how the light reflects?
How does polishing a piece of dirty metal affect how light behaves when it hits it?

Vocabulary :
Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight,opaque, shadow, block, transparent, translucent.

National Curriculum Coverage:
Light (Year 3 curriculum)
Pupils should be taught to:
• 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.

Working scientifically lower KS2
• Ask relevant questions and use different types of scientific enquiries to answer them
• Set up simple practical enquiries, comparative and fair tests
• Make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment including thermometers and data loggers.

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• Set up simple practical enquiries, comparative and fair tests
Make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment including thermometers and data loggers.
• Gather, record, classify and present data in a variety of ways to help in answering questions
• Record findings using simple scientific
• Ask relevant questions and use different types of scientific enquiries to answer them
• Set up simple practical enquiries, comparative and fair tests
Make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment including thermometers and data loggers.
• Gather, record, classify and present data in a variety of ways to help in answering questions
• Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables
• Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
• Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
• Identify differences, similarities or changes related to simple scientific ideas and processes
• Use straightforward scientific evidence to answer questions or to support their findings

Nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, Joints, endoskeleton, exoskeleton, hydrostatic Skeleton, vertebrates, invertebrates, muscles, contract, relax.

Pupils will work scientifically by:
• identifying and grouping animals with and without skeletons and observing and comparing their movement
exploring ideas about what would happen if humans did not have skeletons.

Pupils will work scientifically by:
• comparing and contrasting the diets of different animals (including their pets) and decide ways of grouping them according to what they eat.
• research different food groups and how they keep us healthy and design meals based on what they find out.

National Curriculum Coverage:

Animals including humans (Year 3 curriculum)
Pupils should 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.

Working scientifically lower KS2
• Ask relevant questions and use different types of scientific enquiries to answer them
• Set up simple practical enquiries, comparative and fair tests
• Report on findings from enquiries, including oral and written explanations, displays or presentations

• Gather, record, classify and present data in a variety of ways to help in answering questions
• Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables
• Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
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• Identify differences, similarities or changes related to simple scientific ideas and processes
• Use straightforward scientific evidence to answer questions or to support their findings

Assessment : Light

Provide the children with a collection of materials to explore (some transparent, some translucent and some opaque).
Ask the children to investigate which materials form shadows when a torch is shone on them (e.g. colour, darkness, no shadow?)
Ask them to record their observations to answer the question about which materials form a shadow (e.g. draw, write, sort, photo, order, table). Can they categorise or order the materials and/or shadows in some way?

Not yet met: Can use their observations to decide whether or not a shadow has been formed by the material, *e.g. has sorted materials into two piles or recorded tick/cross.*

At: Can make observations and decide how to record them to answer the question, *e.g. independently records best to worst shadow.*

Possible ways of going further: Recording

Assessment : Rocks

Provide a purpose for the investigation e.g. to find the best material for a new paved area in school. Suggest that you would like to find out which rock would last the longest/be the least wearing/the strongest. Decide whether to do a rub test and/or a scratch test etc.
Rub: Children to rub rocks on sandpaper and collect scrapings onto white paper.
Scratch: Try scratching the rocks with e.g. a fingernail, a matchstick, a metal nail etc.
Ask children to order the rocks and justify their selection of strongest rock.
How will you report your findings (to persuade), e.g. draw, write, present?

Not yet met: Says which rock is 'best' but does not give reasons for this conclusion or use their results to make comparisons between the rocks.

At: Uses their results to order the rocks and can say (orally or with diagrams/writing) which rock is strongest/harder wearing.

Possible ways of going further:
Recommendations are clearly drawn from results and are presented appropriately for the audience. The report contains an explanation of how trustworthy the data is and explains that other factors may need to be tested, *e.g. marble is strong but may be slippery if it gets wet.*

Animals Inc Humans :
Vocabulary:
Nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, Joints, endoskeleton, exoskeleton,

of results and conclusions
• Identify differences, similarities or changes related to simple scientific ideas and processes
• Use straightforward scientific evidence to answer questions or to support their findings

Assessment : Plants

Show children a complete head of celery and/or white carnations and ask them to name the parts (noting the stem). Explain to the children that they are going to put the celery stem/carnation upright in a vase/container of water coloured with red/blue food colouring. *(Test colouring in advance if possible because not all brands work).* What could happen? Make careful observation before placing in water e.g. draw and label.
Leave overnight/all day. Carefully observe and reflect on what has happened and how well (or not) the dye has been transported. Use their scientific evidence to explain how water is transported in plants e.g. labelled drawings of whole and cut celery.

Not yet met: Can draw/say what has happened simply, e.g. *the colour went up*.

At: Observes what has happened and can make suggestions, e.g. *I know there are tubes in the stem, the water goes up the stem and it might go up to the leaves if I leave it for longer.*

Possible ways of going further: Children can predict what they would expect to happen if the stem was split and each section placed in two different dyes. They raise further questions about how water transportation can be shown in other types of plants *e.g. If we split the celery between two food dyes, I think half the stem will be blue and*

communicates clearly how it answers the question, using appropriate vocabulary such as opaque, translucent and transparent. Forces and Magnets : Pupils will work scientifically by: • comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces and gathering and recording data to find answers their questions; • exploring the strengths of different magnets and finding a fair way to compare them; • sorting materials into those that are magnetic and those that are not; • looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; • identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets. **Vocabulary : Force, push, pull, friction, surface, Magnet, magnetic, magnetic field, pole, north, south, attract, repel, compass.** Forces and Magnets (year 3 curriculum) Pupils should be taught to: • 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.	**hydrostatic Skeleton, vertebrates, invertebrates, muscles, contract, relax.** Pupils will work scientifically by: • identifying and grouping animals with and without skeletons and observing and comparing their movement exploring ideas about what would happen if humans did not have skeletons. Pupils will work scientifically by: • comparing and contrasting the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. • research different food groups and how they keep us healthy and design meals based on what they find out. **Assessment : Animals Including humans** Discuss differences between human skeletons, taking care when discussing differences between children in class. Consider which bones can be more easily measured e.g. skull, foot, part of arm/leg etc. Ask children to use these ideas to create a question to be investigated, e.g. *Are adult heads bigger than children's heads?* *Do taller children have longer arms/bigger feet etc?* *Am I/Are you a square? (look at arm span versus height)* Ask children to explain how they will answer their question. Support them to carry out their pattern seeking enquiries to answer their own questions. **Not yet met:** Can ask questions about the human body, e.g. *How big are people's heads? I wonder who has got the biggest feet?* Unable to relate the question to a suitable enquiry.	*half will be red because the water from each container will be transported up the stem. I wonder if we could make a white flower change colour?*

Assessment : Magnets Provide the children with a collection of magnets and other materials (e.g. card, fabric, tissue, thin wood, aluminium foil, paperclips) to explore. Ask them to find out ways to test whether the magnets are all equally strong *e.g. through paper/card or layers of each, how close magnet needs to be before it attracts a paper clip etc.* Ask the children to report their findings verbally, e.g. explaining how they carried out their investigation to their peers. As a class, discuss the different ways of testing magnet strength and talk about the advantages and disadvantages of each approach. Discuss why it is a good idea to try different ways of answering a question (to get a more reliable answer). **Not yet met:** With support, can make suggestions about how to find which magnet is the strongest, *e.g. see how many paperclips the magnet will pick up.* **At:** Can decide on an approach to answer the question, and what observations/measurements need to be made, *e.g. hold each magnet above the paperclips and measure the greatest distance each magnet can still attract them from.* **Possible ways of going further:** Can compare different ways of answering the question and whether they lead to the same sequence of strength of magnets, e.g. *The order was different when you measure the distance the paperclips jump because it is not very easy to know when this happened.*	**At:** Can ask questions, and turn them into a form that can be investigated *e.g. Do Y6 children have bigger heads than Y4 children?* **Possible ways of going further:** Investigate more than one criteria e.g. Will taller people have wider arm spans and wider hand spans?	
Planning ideas: **Rocks** Locate Soil and Rock types in school grounds.	**Planning ideas:** **Light :** The shiny coin problem. A coin is lost - what would	**Planning ideas:** **Animals inc Humans :**

(Rock Scavenger Hunt) Soil Detectives (How are the soils different? What characteristics are the same? 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 have to withstand? Lots of rock samples, foods such as ketchup, 'vinegar') xMake chocolate rocks: Chocolate can be ground into small particles (weathered), heated, cooled, and compressed — just like rocks. Unlike rocks, chocolate can undergo these processes safely and at reasonable temperatures. Use your chocolate to create "sedimentary," "metamorphic," and "igneous" chocolate. And at the end of it all, make a tasty treat! The Soil Factory (Why is your recipe the best for effective soil? 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? Use rocks in school grounds to build a structure. This could be a structure that becomes a permanent fixture within the school grounds and links to a topic Multiple classes could work on one design over the course of the topic and add to it as they discover new information and facts. Investigate different fossils. Make your own fossils (How are fossils created? Why do fossils help us find out about historical events? If you could fossilise an object what would it be?) Link to skeletons topic – how do scientists know	be the best way to find it, turn out the lights and see it shine or use a torch to see it reflect? How does the distance from a light source affect how bright it looks? How does being in darkness affect your sense of hearing? Is this how nocturnal animals survive? Give children lots of objects and a torch and they decide if they are transparent, opaque, translucent or reflective (Do they notice that many materials exhibit more than one property or partial properties. Encourage them to think about how they might display this information). What colour would be 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 the thickness or colour 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 size of a candle affect its brightness? How does the shape of a mirror affect how the light reflects? How does polishing a piece of dirty metal affect how light behaves when it hits it?	Compare X-rays and skeletons of animals looking for similarities and differences and predicting where vital organs are. Look at X rays to identify broken and healed bones. How does the length of a bone affect its bending strength and compressional strength? (You could use paper tubes) How does the diameter of a bone affect its bending strength and compressional strength? (You could use paper tubes) Consider why might some bones need to be stronger than others and then get them to predict relative size of bones from some animals based on how they move. Give children a large empty torso where they sketch in pencil what they think the skeleton is like. Get them to move in a variety of ways and feel how they move and adapt their skeleton. Show a real or model skeleton and ask them to identify similarities and differences. Children draw round their own hands, they feel their hands and look at how it can move and draw in where they think there are bones and put circles wherever they think there are joints, they then compare their ideas with a picture of a real hand. Give children some bones from a chicken skeleton that is not assembled. They try and identify what each bone does and justify their choices, they again compare with a complete chicken skeleton. Make a model arm from pieces of wood, string, sellotape (provide other materials including elastic, does the opposite of a muscle because it contracts when relaxed.). Look at X rays to identify broken and healed bones. Investigate if the length of a bone affects its strength using card tubes. Or could compare thicker real chicken bones. Consider why might some bones need to be stronger than others and then get them to predict relative size

what dinosaurs looked like. **Planning ideas:** **Forces :** Magnetic material hunt, what can they say about magnetic materials? Can I make a magnetic material non-magnetic? How far away does a magnet need 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? Ring magnets can be stacked to create a variety of patterns depending on how their poles are arranged. Challenge children to recreate these patterns and explain how they did it. How is the magnetic attraction or repulsion force affected by putting materials between the magnets? Are bigger magnets stronger? (You could make larger magnets by putting together lots of smaller neo or super magnets) How could you use magnets to measure the number of pages in a book?		of bones from some animals based on how they move. Compare X rays of animals and predict how they moved. Show some video footage of an animal moving and children predict what the skeleton of that animal may be like. Look at a cleaned chicken leg to see how it moves and then let children remove the skin from another one to see how muscles are attached. **Plants :** Teach children how pollination and fertilisation occur, let them dissect a flower (lilies and daffodils are good) and identify the parts of the flower. Use a microscope to observe the pollen. Children then chose a flower from the school and try and identify the reproductive organs. Bring in as many different flowers as possible, including grasses and trees. Children try and work out of if they are wind or insect pollinated. They could check their predictions using the internet. Leave a tub of compost outside and let weeds develop. Where did they come from? Were the seeds already in the compost or have they come from elsewhere? Plan and carry out an investigation to find out. Collect as many different ‘helicopter’ seeds as possible and ask which ones would be able to go further (will need to explain that the longer it takes to fall the further the wind could blow them). Draw out questions like ‘how does the wing length affect how long it takes to fall. This could be investigated with real seeds or modelling it with paper helicopters**.** How does the space between seeds affect how well they grow?

		Plants grow best when they are damp, warm and in light. Is this true for seed germination? What can you predict about a plant and how it grows from the size of its seed? Plan and carry out investigations to test your ides. Provide children with small pots of already growing grass and cress. Cut back each plant to about 1/2 inch, predict and monitor how they both respond. How does the amount of light affect how well a plant grows? Do plants take in water through their roots alone, their leaves or both leaves and roots? How could you find out? Does the carbon dioxide enter at the top of the leaf or the underside of the leaf? How could you find out? How are soils that retain water well different from those that don't? Do all plants prefer the same type of soil? How is the growth of a plant affected by removing different amounts of leaves? If we stop gases from getting in and out of leaves what will happen? How can we find out? If you set up a sealed glass dome containing damp soil, normal air and some small flowering plants, what would you predict to happen over a long period of time.

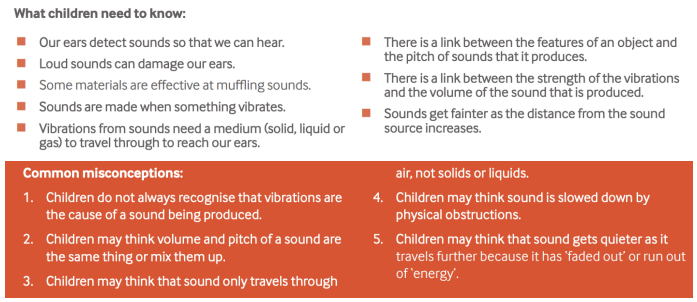
Year 4
Over the course of the year children in Year 4 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed below.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topic **Living things and their Habitats/ Animals Including Humans**	Spring Topic **States of Matter / Sound**	Summer Topic **Electricity/ Consolidation of prior learning**
Living things and their Habitats **Prior Learning:** ● Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) ● Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) ● Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) ● Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) ● Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)	**States of Matter** **Prior Learning:** ● Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) ● Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) ● Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) ● Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) ● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) ● Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	**Electricity** **Prior Learning:** Children may have: ● Explored how things work.
Future Learning: ● Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) ● Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) ● 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. (Y6 - Living things	**Future Learning:** ● 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. (Y5 - Properties and changes of materials) ● Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials) ● Use knowledge of solids, liquids and gases to decide	**Future Learning:** ● Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) ● 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. (Y6 - Electricity) ● Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)

and their habitats) ● Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)	how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials) ● Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials) ● Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials) ● 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. (Y5 - Properties and changes of materials)	
Animals including Humans **Prior Learning:** ● Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) ● Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) ● Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) ● 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. (Y3 - Animals, including humans) ● Discrete session on how to brush teeth properly. (EYFS and Y2)	**Sound** **Prior Learning:** ● Describe what they see, hear and feel whilst outside. (Reception - Sound) ● Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	
Future Learning: ● Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. (Y6 - Animals, including humans) ● Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans) ● Describe the ways in which nutrients and water are	**Future Learning:** ● Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3) ● Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3) ● Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3) ● Sound produced by vibrations of objects, in loud	

transported within animals, including humans. (Y6 - Animals, including humans)	speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3) • Auditory range of humans and animals. (KS3) • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3) • Waves transferring information for conversion to electrical signals by microphone. (KS3)	
Living things and their habitats : Pupils will work scientifically by: raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched. • raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched. **Vocabulary:** **Environment, flowering, non- Flowering, plants, animals, vertebrates, fish, amphibians, reptiles, Mammals, invertebrate, human impact, nature reserves, deforestation.** **Animals inc Humans :** Pupils will work scientifically by: • comparing the teeth of carnivores and herbivores, and suggesting reasons for differences; • finding out what damages teeth and how to look after them; • draw and discuss their ideas about the digestive system and compare them with models or images. **Vocabulary:** **Herbivore, Carnivore, Digestive system, tongue, mouth, teeth, oesophagus, stomach, gall bladder, small intestine, pancreas, large intestine, liver,Tooth, canine, incisor, molar, premolar, producer,consumer.** Identify the part played by evaporation and	**States of matter:** **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions **What children need to know:** ■ observe that some materials change state when they are heated or cooled. ■ know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. ■ identify the part played by evaporation and condensation in the water cycle. ■ demonstrate that dissolving, mixing and changes of state are reversible changes. **Common misconceptions – often children will think:** ■ **Steam is visible.** ■ **Steam and condensation are the same.** ■ **Evaporation only occurs when water is boiling.** ■ **Clouds are made of gas.** ■ **Boiling/evaporation are irreversible changes.** ■ **When a solid dissolves in water it does not contribute to the mass of the solution.** ■ **Liquids that evaporate/boil disappear forever.** ■ **A fizzy-drinks can or glass container becomes wet because liquid from the inside seeps through to the outside.** ■ **When a substance has dissolved it has 'disappeared'.** ■ **Substances (like sugar) 'melt' in water.** Pupils will work scientifically by: • grouping and classifying a variety of different materials; • exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). • researching the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting. **Vocabulary:** **Solid, liquid, gas, particles, state, Materials, properties, matter, melt, freeze, water, ice, Temperature, process, condensation, Evaporation, water vapour, energy, precipitation,**	**Electricity :** **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions **What children need to know:** ■ *A simple circuit consists of a series of conductors.* ■ *That some materials, such as metals, are conductors and others, such as plastic, are insulators.* ■ *A circuit needs to be complete to work.* ■ *The number and voltage of cells in a circuit, affect the brightness of the bulb or loudness of the buzzer.* ■ *The reasons for differences in how components behave in a circuit.* ■ *The different symbols that represent a simple circuit.*

condensation in the water cycle and associate the rate of evaporation with temperature	**collection** **Sound:** **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions  **What children need to know:** ■ Our ears detect sounds so that we can hear. ■ Loud sounds can damage our ears. ■ Some materials are effective at muffling sounds. ■ Sounds are made when something vibrates. ■ Vibrations from sounds need a medium (solid, liquid or gas) to travel through to reach our ears. ■ There is a link between the features of an object and the pitch of sounds that it produces. ■ There is a link between the strength of the vibrations and the volume of the sound that is produced. ■ Sounds get fainter as the distance from the sound source increases. **Common misconceptions:** 1. Children do not always recognise that vibrations are the cause of a sound being produced. 2. Children may think volume and pitch of a sound are the same thing or mix them up. 3. Children may think that sound only travels through air, not solids or liquids. 4. Children may think sound is slowed down by physical obstructions. 5. Children may think that sound gets quieter as it travels further because it has 'faded out' or run out of 'energy'. Pupils will work scientifically by: • finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses • making earmuffs from a variety of different materials to investigate which provides the best insulation against sound • making and playing their own instruments by using what they have found out about pitch and volume. **Vocabulary :** **Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave.**	**Common misconceptions – often children may think that:** ■ *Different coloured wires affect how the circuit works.* ■ *Wire is made of plastic.* ■ *If a circuit is broken, energy goes off into the air.* ■ *Electricity comes out of both sides of the battery and leads to both sides of the component.* ■ *Current, voltage and electricity are all the same thing.* ■ *Current gets less as it passes through components.* ■ *Electricity is an object that can be seen.* Pupils will work scientifically by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit. **Vocabulary:** **Electricity, appliance, circuit, component, cell, battery, connect/connections, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol.**
National Curriculum Objectives : Living things and their habitats Y4 Pupils should be taught to:	National Curriculum Objectives : States of Matter (year 4 curriculum) Pupils should be taught to:	National Curriculum Objectives : Electricity (Year 4 curriculum)

• 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. **Assessment :** **Living things and their habitats :** Recap previous work on classifying and habitats. Consider school grounds/local area as a habitat and go on a search for living things (incl. plants) in the grounds. Take a camera/draw/make lists of larger things and collect smaller things. Classify the living things into groups e.g. vertebrates / invertebrates / plants. Create subsets within groups e.g. flowering / non-flowering plants, birds / mammals/ invertebrates etc. **Not yet met:** Children can identify various living creatures by obvious differences and begin to suggest methods of grouping them. **At:** Children identify that animals and plants can be classified in a number of possible ways including vertebrates and invertebrates, flowering and non-flowering plants. **Possible ways of going further:** All groups are sorted by the same characteristic and some groups may be sub-divided. Connections are made between types of living creatures and plants found in each group, e.g. *most insects live in a dark place under rocks or logs*. Animals including humans – (Year 4 curriculum) Pupils should 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. **Assessment : States of Matter** Plan an investigation to reach a conclusion within a real life context, e.g. Where is the best place to dry your washing? Which conditions are the best to dry materials by evaporation? Make a list of different places/conditions (e.g. temperature or draughtiness). Discuss how to know if it is dry e.g. dry to touch, handprint no longer visible, no imprint on tissue. In small groups, children to decide on the type of material (cloth/paper towels), quantity of water, locations to test evaporation (e.g. could arrange washing lines in different locations around the school) and how often to observe/check. Provide measuring equipment including thermometers, jugs, rulers. Pupils could record their method before/after set up. N.B. Paper towels can dry in an afternoon, heavy fabric will take longer. **Not yet met:** Can make suggestions about how to answer the question but needs support to explain which variables must be kept the same. **At:** Can set up and carry out a fair test. Is able to say what is changed and that other factors which could affect evaporation are kept the same, e.g. *I will keep the same…amount of water, size of material.* **Possible ways of going further:** Recognises additional	Pupils should be taught to: • 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. (May continue into T3) Working scientifically lower KS2 • Ask relevant questions and use different types of scientific enquiries to answer them • Set up simple practical enquiries, comparative and fair tests • Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • Identify differences, similarities or changes related to simple scientific ideas and processes • Use straightforward scientific evidence to answer questions or to support their findings **Assessment : Electricity** Introduce the terms conductors and insulators. Example context: soldiers wear ‘smart’ clothing which conducts electricity: http://www.bbc.co.uk/news/technology-17580666 E.g. a soldier in the desert that has ripped

• 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. <u>Working scientifically</u> lower KS2 • Ask relevant questions and use different types of scientific enquiries to answer them • Set up simple practical enquiries, comparative and fair tests Make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment including thermometers and data loggers. • Gather, record, classify and present data in a variety of ways to help in answering questions • Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables • Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • Identify differences, similarities or changes related to simple scientific ideas and processes • Use straightforward scientific evidence to answer questions or to support their findings **Assessment : Animals Including Humans** Discuss how children look after their teeth. Explain that we will be using hard boiled eggs to represent teeth to investigate tooth decay. As a class set up a fair test to investigate the effects that different liquids have on teeth e.g. cola, water, vinegar, milk, sports drink and orange juice. Discuss how they can make the comparison fair, i.e. as to quantity of liquid, types of containers, time and location (if	variables and could suggest some controls, e.g. *have a dry towel outside to check it doesn't rain, put under gazebo so if it rains it doesn't get more wet.* Sound (Year 4 curriculum) Pupils should be taught to: • 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. **Assessment : Sound** Show children some homemade 'musical instruments': elastic bands over shoe box, 'straw flute/pan pipes', 'sound sandwich' (lolly stick and straw harmonica), stretched balloon 'drum skin' over tube, glass bottle containing water to blow or tap. Explore how to play them to make a sound and ask the children to suggest which parts are vibrating. Ask children to record a range of questions that they could investigate, focusing on changing pitch (e.g. How does the width of the elastic band affect pitch?) Children then work in small groups investigating their questions, considering different ways to alter pitch. **Not yet met:** Can ask questions, e.g. *which makes the highest sound?* Makes some suggestions about what to do, but needs help in phrasing the question. **At:** Can ask questions and turn them into a form that	part of 'smart' clothing losing part of the GPS circuit, so unable to provide location for rescue. Explain that the soldier has a pack containing a variety of objects: which could be used to complete a circuit to activate the GPS? Provide each group with a 'soldier's backpack' containing a collection of objects/ materials (including different metals and plastics). Discuss how to find out whether electricity can pass through the materials. Groups test by putting materials into a gap in a circuit with a bulb/buzzer. Focus pupil recording/presenting on explaining what the results show. E.g. they could produce a radio or video message to send to the soldier explaining how to produce a working circuit and why they are confident that this will work, providing scientific evidence and a list of all possible conductors (in case some are damaged). Recap on the terms insulators and conductors. **Not yet met:** Can identify some (not all) objects that allow/do not allow electricity to pass through them but does not yet make generalisations. **At:** Can describe the circuit and explain how their results (orally/written form) show that metals conduct electricity and most other materials do not. **Possible ways of going further:** Can also suggest other items to fit into the pattern and explore exceptions to the rule. Can apply the terms conduct/insulate to explain safety rules, e.g. not putting knife in toaster.

using milk do they all need to be in the fridge?) Leave for one week, although children can check on the experiment daily to see if they can notice and changes. After one week, unveil the eggs by tipping into a white bowl and photograph. Children to record their observations (look, feel, smell, etc.) and rate the eggs in order of damage to shell observed. Children to consider how they could improve the test and what further questions arise that they could investigate. **Not yet met:** Describes differences, e.g. *the egg is OK in milk/water but not in coke.* **At:** Can order liquids according to damage done to eggs and suggest reasons why. Able to raise further questions, *e.g. I thought sports drink/orange juice was a 'healthy' drink but it was not, I wonder whether these drinks contain a lot of sugar?* **Possible ways of going further:** Would be able to think about other liquids or factors including acid and carbonated drinks and suggest causal relationships, *e.g. the more acid/sugar in the drink, the worse the damage.* Can recognise problems with the test, e.g. *use of eggs not teeth, eggs were in liquid for 1 week but I do not keep coke in my mouth for 1 week!*	can be investigated. E.g. *How does the size of the drum affect the pitch?* **Possible ways of going further:** Can use their results to make a prediction to set up further comparative fair tests, e.g. *I know that a small drum makes a high pitch so will a small recorder make a higher pitch than a long one?* Working scientifically lower KS2 • Ask relevant questions and use different types of scientific enquiries to answer them • Set up simple practical enquiries, comparative and fair tests • Make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment including thermometers and data loggers. • Gather, record, classify and present data in a variety of ways to help in answering questions • Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables • Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • Identify differences, similarities or changes related to simple scientific ideas and processes • Use straightforward scientific evidence to answer questions or to support their findings	
Planning ideas: Ideas for longitudinal studies: Research a food chain for a minibeast in the local environment that is easy to find (e.g. woodlice and snails). Each group of children is allocated a small habitat, they monitor the plants and animals that live there over the course of the year and relate any	**Planning ideas:** Given a variety of objects (e.g. water in bottles, elastic bands, rulers, tuning forks, those wind up music box things). Children try and change the pitch of the notes and try and summarise what they have found. If the volume of a sound decreases with	**Planning ideas:** Electrical power Sources. Lots of devices are powered by electricity; these need a source of electricity, which could be mains or battery. What batteries do. The battery's job is to push electricity to the device, but it needs something to carry the

population changes to the seasons and the change in populations of other organisms in the food chain. Identify as many plants and mini beasts in the pond. Research how these might be related in a food chain. Investigate how the populations **c**hange over the course of a year and use the food chains to help them explain these changes. Cover a patch of grass with two planks of wood, and a mark a similar area and leave uncovered (before doing this identify the mini beasts and plants that are in the covered patch). Monitor the changes in populations over time and after a period of time remove one of the planks and monitor how it responds and compare it with the covered and uncovered area. Set up a series of water butts, put different things in each (all the kinds of things you might see in a pond). Monitor what happens in each butt over a year (even better if you carry it on for a few). What are the most important things to add to a pond to help it develop? Notes about monitoring the seasons: Children need to learn how the temperature, light and water affect food chains in the local environment. They need to learn how these weather factors change through the seasons. One powerful way of helping children do this is to monitor the weekly temperature, rainfall and daily hours of sunlight and constru ct a large wall chart of this data. This will help them see the patterns and relate them to changes in populations. **Animals Inc Humans :** Provide children with a variety of different foods and they predict what nutrients they provide. Show them the food labels to check their ideas. Children keep a food diary for a day and then check tally up how much of each food group was in their diet. How does this compare with a healthy diet? Compare the diets of athletes with different	distance what happens to it? If it spreads out how could you prove it? How does the size of an ear trumpet affect the volume of sound detected? How does the type of material affect how well it blocks sound? How does the thickness of a material affect how well it blocks sound? Which materials vibrate better and produce louder sounds? Can we identify any patterns? Which materials make the best string telephone components? Tin cans, plastic cups, paper cups; or for the cable wire, string or elastic. Predict and test. Blow up a balloon with a 10p coin inside it. Swirl the balloon so the coin rolls around the inside (not slides). See clip https://www.youtube.com/watch?v=aAMW_3kWUhE Challenge children to use their knowledge of pitch and volume to investigate what made the squealing noise. Make a straw oboe. See clip https://www.youtube.com/watch?v=yCmXhDZhqKQ There are many exciting investigations this can be used for, a simple one is how does the length of the tube affect the pitch and volume? Partially fill a glass bottle (or use test tubes) with water. Tap it to make a sound and blow across it to make a sound. What is vibrating to make the sound in each case? Plan and carry out an investigation to find out. Can you predict the relative pitch of tuning forks from the patterns of ripples they make when struck and placed in water? **<u>States of Matter</u>**: Give children a variety of materials (including powders, gels, foams and things like blu tac) ask them to classify them as solids, liquids or gases. How does the amount of water added to flour	electricity all the way from the supply to the device, this is what we call a circuit. Making devices work harder. If there are more batteries they push harder and so the device will work harder e.g. brighter or faster. Chapter 4: Insulators and conductors. However not everything can carry the electricity from the source to the device, some materials allow the electricity through (conductors) and others don't (insulators) Identify and name devices and justify if it is mains or battery powered and if battery powered, find it. Give children a range of different battery powered devices and ask them to predict how the battery would need to be different. They remove the batteries and categorise how batteries need to be different and why. Give children leads, batteries and lamps and let them get it to light. Give children some broken circuits. they have to identify what is wrong and make it work. How does the length of time a battery is on for affect how well a device works? How does the number of batteries added to the circuit affect a device? Give them a battery and a bulb and lots of junk material and they have to make the lamp light. Scenario where they have to make a switch from junk (maybe a light or/and buzzer goes on when burglar steps on a mat)

demands e.g. cyclists and sprinters, marathon runners and weightlifters. How are they different and why? Give information about the poor diet of someone who is trying to be super skinny, predict the effects on the persons health and body Children keep a food diary for what they ate the previous day. Provide a large torso outline and ask children to annotate what has happened to the food they ate the previous afternoon and evening. After washing hands children feel their teeth, describe what they are like, then look in a mirror and draw them. They then eat a variety of foods; identifying which teeth they use and hypothesise which teeth do which job. Show pictures or fossils of animals teeth and jaws, predict what the animal eat. What liquids make teeth rot? (Use marble chips rather than eggshells as they fizz gently in lemon juice and acid). (This is interesting because sugar does not corrode teeth, only acids do. Sugar does result in tooth decay because bacteria in the mouth eat sugar and excrete acid; it is this acid that corrodes teeth). Construct a food chain from animals teeth found in the local area (or ones you have bought!) Bread is a carbohydrate and so provides our muscles with energy, but it needs to dissolve in the blood before it can be transported to the muscles. Where in the body does this happen? Does chewing make it dissolve? Does chewing with saliva make it dissolve? Does mixing with acid make it dissolve? They can test all of these things. The point is that one of these things causes bread to dissolve, this happens in the intestines. (They don't need to know how it happens just that this is where it does)	affect its state? We need to make the best water slide possible. How does the amount of detergent added to water affect how slippy it is? How does the temperature affect how viscous a liquid is (use cooking oil)? Put a series of liquids into order of viscosity (choose ones that are similar so they have to perform an accurate test). Spray perfume or water (children don't know which) at one end of the room and they raise their hands when they can smell it. They then draw diagrams of their choice to show what happened to the smell (gas) and explain the pattern of its movement. Dancing raisins. Place a handful of raisins in a small bottle of lemonade. Children explore why they behave the way they do. Place a peach in a glass of lemonade and watch it spin. Why does it behave that way and can you prove it? Demonstrate the water cycle by melting ice, heating water to let it evaporate, showing the steam condense on a cold surface and letting it run off and drip like rain back into the original container. Children are shown the following equipment and asked to predict what will happen and why, and then they do it. The council put salt on ice and snow to melt it. How does the material sprinkled on ice and snow affect how quickly it melts? What is the freezing temperature of water? (Mixing ice and salt produces mixtures that can be as cold as -15oC and make good baths for freezing water in).Does the volume of water affect the temperature at which it freezes? Chocolate smugglers. Children have been trying to	

	smuggle chocolate into class by putting it in their pockets, but it always ends up as a squidgy, liquid mess. What chocolate would be best to smuggle? How does the type of chocolate affect its melting temperature? Give children a range of substances and ask them to put them in order of what they think their melting temperatures may be. Include metals, rocks, and oils. Can they estimate the melting temperatures? 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? Investigate. What do we think will happen to an ice cube if it is left out for a few days? What do we think would happen to a lump of wax and why is there a difference?	

Year 5

Over the course of the year children in Year 5 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed below.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topic **Properties and Changes of materials**	Spring Topic **Forces / Earth and Space**	Summer Topic **Living things and their habitats / Animals inc Humans (to include)**
Properties and Changes of Materials **Prior Learning:** ● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) ● Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) ● 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. (Y3 - Forces and magnets) ● Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) ● 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). (Y4 - States of matter) ● Identify the part played by evaporation and	**Forces** **Prior Learning:** ● Compare how things move on different surfaces. (Y3 - Forces and magnets) ● Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) ● Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) ● 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. (Y3 - Forces and magnets) ● Describe magnets as having two poles. (Y3 - Forces and magnets) ● Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)	**Living things and their Habitats** **Prior Learning:** ● Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) ● Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)

<table>
<tr>
<td>condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)</td>
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<td><u>Future Learning:</u>
• Chemical reactions as the rearrangement of atoms. (KS3)
• Representing chemical reactions using formulae and using equations. (KS3)
• Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)
• Defining acids and alkalis in terms of neutralisation reactions. (KS3)
• The pH scale for measuring acidity/alkalinity; and indicators. (KS3)</td>
<td><u>Future Learning:</u>
• Forces as pushes or pulls, arising from the interaction between two objects. (KS3)
• Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)
• Moment as the turning effect of a force. (KS3)
• Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3)
• Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)</td>
<td><u>Future Learning:</u>
• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)
• Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)</td>
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<td rowspan="2"></td>
<td><u>Earth and Space</u>
<u>Prior Learning:</u>
• Explore the natural world around them. (Reception - Earth and space)
• Describe what they see, hear and feel whilst outside. (Reception - Earth and space)
• Observe changes across the four seasons. (Y1 - Seasonal changes)
• Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)</td>
<td><u>Animals including Humans</u>
<u>Prior Learning:</u>
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)</td>
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<tr>
<td><u>Future Learning:</u>
• 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). (KS3)
• Our Sun as a star, other stars in our galaxy, other galaxies. (KS3)
• The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)
• The light year as a unit of astronomical distance. (KS3)</td>
<td><u>Future Learning:</u>
• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)</td>
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<tr>
<td>Properties and Changes of materials
Common misconceptions:
https://pstt.org.uk/resources/curriculum-materials/common-misconceptions</td>
<td>Forces
Common misconceptions:
https://pstt.org.uk/resources/curriculum-materials/common-misconceptions</td>
<td>Living things and their habitats:
Pupils will work scientifically by:
• observing and comparing the life cycles of plants and animals in their local environment with other</td>
</tr>
</table>

What children need to know:

- observe that some materials change state when they are heated or cooled.
- know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.
- identify the part played by evaporation and condensation in the water cycle.
- demonstrate that dissolving, mixing and changes of state are reversible changes.

Common misconceptions – often children will think:

- **Steam is visible.**
- **Steam and condensation are the same.**
- **Evaporation only occurs when water is boiling.**
- **Clouds are made of gas.**
- **Boiling/evaporation are irreversible changes.**
- **When a solid dissolves in water it does not contribute to the mass of the solution.**
- **Liquids that evaporate/boil disappear forever.**
- **A fizzy-drinks can or glass container becomes wet because liquid from the inside seeps through to the outside.**
- **When a substance has dissolved it has 'disappeared'.**
- **Substances (like sugar) 'melt' in water.**

Pupils will work scientifically by:
• carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
• comparing materials in order to make a switch in a circuit.
• observing and comparing the changes that take place, for example, when burning different materials or baking bread or cakes.
• researching and discussing how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials.

Vocabulary:
Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversible, separate, mixture, insulator, transparent, flexible, permeable, soluble, property, magnetic, hard.

What children need to know

English National Curriculum statutory statement: To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

- Mechanisms are designed to make 'work' easier because less force may be required to make an object move
- Levers, gears and pulleys are different mechanisms and can be used for specific purposes
- How to use mechanical systems in products they design and make (English Design Technology curriculum)

Common misconceptions – often children may think:

- The term 'force' means someone makes you do something you do not want to do. It is also associated with the Armed Forces by some children in schools.
- Movement stops when things 'run out of push' rather than because there are other forces acting on them. They may think that to keep an object moving you need to keep giving the object a force (push). This common misconception is because of the invisibility of the other forces at work. To help overcome this idea, the use of arrows to define size and direction of forces is needed in diagrams. This is particularly important as force is a 'vector quantity' and therefore should have both its size and its direction identified.
- A stationary object has no forces acting on it. The reason the object is stationary is because the forces acting on it are balanced.
- The best place to put the fulcrum is in the centre of the lever. The mechanism will in fact have a bigger effect when it is closer to the object being moved.
- A greater force on a mechanism always has a greater effect on the object. In fact, a mechanism can allow a smaller force to have a greater effect.
- Mass and weight are the same thing. Mass is a measure of the amount of matter in an object; weight is a measure of the force exerted by the object due to gravity. It is important to define these measurements and the difference must be clear when introducing pulleys.

Pupils will work scientifically by:
• exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective.
exploring resistance in water by making and testing boats of different shapes.

Vocabulary :
Air resistance, Water resistance, Friction, Gravity, Newton, Gears, Pulleys, force, push, pull, opposing, streamline, brake, mechanism, lever, cog, machine, pulley.

Earth and Space
Pupils will work scientifically by:
• describing the movement of the Earth, and other planets, relative to the Sun in the solar system
• describing the movement of the Moon relative to the Earth
• describing the Sun, Earth and Moon as approximately spherical bodies
• using the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences.
• trying to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs.

Vocabulary:
Environment, flowering, non- flowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Sexual, asexual, reproduction, cell, fertilisation, pollination, male, female, pregnancy, gestation, young, Mammal, metamorphosis, amphibian,insect, egg, embryo, bird, plant.

Animals inc Humans
• researching the gestation periods of other animals and comparing them with humans;
• finding out and recording the length and mass of a baby as it grows

Vocabulary:
Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty

	Vocabulary : **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**	
National Curriculum Objectives: **Properties and Changes of Materials** (Year 5 topic) • 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 changes not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. **Working Scientifically :** Plan different types of scientific enquiries to answer questions, including recognising and controlling variables, where necessary • Take measurements using a range of scientific	National Curriculum Objectives: **Forces** (Year 5 topic) • 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. • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Identify the effect of drag forces, such as air resistance, water resistance and friction, that act between moving surfaces. • Describe, in terms of drag forces, why moving objects that are not driven tend to slow down.understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs. **Assessment : Forces** Ask groups to make a working zipline for a small	National Curriculum Objectives: Animals inc Humans Animals, Including Humans Year 5 Objectives • describe the changes as humans develop to old age. Living things and their habitats – Year 5 objectives • 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. **Working Scientifically :** Plan different types of scientific enquiries to answer questions, including recognising and controlling variables, where necessary • Take measurements using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • Use test results to make predictions to set up further comparative and fair tests • Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations • Identify scientific evidence that has been used to

equipment, with increasing accuracy and precision, taking repeat readings when appropriate
• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
• Use test results to make predictions to set up further comparative and fair tests
• Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
• Identify scientific evidence that has been used to support or refute ideas or arguments

Assessment : Materials

You want to see which cup will keep your tea warm for longer. Show different cups of hot water, e.g. paper cup, stacked paper cups, thermos mug. Measure the temperature of the water, repeat after about one hour (e.g. at the beginning and end of lunchtime).

Activity

Use the results of the pre-activity to make predictions about insulation (e.g. a good insulator has more layers / traps air / made of….). Provide a collection of different materials and invite the children to discuss their ideas about which might be good for keeping the drink warm. The children could order the materials according to which will be best insulators or select one to test for layering and record their predictions, giving reasoning based on the previous test results. Children plan and carry out an investigation to test their predictions.

Not yet met: Suggests which insulators might be best but this is not linked to evidence from the first test. Needs support to carry out fair test

At: Uses evidence from the first test to support their prediction. Carries out a fair test independently. From

toy using string from e.g. a door, display board, tree branch or wall bar etc. Provide time for exploration of variables which could affect the zipline.
Bring the class back together to discuss what could affect the zipline performance.
Discuss a range of 'change' variables e.g. 'wire', incline, toy, means of connecting toy to string.
Make and record predictions.
Each group to select one variable to change and aim to keep all others the same.
Measure time or distance to see if the change variable makes a difference to the zipline rate.
Note that measurements can be repeated or discounted.
Discuss findings as a class and compare to predictions.

Not fully achieved: Pupils make predictions but may not carry out tests in a systematic way or refer to their evidence when revisiting their predictions.

At: Pupils identify a range of variables which could affect the zipline and make predictions based on their explorations and previous experience of friction. They carry out tests and compare evidence to their predictions.

Exceeded / going further: Pupils recognise flaws in their fair testing e.g. difficulty in maintaining the gradient. Tests are repeated in a systematic way. Pupils apply their scientific knowledge of friction and gravity to provide more in-depth explanations of their predictions and findings.

Earth and Space :
National Curriculum objectives
Pupils should be taught to:

support or refute ideas or arguments

Assessment :

Ask children to research the life cycles of two different species using a range of secondary sources. This could be in small groups or individually. Discuss possibilities for presenting their research (if possible, provide a purpose e.g. presenting to younger children/parents etc.) For example, different children could choose to make a model, a mime/drama, a rap/song or a poster/book. Agree on criteria for successful presentation of research e.g. clear order to life cycle, comparison between two life cycles, use of scientific vocabulary etc. Children present their research to the intended audience. Groups could peer assess against agreed success criteria.

Not yet met: Children report either with little reference to their research, or using sections verbatim.

At: Children select relevant facts from their research to compare the life cycles of different animals. They describe the main stages of each life cycle. *e.g. The lifecycle of a cricket has 3 stages: egg, nymph and adult whilst the lifecycle of a frog has 5 main stages: eggs, tadpole, tadpole with legs, young frog and adult frog.*

Possible ways of going further: Children make links to other areas e.g. animal classification, habitats, survival, life processes.

own findings identifies which material is the best insulator, *e.g. this one because it took longer to cool.* **Possible ways of going further:** Compares own data with the original hypothesis & suggests reasons for similarities and differences, including any anomalies, *e.g. this one took longer to cool because....*	• 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. **Working Scientifically :** Plan different types of scientific enquiries to answer questions, including recognising and controlling variables, where necessary • Take measurements using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • Use test results to make predictions to set up further comparative and fair tests • Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations • Identify scientific evidence that has been used to support or refute ideas or arguments **Assessment : Earth and Space** Investigate the formation of 'craters' by dropping meteors (e.g. marbles or balls) into a tray of sand and observing the craters produced. Introduce by looking at photos/websites of impact craters. As a class drop a variety of different spherical objects into the sand and measure the diameter of the craters, creating a class graph. As a class, consider what could be changed and measured (could use a sticky note planning board) and allocate different variables to different groups of	

	children (height of drop, size of meteor, type of sand). Discuss how they can make their results more reliable (repeating each drop and finding an average) and suitable units of measurement to use. Together, generate success criteria for drawing tables and graphs for children to peer assess against together at the end of the activity. Ask each group to make measurements and record them in a table and graph of their own design. **Not yet met:** Records measurements in a simple table / graph but needs adult support to record measurements and plot values. **At:** Can make decisions about what to record and where to put information in a simple table and graph. Can calculate/plot mean or median if repeat measurements have been taken. **Possible ways of going further:** Notice and discuss anomalous results or discount them from the data, suggesting possible explanations for them linked to their investigation.	
Planning Ideas : **Materials:** It is possible to change materials into completely different ones. This is very important because new substances might have different properties to materials we currently have. For example plastics can be moulded into intricate shapes, are waterproof, strong and electrical insulators. 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? Indicators that something new has been made are: 1. The properties of the material are different (colour, state, texture, hardness, smell,	**Planning Ideas :** **Forces :** How does the saltiness (salinity) of water affect water resistance? How does the length of a paper helicopter's wings affect the time it takes to fall? 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 (model this with a material they can change the tread on rather than a real shoe). Is the same conclusion reached if the surface is rough and smooth? Modern racing cars have very wide tyres; is this to	**Planning Ideas :** **Animals Inc Humans** Study images of different humans. What are the similarities and differences? Children explore images of what they looked like as babies, toddlers and children. How have they changed? How are they similar / different etc? Compare the lifecycles of different mammals, amphibians and birds. Study an animal in the classroom and track how it changes over time. Compare different plant life cycles.

temperature) If it is not possible to get the material back easily it is likely that it is not there any more and something new has been made (irreversible change) The key question we want children to interrogate is "have we made a new substance?" Wet clay to air-dried clay to fired clay. Flour and water to dough to 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 un dissolved) 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) 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.	improve grip? How does surface area affect friction? Putting small granules (cous cous is effective) under a block allows it to be dragged more easily. How does the amount of cous cous affect the friction? How does the type of liquid put between two surfaces affect the friction between them? How does the roughness of a surface affect the effectiveness of a lubricant in reducing friction? **Earth and Space :** Predict and explain how the temperature of each planet may vary. Use data to check and then consider which planets could possibly host life (it must contain liquid water for at least some time) Predict how long each planetary year might be and compare with data. How does the distance from a light source affect how much light hits an object? Apply this to the solar system and predict how much light each planet receives. Does having more moons result in more light hitting a planet? How could you test this idea? Using knowledge of the solar system and the importance of water and light for life, predict the temperature and light levels on different planets and suggest which planets might be possible to support life in the future. They then look at real temperature and light data and reflect upon what they suggested. Investigate moon craters. How does the speed / size of a meteorite affect the size of a moon crater formed? If the moon became heavier as a result of meteorite collisions what would happen to its position relative to the Earth? Imagine that somewhere in the universe is a vast (bigger than the solar system) cloud of dust of varying sized bits and varying distances apart.	**Living things and their Habitats:** Explore lifecycle of a human (a recap and revision of **Animals including humans**) Compare the lifecycles of different mammals, amphibians and birds. Study an animal in the classroom and track how it changes over time.. Amphibians have a process of metamorphosis. Mammals have similar lifecycles Compare different plant life cycles. Explore the different processes of reproduction in these. How do bulbs reproduce? Can you complete a full life cycle? (Plant a quick growing plant / beans] and observe how it changes. Harvest the fruit and dry out the seeds. What happens if you plant it? Observe a pair of old shoes and how minibeasts begin habituating spaces. (leave outside for topic) (Would our results have been different if we had located them somewhere else? How could we prove this? What does this information tell us?) Invite the children to select an animal of interest. How has it adapted? What are the issues surrounding its survival? How does global warming affect animals like polar bears? How does deforestation impact food chains and populations? Explore how animals are suited to live in their habitat.

	What might happen to this cloud over many years? (This can be modelled using a handful of pom poms of varying sizes randomly dropped onto a table) Consider a spacecraft travelling from the Earth to the moon. Predict the forces acting on the craft at various stages in its journey. (The mass of the earth is 80 x that of the moon) If the mass of the earth is 80x that of the moon why is the gravity at the Earth's surface only 6 x greater than that at the surface of the moon?	

Year 6

Over the course of the year children in Year 6 will develop the following knowledge and skills:

They will also develop a bank of scientific terms and topic specific vocabulary which they should be able to demonstrate an understanding of and use in context. These are listed below.
Prior knowledge from the previous year will be built upon - this will be done through Knowledge mats and Knowledge boxes. Outside learning will be used as much as possible and cross curricular links made with other subjects.
We will use Explorify Year group activities for starters to lessons and to enable children to link knowledge and skills from different themes together.

Autumn Topic **Electricity (Aut 1) / Light (Aut 2)**	Spring Topic **Animals inc Humans** (Spring 1) **Living things and their Habitats (Spring 2)**	Summer Topic **Evolution and Inheritance**
Electricity **Prior Learning:** ● Identify common appliances that run on electricity. (Y4 - Electricity) ● Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity) ● 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. (Y4 - Electricity) ● Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity) ● Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)	**Animals including Humans** **Prior Learning:** ● Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) ● 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. (Y3 - Animals, including humans) ● Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) ● Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)	**Evolution and Inheritance** **Prior Learning:** ● 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. (Y2 - Living things and their habitats) ● Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) ● Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) ● Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks & Soils) ● Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) ● Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5)
Future Learning: ● Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3)	**Future Learning:** ● The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3) ● The effects of recreational drugs (including substance	**Future Learning:** ● Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3) ● A simple model of chromosomes, genes and DNA in

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- Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3)
- Differences in resistance between conducting and insulating components (quantitative). (KS3)
- Static electricity. (KS3)

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misuse) on behaviour, health and life processes. (KS3)

- The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3)
- The mechanism of breathing to move air in and out of the lungs. (KS3)
- The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)

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heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3)

- The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3)
- 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. (KS3)

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Light

Prior Learning:

- Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light)
- Notice that light is reflected from surfaces. (Y3 - Light)
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light)
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light)
- Find patterns in the way that the size of shadows change. (Y3 - Light)
- 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. (Y5 - Properties and changes of materials)

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Living things and their habitats

Prior Learning:

- Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats)
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats)
- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
- Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)

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Future Learning:

- The similarities and differences between light waves and waves in matter. (KS3)
- Light waves travelling through a vacuum; speed of light. (KS3)
- The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3)
- 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. (KS3)
- Light transferring energy from source to absorber

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Future Learning:

- Differences between species. (KS3)

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leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3) • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)		
Electricity **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions **What children need to know:** ■ *A simple circuit consists of a series of conductors.* ■ *That some materials, such as metals, are conductors and others, such as plastic, are insulators.* ■ *A circuit needs to be complete to work.* ■ *The number and voltage of cells in a circuit, affect the brightness of the bulb or loudness of the buzzer.* ■ *The reasons for differences in how components behave in a circuit.* ■ *The different symbols that represent a simple circuit.*	**Animals inc Humans** Pupils will work scientifically by: • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. • exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health. **Vocabulary:** **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.** **Living things and their habitats** Pupils will work scientifically by: • using classification systems and keys to identify some animals and plants in the immediate environment. • researching unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system. **Vocabulary:** **Variation Organisms Populations. Classification Characteristics Environment, flowering, non- flowering, plants, animals, Vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare,**	**Evolution and Inheritance :** **Common misconceptions:** https://pstt.org.uk/resources/curriculum-materials/common-misconceptions **What children need to know:** ■ *There are similarities and differences between living things and they can be grouped according to specific characteristics* ■ *Animals and plants live in habitats to which they are suited* ■ *Living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents* ■ *Living things have changed over time and fossils provide information about living things that inhabited the Earth millions of years ago* ■ *Animals and plants are adapted to suit their environment in different ways and adaptation may lead to evolution*

Common misconceptions – often children may think that:

- *Different coloured wires affect how the circuit works.*
- *Wire is made of plastic.*
- *If a circuit is broken, energy goes off into the air.*
- *Electricity comes out of both sides of the battery and leads to both sides of the component.*
- *Current, voltage and electricity are all the same thing.*
- *Current gets less as it passes through components.*
- *Electricity is an object that can be seen.*

Pupils will work scientifically by:
• systematically identifying the effect of changing one component at a time in a circuit.

Vocabulary:
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.

Light :
Pupils will work scientifically by:
• Investigating the relationship between light sources, objects and shadows by using shadow puppets.

Vocabulary:
Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent. Reflect Absorb Emitted Scattered Refraction

bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean.

Common misconceptions – often children may think that:

- *Environmental change can be inherited, e.g. if a sheep loses its tail, its lambs will be born without a tail*
- *Humans used to be monkeys*
- *An individual can evolve during its own lifespan*
- *Evolution produces living things perfectly adapted to their environment*
- *Natural selection is an active process, ie an individual or a species can try to adapt*
- *Natural selection is always good for the species*
- *Evolution and religion are incompatible*

Pupils will work scientifically by:
• observing and raising questions about local animals and how they are adapted to their environment;
• comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels.
• analysing the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

Vocabulary: Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics

National Curriculum Objectives: **Electricity** Electricity (Year 6 topic) • 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. **Assessment :** Recap previous work on conductors/insulators and what is needed to make a bulb or LED light. Can we use something other than a metal to be a conductor in a circuit? Make salt dough (with the children if possible) – see recipes and practical guidance below. Challenge the children to use a battery, wires, an LED and balls of dough to make a circuit to test whether the dough is a conductor. NB. LEDs have a polarity – short leg to negative, long leg to positive. The dough has a higher resistance than a wire, so you may need more powerful batteries than usual. Explore using more LEDs and making different shapes with the dough e.g. animals. (Remind children that the electric current will take the path of least resistance, so check for shortcuts – dough touching). Children could take photos or draw diagrams of different designs. **Not yet met:** Pupils need support to create a circuit with the dough and find it difficult to explain how the LED/bulb lights up.	National Curriculum objectives : **Animals inc Humans** Animals Including Humans – Year 6 objectives • 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. **Assessment : Animals including Humans** **Previous lesson:** measuring pulse rate at rest and after exercise (measuring and recording focus). **This lesson:** Discuss previous findings about pulse rate: can be hard to measure, but generally found that pulse rate increases after exercise. Recap why: *blood carries oxygen around the body, the muscles need more oxygen during exercise, so your heart works harder to supply more oxygen.* But what if your body is still e.g. headstand, raised arms, balance, yoga pose, plank? Focus individual recording on predictions and explanations. Discuss with the children how to plan and carry out a test into a stationary exercise. Consider how long the pose should last, comparison with resting pulse rate, whether one child or several children should be tested, how to carry out the tests safely. Ask the children to carry out the test and record results as in a group. Discuss findings. **Not yet met:** Children can explain that where the pulse rate goes up, this indicates that the heart is beating faster. They are aware that different children may have different resting pulse rates.	National Curriculum Objectives: **Evolution and Inheritance** (Year 6 topic) • recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. **Assessment : Evolution and Inheritance** Show a picture of a fossilised skeleton/creature and discuss the children's ideas about fossils, what it was, what it ate, where it lived etc. (Could provide only one part to start with, or parts to different groups, to show how we only have part of the information). Discuss strong/weak evidence e.g. strong evidence that has skeleton/teeth etc, place where fossil was found suggests habitat, similarities with modern creatures suggest colour etc. Provide children with photos or real/resin fossils (trilobite, ammonite, ichthyosaurus etc, plus any found locally or linked/displayed at local museums). Ask them to use the fossils and their own research to develop ideas about the creatures e.g. labelled drawing with size, possible appearance, diet, habitat, what other fossils could exist eg what prints could be left behind.

At: Pupils work systematically to create a range of circuits. They identify the dough as a conductor and recognise the need for a complete circuit (without a short circuit) in order for the LED/bulb to light.

Possible ways of going further: Pupils explore the differences between circuits they have made e.g. comparing series and parallel circuits or different types of dough.

Light (Year 6 topic)
• 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.

Assessment : Light
Introduce the investigation by shining a light on an object and asking how the shadow of the object could be changed (e.g. size of object/number of blocks, distance/angle of torch). List potential investigation questions. Ask children to select a question which will result in numerical data and carry out the investigation. As a class, generate clear success criteria for taking precise measurements and drawing accurate line graphs to display results. Focus on recording of results. Children could peer assess graphs against the success criteria, giving each other feedback for improvement.

At: Children can use their data to make further predictions linking how hard the heart has to work with the heart rate, *e.g. When you are upside down the distance that the blood needs to be pumped upwards is greater, so your heart works harder and beats faster. Therefore, I predict that our pulse rates would rise if we raised our arms as the blood would also be pumped upwards.*

Possible ways of going further: Can explain that it is important to measure the changing pulse rates of several children to get a good picture of the overall pattern as individuals might vary. Can use their tables or graphs to make predictions about different situations.

National Curriculum Objectives:
Living things and their habitats – Year 6 objectives
• 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

Assessment : Living Things and their Habitats

(To be completed after some input on animal classification).
Show children some invertebrate film clips (e.g. David Attenborough). Explain that their task is to research different invertebrates (show egs).
Discuss: how will you share what you have found out? Agree options e.g. poster, labelled diagram or model (playdough), written report, information leaflet, drama, animation etc.
Give small groups a different invertebrate group to focus on (annelids, molluscs, insects, arachnids,

Could colour code or star ideas for which there is the strongest evidence.

Not yet met: Ideas about the creature are limited or lacking in use of evidence from fossil, research or comparisons with modern animals.

At: Can explain how fossils are formed. Can identify evidence to support ideas, from fossil, research or comparisons with modern animals.

Exceeding: Considers what can be known about appearance, habits and habitats from fossil evidence. Describes potential sources of error.

Possible ways of going further: Can explain that it is important to measure the changing pulse rates of several children to get a good picture of the overall pattern as individuals might vary. Can use their tables or graphs to make predictions about different situations.

Not yet met: Requires support to take accurate measurements and and needs help to plot points accurately on a line graph. **At:** Uses appropriate equipment to measure, e.g. a protractor for angle of light, a ruler to measure length of shadow to nearest mm. Takes precise measurements which are recorded accurately on a line graph. **Possible ways of going further:** Uses line graph to make further predictions, *e.g. if the angle of the light is 60°, the shadow will be 5cm.*	crustaceans and myriapods). Each group must give an example and describe the features which make it a member of its classification group. Present/share with rest of the class. Groups peer assess against agreed success criteria **Not yet met:** Report and present information about an animal. Explains some differences between animals, but lack of clarity about the classification groupings. **At:** Explain all of the key characteristics of that group and how they differ from other groups. Able to justify why their chosen animal belongs to one invertebrate group and not another. E.g. a *ladybird is an insect as it has an exoskeleton, a three-part body and three pairs of jointed legs.* **Possible ways of going further:** Able to explain how invertebrates from a broad range of habitats are classified with reasons why. Could answer questions about an unfamiliar invertebrate and decide which group it belongs to.	
Planning Ideas : **Electricity:** Do all batteries push as hard as each other? Design a circuit that will allow us to quickly compare how well different batteries push current. How does the voltage of a battery 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 the number of batteries used affect the	**Planning Ideas :** **Animals inc Humans :** How does the size of a person affect their lung capacity? Candles need oxygen to burn. How is the time a candle burns for affected by the amount of times I have breathed in and out the air that it burns in? How does the size of the muscle we exercise affect our pulse rate?	**Planning Ideas :** **Evolution and Inheritance:** Construct a large time line along the class wall covering the last 1 billion years. Add to this timeline key events e.g. when life first appeared, when plants first appeared, when dinosaurs appeared and became extinct. Give groups an organism to research how it has evolved and hang this information from the time line.

current that flows? How does the length of a wire affect how bright a bulb is? What can I do to make it easier (reduce the resistance) for current to flow from the battery to the bulb? Are all wires equally good at conducting electricity? How does the number of lamps in a circuit affect how long a battery lasts? How does the length of a wire affect how hot it becomes when it conducts? (Test this carefully, you could rest the wire on chocolate as a way of testing the heating effect, you could also coil plastic covered wire and immerse it in a small amount of water and measure the temperature the water reaches.) How does the number of batteries / devices in the circuit affect how much heat is produced in the wire? **Light:** Drawing upon idea about light taught in years 3 or 4: a) How does the size of an object affect the size of the shadow? b) How does the distance between the light and the object affect the size of the shadow> c) How does the distance between the object and the screen affect the size of the shadow? How would a solar eclipse be different if: a) The moon was a different size? b) The earth span faster or slower? c) The sun was large or smaller. d) If the earth and moon were the same size but further away in the solar system. Two trees in a field, one in front of the other as below. Predict if where the shadows over lap will be	How does sustained, gentle exercise affect our pulse rate? Use the model to predict the body wide symptoms of: 1. A disease that reduces the lungs ability to transfer oxygen to the blood. 2. A disease that restricts the amount of blood that can flow around the body. How might the circulatory system be different for an elephant or a hummingbird? Does your exhaled air always contain the same amount of oxygen or does exercise change this? (Use the burning candles in jars test) How might doing exercise at the top of a mountain affect the body (less air at altitude) **Living things and their Habitats:** Explore the work of Linneaus and how his work is used today. Classify a range of animals and plants in different areas of the school. Consider creating a longitudinal study whereby these areas are monitored over time for change. Know how animals and plants are adapted to suit their environment. Know about reproduction and offspring (recognising offspring normally vary and are not identical to their parents). Pupils might find out about the work of palaeontologists, such as Mary Anning, and about how Alfred Wallace and Charles Darwin developed their ideas on evolution. Study how Darwin compared different animals in different locations. How did giraffes adapt to feed? What happens when you put a house plant outside? Observe and study the impact on the plant. Make	Fossil evidence suggests mammoths lived from 400,000 to 10,000 years ago. What happened to them? Did they become extinct? Did they evolve into modern elephants? Are they still here? Children consider what scientists would have to do to find out which of these is the most likely. Show some trilobite fossils and ask children to consider the possible reasons as to why no fossils younger than 250 million years have ever been found. Provide children with cards of the Simpson's extended family. They try and create a family tree based upon similarities and differences. Some traits are inherited and others are not. Children don family research to try and work out if the following traits are inherited or not: earlobe attachment, hand clasping (when you link your fingers in a hand clasp which thumb do you place over the other?), cheek dimples, cleft chin, ability to remember random numbers, how far you can stand jump. Provide children with a simple Darwinian and Lamarckian explanation for evolution (but keep anonymous). Children try and work out what the illogical arguments are and therefore workout which one is the better argument. They could try and apply both arguments to explain why giraffes evolved longer necks as available food became higher in trees. Polar bears habitat is rapidly changing, what possible futures do they face and can we predict which is most likely? "Dinosaurs became extinct, so they can't have been very well adapted." Pupils consider this question and do some research and prepare feedback to other groups. All edible bananas have been bred so they have no seeds. All new banana trees are grown from cuttings of existing ones. If the climate changed

darker, lighter or the same as where they don't and plan an investigation to find out. (Give them card and a torch). To what extent is solid card a good model for a tree? Adapt the experiment to make it a better model; does this affect your conclusion? How does the amount aluminium foil is scrunched affect how much light is scattered? How does the amount of polishing affect how well a piece of metal scatters light? How perfect are our mirrors? Do some scatter more light than others? What happens to light when it is shone through water? How is the affected by putting glitter in the water, or salt in the water, or talc in the water? How does the eye adapt to different light conditions? Predict how nocturnal animals are adapted to living in low light conditions; check predictions through research. Set up some mirrors so you can see a candle that is hidden behind several corners. Give children a periscope that doesn't work very well, they work out what is wrong and try to correct it.	predictions for how it could have adapted and what could have been done to protect it.	would bananas we able to evolve? Plants that grow from bulbs (daffodils, blue bells, snow drops and crocuses) can reproduce sexually by pollination (but at the time of year when few insect pollinators are active) and asexually by bulbs swelling and dividing. Children consider how this might give these plants advantages and disadvantages over plants that only reproduce sexually. Construct these time lines for different organisms and consider why there are such variations in the relative times for each of these stages. E.g. compare humans and horses and oak tree and a bean.

SEND Adaptations for SCIENCE

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Cognition and Learning

- Use of first-hand practical activities to explore and spark interest.
- Use of secondary sources to support understanding of content such as books, photos, videos, simulations or animations.
- Use of word banks (and picture cards where necessary) to support understanding and learning of vocabulary. These could be displayed in class in a personalised version for adults to point to during whole class teaching or independent learning. Keep referring back to the vocabulary.
- Use of alternative ways of recording for writing up experiments including some scribing (leaving blanks for children to complete some known words independently rather than copying).
- Pre-learning and over learning to support understanding including topic related vocabulary tick sheets so children can tick off when they feel confident in using the word verbally or in writing.
- Providing examples of Science learning or experiments as models for children.
- Use of small groups to scaffold SEND children where needed.
- Application of vocabulary into different contexts to deepen understanding.

Communication and Interaction

- Create a calm and simple working classroom with clear routines, expectations and organised, labelled workspaces.
- Consider carefully where children are seated to maximise their focus and attention and minimise background noise/distraction.
- Pre-expose children with some of the Science equipment so that they naturally have an interest in what the learning is going to be about.
- Plan movement breaks and classroom jobs to allow children to move within a lesson.
- Science does not always run according to a set routine so children can be prepared for the structure of a lesson by breaking it down for them into manageable chunks and explaining this in advance of the learning. Now and Next boards could be useful for this.
- Visual words/cues/phrases.
- Repetition and reinforcement.
- Scaffolding observational skills for Science through careful and targeted questioning.
- Giving a processing prompt that a question will be coming, give the question before moving onto a few other children, before coming back for the answer.

Social, Emotional and Mental Health

- Ensure that the learning environment is calm and not too stimulating, that resources are clearly labelled and organised for independent use, therefore not encouraging frustration.
- Ensure that instructions are clear and tasks are broken down to be achievable.
- Children can be given a role within a group which does not involve them being highly active or speaking out to not heighten arousal.
- Providing fidgets to allow children to concentrate and listen despite not necessarily looking like they are listening.
- Using IT to support where necessary either for whole class learning or for recording their learning - IPads
- Providing a safe space for children within the lesson if needed – this can be accessed through an adult directed or child-initiated time out card.
- Use of positive language to encourage good choice and higher self-esteem.
- Teaching with empathy and understanding of the child's needs.
- Allow movement breaks within the classroom for example

Sensory and/or Physical

- Ensure all images are large enough and accessible.
- Consider where children with a hearing, sensory or other impairment are sitting in relation to the whiteboard or resources.
- Use of an iPad to support children with a visual impairment where screen sharing can occur.
- Additional ways of recording, i.e. videos, verbal commentary etc rather than always writing.
- Consider the Science equipment which is being used – does the child have a fine motor control difficulty which makes using equipment such as tweezers or electrical circuits difficult.
- Working within mixed ability groups to support.
- Pencil grips, tripod pencils, left handed pens etc to support.
- Use of IT to support access beyond screen sharing.
- Careful consideration of trips for Science, will the child need some access arrangements or physical support? Additional risk assessments may be required.

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• Physical warm ups to start a lesson to help recall previous learning i.e. some photos of the experiment carried out with recaps on vocabulary and processes. • Ensure that parents are aware of the vocabulary of the Science curriculum and can support the learning of terminology at home through research. Where this does not take place, allow the children time before the learning begins to research the Science vocabulary. • Knowledge organisers can be sent home and referred to in class. • Sticky knowledge quizzes (Powerpoints) in mixed ability groups to be completed to recap important knowledge regularly.	• Simple, step by step instructions verbally and then in a prompt sheet. • Use of appropriate modelling to support understanding.	giving out equipment or books etc. • Allow sensory/brain breaks as a break from learning. • Think about cognitive overload and the child's ability to cope with this.	

Y4 states of matter- Adapted worksheets using widgit- circle the widgit rather than write a prediction as to whether the object will melt or not melt.

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Y4 Sound- Ordering the widgit images based on the loudness of the instrument.

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Y4 States of Matter-

Widgits to sort the images into the different states.

· Y3 Plants- use large scale representations to identify the main features, recognise where parts are and discussing jobs.

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Year 3 Plants- had real plants to feel for sensory, movement to find plants and explore to build knowledge.

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Y3 Rocks- sensory use of feeling rocks with word cards to encourage use of vocab and language. Use of widgets and images to match and

SEND Adaptations for SCIENCE

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place in categories.

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Y3 Rocks- Pictures/widgets of light heavy, soft etc to sort into groups and stick in books.

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Y3 light- widgets and images with fewer selections to choose from for natural and man made then stuck on worksheet. Practical before to build knowledge.

- Year 1 Materials - Allow children to explore resources in STEM-in-a-box before practical investigations are undertaken.

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Year 1 - Colour Semantics Mats produced to form coherent sentences and aid the spelling of content-specific words.

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Year 6 Electricity and Light - Hands on practical activities with equipment. Widgit strips to write up investigations.

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Year 2 - Widgit mats with key vocab

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Year 5 - practical activities as much as possible. Help with discussing conclusions/scribing.